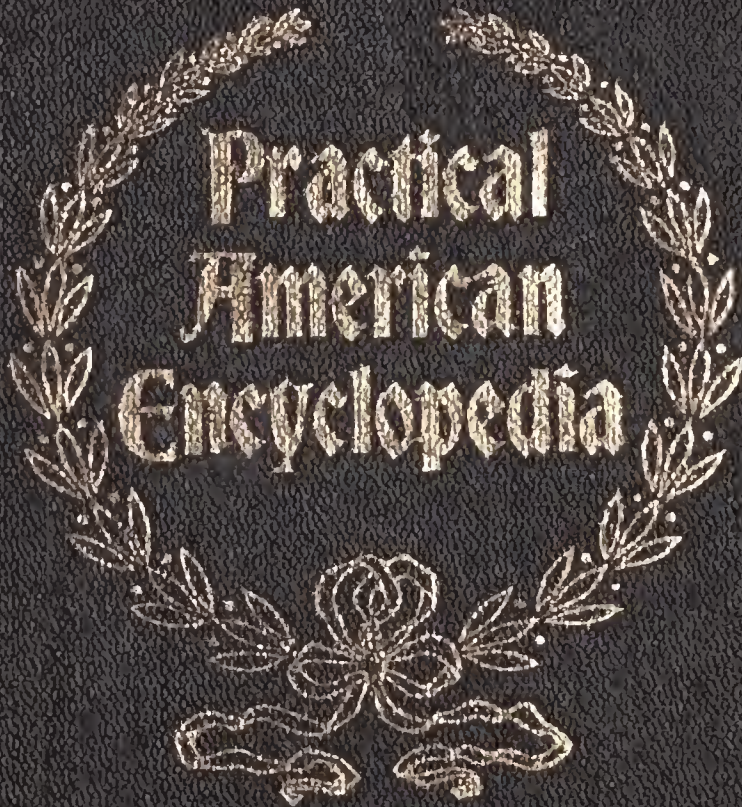


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Associate Editor

RURIC NEVAL ROARK

Teacher and Educational Writer; Author of Pedagogical Works; President Kentucky State Normal School, Richmond, Ky.

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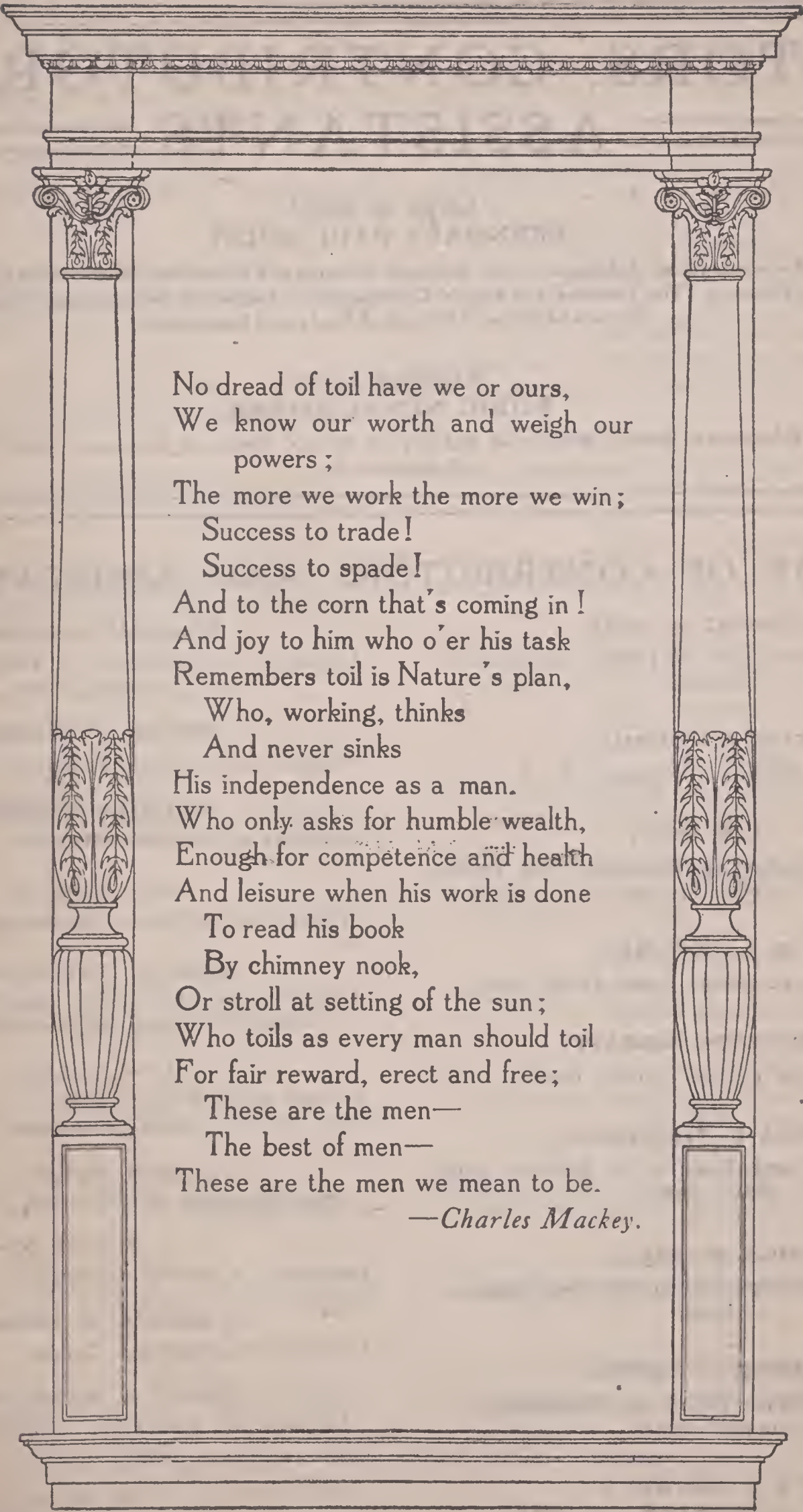
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No dread of toil have we or ours,  
We know our worth and weigh our  
powers ;

The more we work the more we win ;  
Success to trade !

Success to spade !

And to the corn that's coming in !

And joy to him who o'er his task

Remembers toil is Nature's plan,

Who, working, thinks

And never sinks

His independence as a man.

Who only asks for humble wealth,

Enough for competence and health

And leisure when his work is done

To read his book

By chimney nook,

Or stroll at setting of the sun ;

Who toils as every man should toil

For fair reward, erect and free ;

These are the men—

The best of men—

These are the men we mean to be.

—*Charles Mackey.*



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## PREFACE

**B**OOKS of reference have an abiding place in every modern library. They combine convenience in obtaining facts with a wide range of knowledge, enabling the student, the man of commerce, and the professional man and woman to remain in close touch with reliable and recent information.

In this age of the telephone, the automobile, the flying machine, and thousands of new and useful implements of civilization, the demand for books of reference has multiplied beyond the dreams of the past. Those who wish to remain in contact with the advancing spirit of the age, who desire to stand abreast with the intelligent in the struggle for place and power, need to have at their command information fitted for the spirit of the times.

When asked for an opinion in regard to the relative value of different kinds of books, Chauncey Mitchell Depew, famous among the public men of America, made the following reply:

“I look with great favor on and attach considerable importance to encyclopaedias, as may be judged from the fact that I not only paid \$250.00 for my first set, but have bought several others since then. I have always advised young men who could not afford to buy a library to get an encyclopaedia, which is a library in itself.”

This work of reference is more than a storehouse of knowledge, more than a collection of facts in the arts, sciences and literature, in that it contains the instruments which enable students to spell and pronounce correctly, as well as to define and properly use the thousands of titles which are treated. A fact without a mind to use it is valueless, hence the writers of this work have made it doubly valuable by dividing the difficult titles into syllables and by marking the vowels diacritically. This enables the student who needs help, aside from securing information about important subjects, to pronounce and use the words understandingly.

The subjects are treated with the view to furnish accurate information and at the same time to give prominence to the different titles in proportion to the places they occupy in the field of knowledge. Some are treated briefly, while others are explained exhaustively, this depending upon the average requirement for facts as reference is made to the different subjects of thought and conversation. To obtain this balance in the arrangement and to secure the greatest possible accuracy, many subdivisions of the titles treated were arranged by the writers, including such as agriculture, biology, education, geography, history, pedagogy, architecture, and hundreds of other vital topics. Editors of recognized ability gathered the information from the most reliable sources, corresponding with leading students and officials in all the civilized nations, after which the editor-in-chief compared and re-edited the entire productions so as to unify and systematize the scope and general plan of treatment.

Another feature to which the attention of the reader is directed, one which is of much utility, is the collection of illustrations. Practically all the leading plants and animals, the scientific and mechanical devices, the astronomical and geographical topics, are illustrated so as to combine the picture with the printed information. This method fixes in the mind facts of importance more clearly, almost indelibly, which otherwise might be lost or even uncompre-



hended. The artists employed to illustrate this work used in nearly all cases, in fact wherever it was at all possible, objects instead of pictures to make the illustrations as recent and practical as possible.

While scientific accuracy has been maintained, the language is clear and free from such technicalities as often tend to confuse. This feature of the work commends it to all students, who find the treatment such as to understand it. The different titles are not only pronounced diacritically, but cross references are employed to make the subjects plain. In references of this kind, certain titles or subheads are indicated, or the Latin term *quo vide* (q. v.) is used.

Attention is called to the numerous photographic plates and beautiful maps. These illustrations were made especially for this work, hence they aid in a direct way in simplifying the subjects and extending the information sought. Besides the colored maps of political divisions, the work contains wash drawings in the form of physical maps of the continents. The provinces of Canada, the states of the United States, and many of the islands are shown by small maps in the text, giving the outline, the water and land surface, the principal railways, and the capitals and other cities.

The pages are printed from entirely new plates, made by the most approved methods. The type is clear and easily read. This enables the student to search for information without waste of time and with no unnecessary tax upon the eye.

Attention is called to the need of reliable reference in commerce, banking, politics, social development, astronomical research, and the vast achievements of recent years in the arts and sciences. Those who rely upon the newspapers for this information soon find they are not in touch with the spirit of this progressive age, not that the periodicals fail to inform, but they are easily lost or mislaid, or the file on hand becomes too voluminous for practical use. With such a work as this, giving the titles in alphabetical order, brought up to the date of publication, the speaker, the writer, the student, and the teacher are all enabled to utilize facts to the best advantage.

No work has been spared in making this publication an accredited fund of knowledge. Many standard works of reference were consulted, including such as Webster's *International Dictionary*, the *Century Dictionary*, the *Standard Dictionary*, Muret's *Encyclopédie*, Spamer's *Konversation Lexikon*, Brockhaus' *Konversation Lexikon*, and numerous other American and European works of high repute, whose accurate details furnish essential aid in the verification of uncertain dates and controverted facts and events.

This work is offered to the reading public with the feeling of assurance that it will receive a hearty reception, that it will fill a useful place in the library of its owner. It is believed that the newer information, the record of ancient development and modern achievements, as treated and presented in this work, will help and gratify those who search for a larger view of civilization and its attainments.

Those who dedicate their lives to the work of research realize the truth of Charles Mackey's well-written words:

Blessings on Science! When the earth seemed old,  
When Faith grew dotting, and the Reason cold,  
'Twas she discovered that the world was young,  
And taught a language to its lispng tongue;  
'Twas she disclosed a future to its view,  
And made old knowledge pale before the new.

BERNHART PAUL HOLST.

# KEY TO PRONUNCIATION

## VOWELS

- ä (short), as in *hat, cat*.  
 ā (long), as in *ale, hate*.  
 ä (Italian), as in *car, mar*.  
 à (short Italian), as in *fast, class*.  
 ą (broad), as in *all, fall*.  
 â (circumflex), as in *care, snare*.  
 ą (short obscure), as in *final, spinal*.  
 â (long obscure), as in *surface*.  
 ą = ǒ, as in *was, what*.  
 ae = ē, as in *Caesar* (sounded as though they were *e* alone).  
 ě (short), as in *net, met*.  
 ē (long), as in *me, eve*.  
 ê (circumflex = â), as in *there*.  
 ě (tilde), as in *her*.  
 ę (short obscure), as in *patent*.  
 è (long obscure), as in *delay*.  
 è = ĭ, as in *pretty*.  
 ĭ (short), as in *hit, bit*.  
 ī (long), as in *kite, mite*.  
 ĩ (tilde), as in *sir*.  
 î (long obscure), as in *idea*.

- ǒ (short), as in *pop, hop*.  
 ō (long), as in *cone, bone*.  
 ô (circumflex = ą), as in *for*.  
 ô (long obscure), as in *hero*.  
 Ǔ (short), as in *book, brook*.  
 ōō (long), as in *moon, spoon*.  
 ȝ = û, as in *word*.  
 ȝ = ōō, as in *who*.  
 ȝ = Ǔ, as in *wolf*.  
 ȝ = ŭ, as in *son*.

- ŭ (short), as in *rut, cut*.  
 ū (long), as in *muse, fuse*.  
 û (circumflex), as in *turn, urn*.  
 ũ (long obscure), as in *unite*.

w is a vowel only after a vowel, when it forms the second element of certain diphthongs, as in *few, how*.

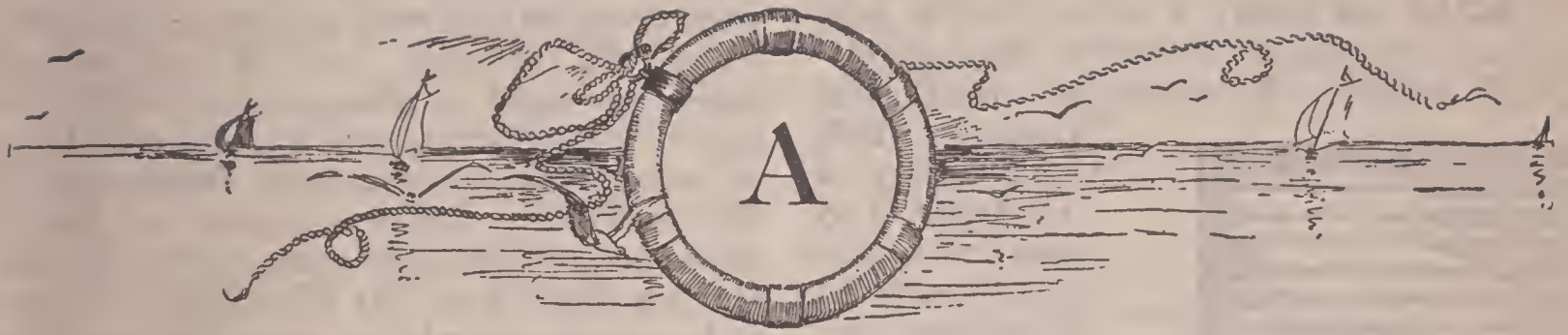
- ȳ (short) = ĭ, as in *hymn*.  
 ȳ (long) = ĭ, as in *by, cry*.

## CONSONANTS

- c (hard) = k, as in *cat, cape*.  
 ç (cedilla) = s, as in *cell, façade*.  
 ġ (hard), as in *dog, gave*.  
 ģ (soft), as in *gem, gentle*.

- k for the German ch, as in *ich, Bach* (bäk).  
 ü for the German ü, as in *Blücher, Grünberg*.  
 ö for the German ö, as in *Göttingen, Görgey*.  
 n for the French n, as in *bon, Bréton* (brâ-tôn').





A

AARHUS

**A**, the first letter in the alphabet of all Indo-European languages. In many modern tongues it has but one sound, that equivalent to *a* in *father*. In English this symbol represents nine distinct sounds, as in *fate*, *senate*, *fare*, *mat*, *arm*, *ask*, *final*, *all*, and *what*; besides variations when used in digraphs, as *ea* in *meat*, *oa* in *float*. The letter *a* is used as a mark or symbol on account of its place at the beginning of the alphabet. In music it stands as the sixth note in the diatonic scale of C major; in logic it represents a universal affirmation; while in algebra it is used with other letters to denote known quantities.

**AA**, the name of about forty small rivers in Central and Northern Europe derived from the Celtic *Ach*, or Teutonic *Aa*, meaning flowing water. Among the most important of them are the following: I. A river of Holland, in North Brabant, which, passing Helmond, joins the Dommel at Bois-le-Duc. II. A river in Groningen, called Westerwolden Aa, which falls into the Dollart. III. A river in Overijssel, which, after uniting its waters with the Vecht, flows into the Zuyder Zee. IV. A river of Belgium, in the province of Antwerp, which flows into the Neethe.

**AACHEN** (ä'ken). See **Aix-la-Chapelle**.

**A1**, a symbol used in Lloyd's "Register of British and Foreign Shipping" to designate vessels for the guidance of shippers and insurers. *A* designates the hull of the ship, and the figure 1 the efficiency of her stores, cables, and anchors. When these are insufficient for any reason, the figure 2 is united with *a*, and in like manner other figures and letters are used to constitute a complete nautical language.

**AALBORG** (a'l'börk), a seaport and city of Denmark, province of Jutland, situated on the south shore of the Lymfjord, near its outlet into the Cattegat. It has a school of navigation, a large herring fishery, and manufactures of clothing and machinery. Direct communication

is maintained by steam and packet boats with Copenhagen. The city library has 31,000 volumes. Population, 1906, 31,509.

**AAR**, or **Aare** (är), a noted river in Switzerland, next to the Rhine and Rhone the largest stream in that country. It contains the Falls of Handeck, 200 feet high, and joins the Rhine at Coblenz after a course of 200 miles. From Lake Thun it is navigable for small craft.

**AARD-VARK** (ärd'värk), a burrowing and insectivorous mammal common to large parts of Africa. Three species are known, one each in Senegal, Nubia, and South Africa. These animals have affinities with the ant-eaters and armadillos, and are timid and harmless. Both natives and Europeans regard the flesh of value as food. The hams, salted and dried, are especially favored for eating in the summer season.

**AARD-WOLF** (ärd'wöolf), a carnivorous burrowing animal of South Africa. In size and habits it resembles the fox, and is allied to the



AARD-WOLF.

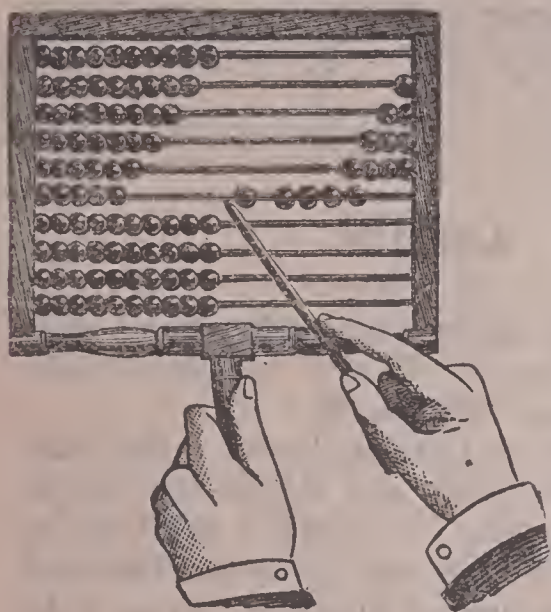
African hyenas. It feeds on small mammals, white ants, and carrion. The aard-wolf is timid, spending most of the day in its burrow, but comes out at night in search of food.

**AARHUS** (ör'höös), a city of Denmark, capital of a district of the same name, 36 miles east of Viborg. It occupies a fine site on the Cattegat. The manufactures include clothing, earthenware,



and ships. Electric and steam railways furnish communication with the leading cities of the country. It has a fine cathedral, several schools of higher learning, and a library of 200,000 volumes. Population, 1906, 55,193.

**ABACUS** (ăb'ă-kŭs), a device used in kindergartens and primary schools to teach the elements of numbers. It consists of a rectangular



ABACUS.

frame, in which parallel wires are fastened to contain counters or beads. In architecture, the abacus is a square or oblong tablet on the crown of a column. In the new Ionic, Corinthian, and Roman styles the abacus has truncated angles and concave sides,

while in the old Ionic, Doric, and Tuscan styles it is oblong.

**ABALONE** (ăb-ă-lō'nĕ), the name of several species of marine gastropods common to California, and found more or less widely distributed throughout the warmer seas. The name *abalone* is of Spanish origin, in California, but these animals are better known generally as ear-shells or sea-ears. They are allied with the limpets, and, like them, when frightened or at rest, withdraw the soft part under the shell, which is a broad spiral and has a richly colored mother-of-pearl, used in making buttons and ornaments. Large quantities are gathered by the Orientals on the coast of California for food, to be consumed locally, and for shipment to China and Japan.

**ABATIS**, or **Abattis**, in military strategy, a bulwark made of felled trees, in frequent use in rude mountain warfare. On emergency, the trees are laid lengthwise, with the branches pointed outwards to repel the invaders, while the trunks serve as a breastwork for the defendants.

**ABBEY** (ăb'bĭ), a monastery or society of persons of either sex, who seclude themselves from the world and lead a life devoted to religion. The name *abbey* is also applied to the monastic building or buildings. Men located in these establishments are called monks, and are governed by an abbot; while the women are called nuns, and are governed by an abbess.

**ABBOT** (ăb'bŭt), a prelate in the Roman Catholic Church, who governs a principal con-

vent or monastery of the old religious orders. An abbot is solemnly consecrated by a bishop, though this is regarded as a merely ecclesiastical and not a sacramental rite. Abbots are allowed to use the mitre, pastoral cross, ring, and crozier, and to celebrate pontifical mass and are styled right reverend. Some of them, in former times, exercised a quasi-episcopal jurisdiction over a small district, and were allowed to confer tonsure and minor orders. During the Middle Ages many abbots, especially in England, were powerful feudal barons. In modern times they are simply superiors of religious houses. In ecclesiastical councils an abbot has a deliberative but not a decisive voice. Superiors of convents in the Greek Church are called *mandrites* and general abbots are known as *archimandrites*.

**ABBOTSFORD**, the country home of Sir Walter Scott, on the Tweed River, in Scotland, built in the Scottish baronial style of architecture. Scott spent large sums of money in adorning the buildings and grounds, a circumstance that was the chief cause of his financial failure. The mansion passed to the only surviving daughter of Scott, and was long used as a Roman Catholic seminary for girls. The Abbotsford Club was organized at Edinburgh for publishing literature and history connected with the writings of Sir Walter Scott. This organization issued thirty-four volumes in the years 1835-64.

**ABBREVIATIONS** (ăb-brĕ-vĭ-ă'shŭns), the name applied to certain contractions employed in writing and printing to represent a letter or group of letters taken from a word or group of words, and used mainly to save time and space. The most common form of abbreviations is the substitution for a word of its initial letter, or of some arbitrary sign. Most of the sciences and arts have sets of signs, abbreviations, or symbols peculiar to themselves. It is quite impossible to give all the abbreviations now in general use, but below is a list of those considered most important:

- |  |  |
|--|--|
| A. B. Bachelor of Arts.  | B. C. Before Christ, British Columbia. |
| Abp. Archbishop.   | B. D. Bachelor of Divinity.            |
| A. D. <i>Anno Domini</i> , in the year of our Lord.                              | B. L. Bachelor of Laws.                |
| Admr. Administrator.   | Bp. Bishop.                            |
| Ala. Alabama.  | B. V. Blessed Virgin.                  |
| Alas. Alaska.  | Cal. California.                       |
| Alb. Alberta.  | C. Consul, Caesar.                     |
| A. M. <i>Anno Mundi</i> , in the year of the world.                              | Can. Canada.                           |
| A. M. Master of Arts.  | C. E. Canada East.                     |
| A. M. <i>ante meridian</i> , forenoon.   | C. E. Civil engineer.                  |
| Ariz. Arizona.   | Cent. <i>Centum</i> , or hundred.      |
| Ark. Arkansas.   | Chap. Chapter.                         |
| A. U. C. <i>Ab urbe condita</i> , meaning from the building of the City of Rome. | Co. Company or county.                 |
| Aug. August.   | Col. Colonel.                          |
| Ave. Avenue.   | C. O. D. Cash on delivery.             |
| Bart or Bt. Baronet.   | Col. or Colo. Colorado.                |
|  | C. R. <i>Civis Romanus</i> .           |
|  | Cr. Creditor, credit.                  |



C. S. A. Confederate States of America.  
 Ct. or Conn. Connecticut.  
 Cwt. Hundredweight.  
 D. Five hundred.  
 D. *Denarius*, a penny.  
 D. C. District of Columbia.  
 D. D. Doctor of Divinity.  
 Dec. December.  
 Del. Delaware.  
 D. F. *Fidei defensor*, defender of the faith.  
 D. G. *Dei Gratia*, by the grace of God.  
 Do. *Ditto*, the same.  
 Dr. Doctor, debtor.  
 D. V. *Deo volente*, God willing.  
 Dwt. Pennyweight.  
 E. East.  
 E. G. *Exempli gratia*, for example.  
 Esq. Esquire.  
 Exr. Executor.  
 Feb. or Febr. February.  
 F. G. S. Fellow of the Geological Society.  
 F. O. B. Free on board.  
 F. R. S. Fellow of the Royal Society.  
 Fla. Florida.  
 Frank. Franklin.  
 Ga. Georgia.  
 Gal. Gallon.  
 G. A. R. Grand Army of the Republic.  
 G. B. Great Britain.  
 Gen. General.  
 G. C. B. Knight of the Grand Cross of the Bath.  
 Gov. Governor.  
 Hhd. Hogshead.  
 H. I. Hawaiian Islands.  
 H. M. S. His Majesty's ship.  
 Hon. Honorable.  
 H. R. H. His or Her Royal Highness.  
 Ia. Iowa.  
 Ib. or *Ibid*, *Ibidem*, in the same place.  
 Id. *Idem*, the same.  
 Ida. Idaho.  
 I. e. *Id est*, that is.  
 I. H. S. *Jesus Hominum Salvator*, Jesus the Saviour of mankind.  
 Ill. Illinois.  
 Incog. *Incognito*, unknown.  
 Ind. Index, Indiana.  
 Inst. Instant, of the present month.  
 Jan. January.  
 J. P. Justice of the Peace.  
 Jr. Junior.  
 Kans. Kansas.  
 K. B. Knight of the Bath.  
 Kew. Kewatin.  
 K. G. Knight of the Garter.  
 Kt. Knight.  
 Ky. Kentucky.  
 La. Louisiana.  
 Lab. Labrador.  
 Lat. Latitude.  
 L. or lib. *Libra*, a pound; or *liber*, a book.  
 L. I. Long Island.  
 Lb. *Libra*, pound.  
 Lieut. Lieutenant.  
 LL. D. *Legum doctor*, Doctor of Laws.  
 Lon. or Long. Longitude.

L. S. *Locus Sigilli*, place of the seal.  
 M. *Mlle*, or a thousand.  
 M. A. Master of Arts.  
 Mack. Mackenzie.  
 Man. Manitoba.  
 Mar. March.  
 Mass. Massachusetts.  
 M. C. Member of Congress.  
 M. D. *Medicinae doctor*, doctor of medicine.  
 Md. Maryland.  
 Me. Maine.  
 Messrs. *Messieurs*, gentlemen.  
 Mex. Mexico, or Mexican.  
 Mich. Michigan.  
 Minn. Minnesota.  
 Miss. Mississippi.  
 Mo. Missouri.  
 Mon. or Mont. Montana.  
 M. P. Member of Parliament.  
 Ms. Manuscript. MSS. Manuscripts.  
 N. North, note, noon.  
 N. A. North America.  
 N. B. *Nota bene*, mark well.  
 N. B. New Brunswick.  
 N. C. North Carolina.  
 N. D. No date, North Dakota.  
 N. E. New England.  
 Neb. Nebr. Nebraska.  
 Nev. Nevada.  
 Nfld. Newfoundland.  
 Nem. con. *Nemine contradicente*, unanimously.  
 N. H. New Hampshire.  
 N. J. New Jersey.  
 N. M. New Mexico.  
 No. Number.  
 Nov. November.  
 N. P. Notary Public.  
 N. S. New style, Nova Scotia.  
 N. Y. New York.  
 Ob. *Obit*, died.  
 O. Ohio.  
 Oct. October.  
 Okla. Oklahoma.  
 Ont. Ontario.  
 Or. or Ore. Oregon.  
 O. S. Old style.  
 Ox. Oxon, of Oxford.  
 Oz. Ounce.  
 Pa. or Penn. Pennsylvania.  
 Parl. Parliament.  
 Per ann. By the year.  
 Per cent. *Per centum*, by the hundred.  
 P. I. Philippine Islands.  
 Pl. Plural.  
 P. M. *Post meridian*, afternoon.  
 P. M. Postmaster.  
 P. O. Post office.  
 Prof. Professor.  
 Pro tem. *Pro tempore*, temporarily.  
 Prox. Next month.  
 P. S. Postscript.  
 Q. Question.  
 Que. Quebec.  
 Qy. *Quaere*, query.  
 Q. C. Queen's Counsel.  
 Q. E. D. *Quod erat demonstrandum*, which was to be demonstrated.  
 Q. S. *Quantum sufficit*, a sufficient quantity.  
 Q. V. *Quod vide*, which see.

R. A. Royal Academy, Royal Artillery.  
 R. E. Royal Engineer.  
 Rev. Reverend.  
 R. I. Rhode Island.  
 R. N. Royal Navy.  
 Rt. Hon. Right Honorable.  
 S. South, of *solidus*, a shilling.  
 S. A. South America.  
 Sask. Saskatchewan.  
 S. C. South Carolina.  
 S. D. South Dakota.  
 Sec. Secretary.  
 Sept. September.  
 S. P. Q. R. *Senatus Populusque Romanus*.  
 SS. *Scilicet*, to wit, namely.  
 St. Saint, street.  
 Tenn. Tennessee.  
 Tex. Texas.  
 U. C. *Urbs Condita*, year of Rome.  
 Ult. *Ultimo*, last month.  
 Ung. Ungava.  
 U. S. United States.  
 U. S. A. United States Army.  
 U. S. N. United States Navy.  
 Ut. Utah.  
 V. or Vs. Against.  
 Va. Virginia.  
 Viz. *Videlicet*, namely.  
 V. S. Veterinary surgeon.  
 Vt. Vermont.  
 W. West.  
 Wash. Washington.  
 Wis. Wisconsin.  
 W. Va. West Virginia.  
 Wy. Wyoming.  
 Xmas. Christmas.  
 Yr. Your, year.  
 Yuk. Yukon.  
 &, etc., and &c. *Et cetera*, and so forth.  
 Y. M. C. A. Young Men's Christian Association.

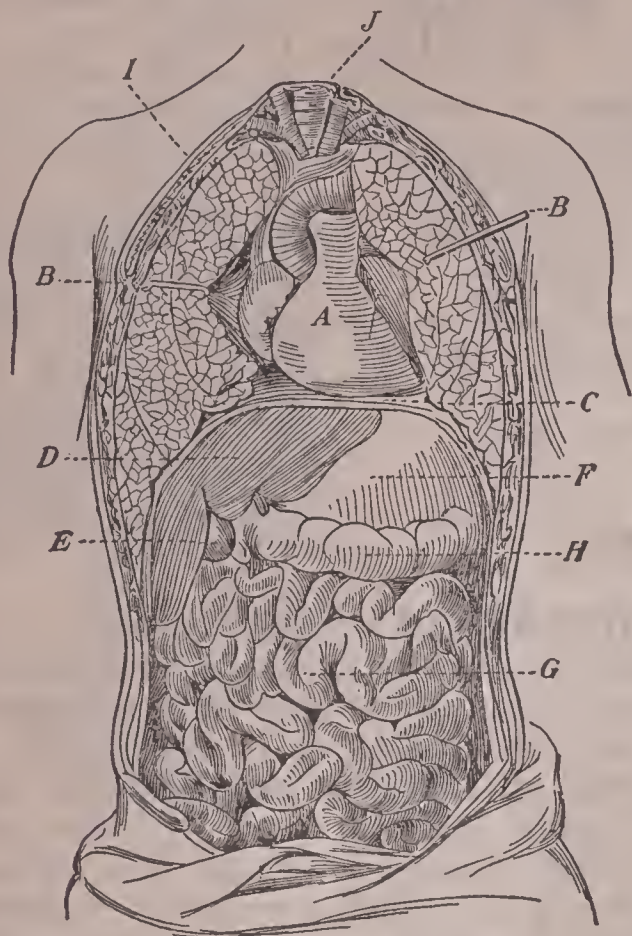
**ABDICATION** (ăb-dĭ-kā'shŭn), the act whereby an office or dignity is given up before the expiration of the term of incumbency, and may be either voluntary or compulsory. The abdication of Diocletian and Maximian are the best known cases in antiquity. In absolute monarchies despotic sovereigns may abdicate at any time, but in a limited monarchy or independent state it usually requires the consent of the legislative branch of government. The following is a list of important abdications occurring in the last century:

Charles Emmanuel IV. of Sardinia.....	June	4, 1802
Charles IV. of Spain.....	March	19, 1808
Joseph Bonaparte of Naples.....	June	6, 1808
Gustavus IV. of Sweden.....	March	29, 1809
Louis Bonaparte of Holland.....	July	2, 1810
Napoleon I. of France.....	} April	14, 1814
		June
Victor Emmanuel of Sardinia.....	March	13, 1821
Charles X. of France.....	August	2, 1830
William I. of Holland.....	Oct.	7, 1840
Louis Philippe of France.....	Feb.	24, 1848
Ferdinand of Austria.....	Dec.	2, 1848
Charles Albert of Sardinia.....	March	23, 1849
Isabella II. of Spain.....	June	25, 1870
Amadeus I. of Spain.....	Feb.	11, 1873
Abdul-Aziz of Turkey.....	May	30, 1876

**ABDOMEN** (ăb-dŏ'mĕn), in anatomy, the lower part of the trunk of the body; the trunk being divided by the diaphragm into two cavities—the upper being the thorax, and the lower the abdomen. It is walled in by broad muscles, fasciae and skin, except behind, where the projecting processes and the bodies of the five lumbar vertebrae assist, above by the walled diaphragm, and below by the bones of the pelvis. The capacity of the abdomen varies according to the nature of its walls. It is lined by a clothed serous sac, the *peritoneum*, whose visceral layer is reflected over the contained viscera, forming a thin exterior coat. In entomology, the abdomen is the last of the three parts into which the body of an insect is divided. It is



composed of a number of rings or segments, frequently nine, more or less distinct from each other. In many insects the last part of the abdo-



THORAX AND ABDOMEN.

A, the heart; B, the lungs drawn aside to show the internal organs; C, the diaphragm; D, the liver; E, the gall cyst; F, the stomach; G, the small intestines; H, the transverse colon; I, muscles of the chest; J, trachea.

men contains pincers, stings, borers, and various other appendages for divers uses.

**ABERDEEN** (ăb-er-deen'), the chief seaport city in the north of Scotland, county seat of Aberdeen County, on the North Sea, at the mouth of the Dee River. The city is conveniently situated on a number of important railroads, has extensive wharfage, and a large export and import trade. There are manufactures of cordage, linen and woolen goods, chemicals, ships, machinery, stone and iron wares, paper, and spirituous liquors. The streets are substantially paved, and improved with gas and electric lighting, sewerage, and extensive street railways. Union Street is its main thoroughfare and its numerous notable buildings cause it to rank as one of the finest streets of Europe. Among the chief buildings of the city are the University of Aberdeen, the custom-house, the Royal Infirmary, and numerous hospitals, schools, and churches. The extensive use of granite in the larger buildings has caused it to be known as the "Granite City." It was chartered in 1179, and has long ranked as a city of great wealth, educational progress, and commercial importance. Population, 153,110.

**ABERDEEN**, a city of South Dakota, coun-

ty seat of Brown county, 120 miles northeast of Pierre, on the Chicago and Northwestern, the Great Northern, and the Chicago, Milwaukee and Saint Paul railroads. It is surrounded by a fertile agricultural country, and is an important shipping point for cereals and live stock. There are manufactures of farming implements and a considerable jobbing trade. It has electric lights, waterworks, sewerage, and many fine churches, and is the seat of a State normal school. The city was incorporated in 1882. Population, 1900, 4,087; 1905, 5,841.

**ABERRATION** (ăb-ēr-ră'shŭn), in optics, the wandering of rays of light from the normal path, caused when reflected from curved mirrors, or made to pass through curved lenses, which form portions of a sphere instead of portions of a parabola. This is due to the unequal refraction of the lenses of the rays of light and renders images formed about the edges in some degree undefined. In astronomy, aberration is the difference between the observed position of a heavenly body and the one really occupied, the result of the combined effect of the motion of the eye of the observer and that of the light caused by the annual or diurnal motion of the earth, or of the motion of light and that of the body from which the light proceeds. The aberration of light, discovered by James Bradley (1693-1762), an English astronomer, is proof of the motion of light and of the earth's motion.

**ABINGTON** (ăb'ing-tun), a manufacturing town of Plymouth County, Mass, twenty miles southeast of Boston. The principal manufactures are boots and shoes. It has a municipal waterworks plant, several fine schools and churches, and good railroad facilities by the New York, New Haven, and Hartford Railway. The first settlement in its vicinity was made in 1680. Population, 1905, 5,081.

**ABO** (ăb'ăbŏ), a city of Russian Finland, built on both sides of the Aurajoki, not far from where it flows into the Gulf of Bothnia. It was founded in 1157 by the Swedes, and was the capital of Finland until 1819. The bishopric established here in the 13th century was raised in 1817 by the Russian government to an archbishopric. In 1827 the greater part of the city was destroyed by fire, including the university buildings and the library containing 40,000 volumes. The university was rebuilt in Helsingfors, the new capital. It is important as a shipbuilding port and has extensive cotton mills and sugar refineries. Population, 1901, 39,238.

**ABOLITIONISTS** (ăb-ă-lish'ŭn-ĭsts), a political party in the United States, whose object was to secure the immediate abolition of slavery. Early in the 18th century a strong sen-



timent became widespread throughout the country in favor of the abolition of all slaves. As early as the close of the Revolutionary War a number of Northern states provided for immediate or gradual emancipation. Before the end of the century many abolition societies were founded. The movement secured new impetus when William Lloyd Garrison and his followers in 1829 demanded the immediate and total abolition of slavery throughout the country. Other influential advocates of abolition, besides Garrison, include Wendell Phillips, John G. Whittier, Edmond Quincy, Samuel J. May, and William Jay. The sentiment grew in popularity until the movement ended Jan. 1, 1863, when Lincoln emancipated the slaves.

**ABOMEY** (ăb-ô-mă'), a town in West Africa, in Dahomey, about sixty miles from the coast of Guinea. It is inclosed by an earthen wall, surrounded by a ditch, and the houses are mostly of mud or are wooden structures. Formerly it had some importance as a slave market, but at present its trade is chiefly in ivory, gold, and palm oil. Population, 21,000.

**ABOUKIR** (ă-bôô-kēr'), or **Abukir**, a village in Egypt, thirteen miles northeast of Alexandria, near the site of the ancient Canopus. Its harbor is spacious, and on its western side is a castle of considerable strength. In 1798 Aboukir Bay was the scene of the famous Battle of the Nile, in which an English fleet under Nelson defeated a French fleet commanded by De Bruyes, thus destroying the naval power of France in the Mediterranean. Napoleon defeated the Turks under Mustapha near Aboukir in 1799, and Sir Ralph Abercromby (1734-1801) repulsed the French in its vicinity in 1801, the engagement being known as the Battle of Alexandria.

**ABRACADABRA** (ăb-ră-că-dăb'ră), a word used as a magical formula to invoke the assistance of good spirits against all evils and sickness. It was probably first used by the Persians, who inscribed it in the form of an inverted triangle on gems that formed a class of Abraxas stones. Worn on the bosom for nine days and then destroyed secretly, it was supposed to cure fevers and other ailments. Severus Sammonicus, a Gnostic physician, recommended its use as early as 200 A. D.

**ABRASIVE** (ăb-ră'siv), the name applied to any natural or artificial material employed in the art of grinding and polishing. In modern

manufacturing the use of natural abrasives has given way to a large extent to the artificial substances in cutting and polishing stone, wood, and metal. To the former class belong sand, emery, quartz, garnet, and corundum. Sand is employed extensively in the sandblast and in the form of sandpaper for cleaning wood and ironwork, while emery is used in the form of powder to polish stones and plate glass. Emery wheels have faces coated with emery or are solid emery stone, and emery paper or emery cloth is paper or cloth coated with powdered emery. Quartz is used for buhrstones, and garnet, which, by its cleavage, presents new cutting edges instead of wearing smooth, is an excellent material for polishing wood and leather. Corundum is mined extensively in North Carolina and is made into an abrasive powder by crushing and grinding. Carborundum, pumice, tripoli, and crushed steel are other abrasives. Whetstones and grindstones are cut from natural rocks, while pumice is a volcanic ash and is used for polishing and scouring in lumps or in the form of powder. See **Emery**; **Carborundum**.

**ABSINTH** (ăb-sinth'), a liquor prepared from the leaves and the flowering tops of various species of wormwood with roots of sweet flags, angelica, the leaves of the dittany of Crete, star anise fruit, and other aromatics, usually by being steeped in alcohol. While the beverage is pleasant to the taste, it is quite harmful to the system and dangerous to health. It is manufactured in Switzerland and France, but is consumed chiefly in the latter country. Its introduction into France dates from the Algerian War of 1844-47, when the soldiers returning to France, who had acquired the habit of drinking it in Algeria, caused the custom to become widely disseminated in French society.

**ABSOLUTION** (ăb-sô-lū'shŭn), the pardon and remission of the sins of a penitent. In the Roman Catholic Church the priest pronounces absolution in *foro externo*, the remission of certain ecclesiastical penalties, or absolution in *foro interno*, the remission where mortal and venial sin is remitted. The Augsburg Confession of the Lutheran Church retained absolution as the individualization of the promise of Scripture to the penitent rightly disposed. In the Episcopal Church absolution is a formula of publicly praying for, or declaring, the remission of the sins of the penitent, and in visiting the sick pardon from sin is pronounced after private confession.

**ABSOLUTISM** (ăb'sô-lū-tiz'm), a form of government in which the executive power is



vested in a ruler who is not controlled by any constitution or law. It was the prevailing government of ancient time, and reached its highest development in Europe after the downfall of the feudal system. Louis XIV. of France was its most arbitrary modern champion, and declared, "I am the state." Japan and Russia a few years ago changed to representative governments. Turkey, though usually classed as an absolute government, has had a constitution since 1908.

**ABSORBENTS** (ăb-sôrb'ents), the vessels by which the nutritive elements of food are carried into the circulation of plants and animals. In plants this function is carried on by the extremities of the roots, and in vertebrate animals it depends chiefly upon the skin, lacteals, and lymphatics.

**ABSORPTION** (ăb-sôrp'shŭn), in physiology, the act of taking up material suitable for nourishment by means of tissues. The nutritious elements of foods are gathered by a system of minute vessels called absorbents, and are carried into the circulation. The vessels consist of two main classes, named, respectively, lacteals and lymphatics, but absorption is carried on to some extent by the skin and blood vessels. In plants, absorption is carried on chiefly by the roots.

**ABSTRACTION** (ăb-străk'shŭn), the mental act of withdrawing the consciousness from one or more subjects with a view to concentrating it on some definite one, or the act of the mind by which a part of the objects presented for observation are disregarded in order to concentrate the attention on the remainder.

**ABUTILON** (ă-bŭ'ti-lŏn), a genus of plants of the mallow family, widely distributed in warm climates, and including about seventy species. Some species are cultivated for their bell-shaped flowers. The common abutilon is a weed in many parts of the United States, where it is known as velvet-leaf.

**ABYDOS** (ă-bi'dŏs), an ancient city of Asia Minor, located at the narrowest part of the Hellespont. It is noted as the scene of a number of historic events, among them those of 480 B. C., when Xerxes crossed the straits on a great bridge of boats at the time of his invasion of Greece. Alexander the Great crossed at the same place when he marched into Asia in the year 334 B. C. Ancient writers credit Leander with swimming nightly from Abydos to Sestos, a distance of about a mile, to see his beloved Hero—a feat in swimming accomplished by Lord Byron to verify the story of Leander. Abydos is also the name applied to an ancient city of Upper Egypt, situated a short distance

west of the Nile, the site of which is now marked by ruins and tombs. It is famous for the palace of Memnon and the temple of Osiris. In 1818 and in 1864 various collections of the famous Abydos tablets were discovered in its vicinity. They contain a list of the successors of Rameses the Great, including the kings of the first three dynasties of Egypt, beginning with Menes.

**ABYSSINIA** (ăb-ĭs-sĭn'ĭ-ă), an independent political division of Eastern Africa, located between the Red Sea and the Blue Nile. Its boundary is formed by the Italian Colony of Eritrea on the northeast, a region known as Danakil on the east, British East Africa on the south, Egyptian Sudan on the west, and Nubia on the northwest. It is divided into the four provinces of Shoa, Tigré, Gojam, and Amhara, but the exact boundaries are not well defined. The four provinces, including the outlying dependencies of Enarea, Harrar, and Kaffa, have an area estimated at 150,000 square miles, and a population of 4,500,000. The seat of government is at Addis Abeba.

**DESCRIPTION.** Abyssinia may be described as an elevated plateau, its altitude being about 8,000 feet. Numerous mountain chains traverse the country, of which the Samen Mountains in the northern section are the most important. These mountains have an altitude of about 10,000 feet, while Ras Dashan, elevation 15,000 feet, may be regarded the culminating peak. The Talba Wakha Mountains are located south of the predominating group and are less elevated, their highest peaks being about 9,000 feet above the sea. The southern portion is less mountainous, but rocky hillocks characterize the surface. Numerous extinct volcanoes are found in both groups of mountains, and partly obliterated craters and hot springs are abundant.

Lake Tzana is the largest body of water and the source of the Atbara, or Black Nile. It is located at an altitude of nearly 6,000 feet, and occupies an area of 1,150 square miles. There is a general depression toward this lake. The chief rivers, besides the Atbara, are the Abai or Blue Nile, the Hawash, and the Takazze, a tributary of the Atbara.

Though wholly within the tropics, Abyssinia, owing to its elevation, has a temperate climate, and yields the usual products of the temperate zone. It is usually divided into three climatic areas, the regions below 4,800 feet, the sections between 4,800 to 9,000 feet, and the portions having an altitude above 9,000 feet. There are two seasons, the rainy and the dry, and the precipitation is greatest from December to May. From October to April, at Gondar, 7,420 feet



above the level of the sea, the average temperature is 68°, while the temperature in more elevated sections ranges from 45° to 50° Fahr. The soil is well adapted to the cultivation of the harder cereals, and the climate is generally healthful.

**INDUSTRIES AND RESOURCES.** Agriculture is the chief industry, though the methods of farming are primitive. Occupation is an evidence of title to land, which is divided principally among families. Wheat, barley, and cattle are the chief products. Oranges, bananas, and lemons thrive, but are not carefully cultivated. There are few manufactured products aside from wearing apparel and primitive implements. The minerals consist chiefly of coal, iron ores, silver, gold, and salt, but mining has not been developed to any great extent. Wild animals infest the forests and mountains, including the zebra, hyena, lion, wolf, leopard, buffalo and elephant, and in the regions of streams and lakes abound the rhinoceros and the hippopotamus. The chief exports include coffee, wax, gum, gold, tobacco, and ivory, while the imports embrace textiles, clothing, glassware, and military stores.

**EDUCATION AND RELIGION.** Until recently the country had no system of public education, the masses having had little opportunity to attend schools, and instruction was confined to the richer classes in the cities. However, all male children over twelve years of age are now required to attend school. Most of the educational work is in the hands of the clergy and Coptic teachers brought from Egypt. Christianity was introduced into the country in the fourth century, but in teaching and practice has been greatly perverted. The Gallas are Mohammedans and the Falashas profess Judaism. Polygamy is practiced extensively among the non-Christian classes.

**GOVERNMENT.** The government is an absolute monarchy, feudal in character, and the reigning sovereigns for centuries trace their lineage back to the Queen of Sheba, who visited Solomon, King of Israel, for the purpose of beholding his enterprise and power. Menelik II. is the present king or *negus*, and his official title is "King of the Kings of Ethiopia and Conquering Lion of Judah." He holds his office from personal qualities rather than by legal or traditional rights. The Maria Theresa dollar is the chief medium of exchange, but considerable of the business is carried on by barter, especially in cartridges and salt bars of uniform size. The chief cities are Addis Abeda, Gondar, Adua, Harrar, and Aukoher. Harrar is the leading commercial center.

**HISTORY.** The country is a part of ancient

Ethiopia, and the people are still called Ethiopians, but are a mixture of Hamites, Semites, and Negroes. The name Abyssinia came from the Portuguese and signifies that the people are a mixture of many tribes. Some think that the Cush of the Scriptures corresponds to Abyssinia. The country was invaded by the Greeks under Ptolemy Euergetes in 247 B. C., and some traces of Greek influence still remain. When Christianity was introduced in the fourth century, the Abyssinian Church had its seat at Axum; but the head of the church is now at Abuna. With the spread of Mohammedism near the close of the sixth century, Abyssinia was isolated from other countries and relapsed into a primitive half-barbarous civilization. It regained power in the fourteenth century, and in the sixteenth century strenuous efforts were made by Portuguese Jesuits to replace the national religion with Catholicism. In 1633 the Jesuits were expelled and the country relapsed and remained isolated until the nineteenth century, when European explorers interested themselves in that section.

Sir Robert Napier invaded the country with a British army in 1868 as a result of Abyssinian depredations in sections over which the English had established a protectorate, and King Theodore committed suicide, after having met with a thorough defeat. He was succeeded by King John, who fell in battle with the Dervishes of the Sudan in 1889. His successor, Menelek II., proved a progressive ruler, but the country is surrounded by territories under the flags of European nations and has become an object of interest for trade and colonization. Italy claimed a protectorate over Abyssinia under the Treaty of Uchali in 1889, but this was set aside in the Treaty at Addis Abeda in 1896. By the latter treaty the independence of Abyssinia was recognized. The king modernized the government in 1907 by establishing a cabinet of ministers, including those of finance, foreign affairs, war, justice, and commerce, but they are advisory rather than directory.



ACACIA.

**ACACIA** (à-kā'shà), a deciduous plant



widely distributed in various portions of the earth, but not found native in Europe. It is most abundant in India, tropical America, Africa, and Australia. About 300 varieties are native to Australia, including the wattletree, which is from fifteen to thirty feet in height, while in North America a form of the same plant is known under the name of locust or honey locust. The plant grows in height from a shrub to a tree ranging from twenty to thirty feet, and is cultivated for its foliage, flowers, and wood. Some species yield a bark containing a large per cent. of tannin, while others yield perfume and gum arabic.

**ACADEMY** (ä-käd'ë-mÿ), the name first applied to the school founded by Plato, and which originated from the place where that philosopher met and conversed with his pupils. The place was in a park or garden in the suburbs of Athens said to have belonged to Academus, and was presented by him to the city for a gymnasium. In modern times the name came to be applied to schools that communicate more than the mere elements of instruction, or schools instructing pupils that have already acquired the rudiments of an education, as colleges and some classes of universities. The name academy is also used to designate societies of artists linked together for the promotion of interest in art, and to various associations of scholars, scientists, and literary men who promote artistic and intellectual interests. Thus, Cardinal Richelieu in 1835 established the celebrated French Academy to fix and polish the French language. It included among its membership the best scholars of that country, but was dissolved by the Revolution in 1793. The greatest work of this organization was the publication of a complete French dictionary.

The Royal Academy, Burlington House, London, is an association of English artists, and is similar in organization to the French Salon. The Royal Academy of Berlin, founded in 1700 by Frederick II. of Prussia, has two sections—physics-mathematics and philosophy-history. Many such societies are maintained in the United States, the oldest of which is the American Philosophical Society, organized by Benjamin Franklin in 1743.

**ACADIA** (a-kä'di-a), the name given by the French to Nova Scotia, New Brunswick, and part of Maine, the most important portion being Nova Scotia. French colonists made settlements in Acadia in 1604 under De Monts. Argall conquered it for England in 1613, and it remained in English hands till 1657, but did not become their permanent possession until so declared by the Peace of Utrecht in 1713. In

1756 about 6,000 of the French inhabitants were forcibly removed from their homes by the British on account of opposition manifested by them to oppressive legislation, an incident on which Longfellow's "Evangeline" is based.

**ACANTHUS** (ä-kän'thüs), a genus of plants, chiefly tropical, found in the south of Europe, Asia Minor, and India, the most common species of which is the *acanthus mollis*, a native of moist shady places in the south of Europe. It has pretty foliage and large white flowers tinged with pale yellow. Several species are cultivated as greenhouse plants for their shining leaves and white flowers. The idea of the beautiful Corinthian capitals of the Greek columns is said to have been derived from a basket filled with the roots of this plant, set down carelessly by a girl, and covered with a tile; when the leaves, forcing their way through the crevices, and rising toward the light, until met by the underside of the cover, presented the effect of the foliage and volutes, simulated by the Grecian chisel.



ACANTHUS.

**ACAPULCO** (ä-kä-pööl'kô), a seaport of Mexico, in the State of Guerrero, about 230 miles southwest of the City of Mexico. Its harbor is one of the best on the Pacific Coast. It has considerable domestic and foreign trade, the latter with San Francisco, China, and the Philippines. The chief exports are indigo, fruit, wood, lumber, and cochineal. Acapulco reached its greatest importance at the time of the French occupation. Its trade suffered greatly by the construction of the railroad between San Blas and the City of Mexico. Population, 5,000.

**ACCELERATION** (äk-sël-ër-ä'shün), a term employed in measuring the rate of increase or decrease of the velocity of a body whose motion is not uniform. A common instance of increasing acceleration is found in a body falling from a height, and of negative acceleration in a ball thrown from a cannon. The term is also employed to denote the velocity of heavenly bodies in their orbits, especially when passing from perigee to apogee and vice versa. The numerical value of acceleration is about



32.2 feet per second; hence a body falling freely through the air has a velocity of 32 feet at the end of the first second, at the end of the next second the velocity is 64 feet, at the end of the third second it is 96 feet, and so on until it reaches the earth.

**ACCENT** (ăk'sěnt), in reading or speaking, the stress of voice placed upon the syllable of a word. English accent was placed originally upon the root, and not upon inflectionable syllables. A change in the position of accent distinguishes a noun from a verb, as ac'cent, ac-cent'; con'test, contest'. In like manner a change of accent distinguishes an adjective from a verb. Accent has exercised a marked influence in changing the form of many words in the English language.

Accent, in music, is a distinction of certain portions or places of measure, or a stress placed on certain tones. Long measures, as in words of several syllables, may have a primary accent and several secondary accents. A number of signs and marks have been invented to express the various shades of accentuation, as for instance, *f* (*forte*), *ff* (*fortissimo*), *p* (*piano*), *pp* (*pianissimo*), *mf* (*mezzo forte*); *sf* (*sforzando*), *cres* (*crescendo*), *deces* (*decrescendo*), and many others.

**ACCLIMATION** (ăk-klĭ-mă'shŭn), or **Acclimatization**, the process or art by which plants or animals are accustomed to a climate or locality not natural to them. The process depends upon the difference between the new locality and the one formerly occupied, as well as upon the nature of the plants or animals acclimatized. In recent times acclimatization has been made a subject for systematic study, and some valuable discoveries have resulted. The ability of the different races of man to bear changes of climate usually is in direct ratio to the intellectuality of the race. Civilized people display greater mental and physical endurance than savages in accommodating themselves to changes of climate, this resulting, of course, from their superior care and power to accommodate themselves to different modes of life. Modern civilization and commercial enterprise have been greatly benefited by the acclimatization of cereals, herbs, and animals. For instance, the reindeer and dog have been acclimated to the polar regions, silkworms have been brought from China to the Baltic regions of Europe, and, in like manner, animals and plants of various kinds have been made to serve man's purpose in greatly diversified parts of the earth. However, this is spoken of more properly as naturalization than acclimatization.

**ACCORDION** (ăk-kôr'dĭ-ŭn), a musical

instrument in the form of a small box, arranged to be drawn by the hands in such a manner as to supply wind to act on metallic reeds fixed at one or both extremities, thus operating to set the reeds in vibration. An accordion has two sets of metallic reeds, so constructed that the same tones are produced as a result of pulling or pressing the bellows. The harmonium and concertina are similar instruments, and are in more or less general use among Europeans.

**ACCOUNT** (ak-kount'), a list of items of debits or credits between two or more parties, or a statement of the particulars of such an account. When each of two parties has demands against the other, as in the case between two merchants, each of whom has sold goods to the other, the account is said to be *mutual*. The account is considered *open* or *current* until a statement is *rendered*. A *stated* account is one that has been accepted as correct by the one against whom it shows a balance. The recipient of a statement, if the account is found incorrect, should give verbal or written notice of that fact within a reasonable time, else its acceptance will be implied. However, corrections on account of fraud or mistakes can be made subsequently.

**ACCUMULATOR** (ăk-kŭ'mŭ-lă-ter), an apparatus by means of which electricity may be accumulated so as to produce directly an electric current. This apparatus is generally known as a storage battery, and its use depends upon the principle that a current acting upon grooved lead plates and lead electrodes causes certain chemical changes. In some cells two lead plates are immersed in dilute sulphuric acid in water, the mixture having a specific gravity of 1.17. When the circuit of a battery is closed, the chemicals recombine and give off a current almost equivalent to that which decomposes them. The two general classes into which accumulators are divided are those known as the Faure type and the Planté type. In the former some easily reducible salt of lead is applied mechanically, and in the latter peroxide of lead is formed by electrochemical action on the surface of the coiled plates used in constructing the cells. In order to charge the battery it is connected with a dynamo and the electricity is retained until required for use, though there is a very rapid depreciation if the batteries are not operated with care. Storage batteries are commonly employed in automobiles and in many central stations to aid the dynamos when the maximum output is required.

**ACETANILID** (ăs-ět-ăn'ĭ-lĭd), a crystalline powder obtained by the action of acetic acid



on aniline. It has a slightly bitter taste, is odorless, and is frequently taken as a medicine for allaying pain. It is used for headache, generally given in tablet or capsule, and its effect is injurious if not administered with great care.

**ACETATE** (ă's'e-tăt), See **Acetic Acid**.

**ACETIC ACID** (ă-sē'tic ă's'īd), an acid composed of oxygen, hydrogen, and carbon, and forming the sour principle of vinegar. In a pure state it is poisonous, has a sour taste and pungent smell, refracts light powerfully, and does not mix with water except at high temperature. It is the product of the acetic fermentation of many vegetable and animal juices, and in some plants is found naturally formed. It is solid at temperatures below 62° Fahr. The action of the micro-organisms of the air on wine or weak spirits produces vinegar, which is a dilute acetic acid. Many dilute and concentrated forms of acetic acid are employed in medicines and the arts. It aids digestion by its solvent action upon albuminous and protein compounds, hence the use of vinegar with foods that are not easily digested. When acetic acid is united with a base or radical, it forms a salt known as an acetate. The acetates of ammonium, iron, lead, potassium, sodium, and zinc are employed in medicine. Those of iron and aluminum are used in calico printing, while that of copper, known as verdigris, is useful as a color.

**ACETYLENE** (ă-sēt'ī-lēn), a pure hydrocarbon gas produced by passing an electric current between carbon poles in an atmosphere of hydrogen, also by hydro-carbon in a state of incomplete combustion. Small quantities of it are present in ordinary illuminating gas. It is colorless and clear, and burns with a bright flame. The flame is brilliant and steady, produces no smoke and little heat, and its intense brilliancy gives it preference for illumination. Until recently it was produced only in laboratories, being too expensive for use, except in experiments. It is now obtained at a very nominal cost by fusing coal dust and lime in an electric furnace, and then bringing the resultant calcic carbide in contact with water. The proportion of lime is 1,130 pounds to 1,750 pounds of coal dust, and the resultant is 2,000 pounds of calcic carbide. When the carbon of the calcic carbide is united with the hydrogen of water, the acetylene gas is formed and is utilized as it rises to the top.

The credit of discovering the method of producing acetylene gas on a commercial basis is due to T. L. Willson, who, as one of the promoters of the Willson Aluminum Company at

Spray, North Carolina, was aided by J. T. Morehead, a student and geologist. In conducting a line of experiments, they placed lime and coke in an electric furnace, which, after being fused together, was thrown into water with the result that gas was formed and when lighted it burned with a clear flame. This discovery caused calcium carbide to become an article of commerce. It is placed in portable generators and sold directly to consumers, who make their own illuminating gas by the use of small generators. At Niagara Falls and a number of other places are large electric furnaces for the purpose of making the commercial product. About 2,000 pounds of carbide are produced by 180 electric horse power in twelve hours, which quantity has an illuminating value equal to 100,000 cubic feet of ordinary gas. Its inexpensive manufacture revolutionized street and house lighting. Pure acetylene requires a special burner, by which it is sufficiently mixed with air before it begins to burn.

A new system of producing power was obtained by a mixture of acetylene gas and alcohol vapor in internal combustion engines. When a certain proportion of acetylene is added to alcohol vapor, a quicker burning, more explosive mixture results. This makes it possible to obtain from a given size of gasoline engine the same horse power when operated with alcohol as when gasoline is used, without the greatly increased consumption that ordinarily occurs when this is attempted. Acetylene gas is thus used as an enricher of commercial alcohol, and is likewise employed to increase the illuminating power of coal gas and other combustible gases.

**ACHAEA** (ă-kē'ă), one of the ancient divisions of the Peloponnesus, extending along the coast of the Gulf of Corinth. Its greatest length from east to west is about 65 English miles. It varies in breadth from 12 to 20 miles. Patras, formerly Patrae, is the only Achaean town that maintains any importance. After the Roman conquest of Greece and Macedonia, the province of Achaea included all of the Peloponnesus, with Northern Greece south of Thessaly. In the present kingdom of Greece it constitutes a division for the purposes of administration.

The Achaeans comprised one of the four main divisions of the ancient Greeks. Their mythological ancestor was Achaeus, son of Xuthus, and grandson of Hellen. They migrated from Thessaly to the Peloponnesus, where they held the preponderance of power, and for a long time maintained a confederacy of twelve towns, known as the Achaean League. It was



broken up after the death of Alexander the Great, reorganized in 280 B. C., and finally suppressed by the Romans in 146 B. C. The "Iliad" designates the whole Hellenic host before Troy as Achaens.

**ACHEEN**, or **Achin** (ăt-chĕn'), a city and state of northern Sumatra, the only state of that island long independent of Holland, but ceded to that power in 1879. It was a powerful state in the seventeenth century, and long resisted attempts at colonization made by the Portuguese, but gradually lost its power with the rise of Dutch supremacy in Sumatra. There are extensive productions of rice, pepper, gutta percha, bamboos, iron, sulphur, and camphor. The forests yield large quantities of merchantable lumber, and there are also productions and exports of fruits and live stock. The state has an area of 20,500 square miles.

**ACHELOUS** (ăk-ĕ-lō'ūs), a river of Acarnania, which, rising in Mount Pindus, and dividing Aetolia from Acarnania, flows into the Ionian Sea. Homer calls it "king of rivers." It is the largest stream in Greece, its length being 130 miles. It is now called Aspro Potamo.

**ACHERON** (ăk'ĕ-rŏn), in Greek mythology, a river of the lower world, and which is connected with many ancient legends. Around it were supposed to hover the shades of the departed, while Charon was reputed the ferryman who piloted those permitted to enter the realm of the dead across its water.

**ACHILL** (ăk'il), or **Eagle Island**, the largest island off the west coast of Ireland, and included with the county of Mayo. Its shape is almost that of a right-angled triangle, while its length is about fifteen miles, and breadth twelve miles. The surface is mostly marshy and boggy, and the inhabitants engage chiefly in fishing. The area is 51,521 acres, and the population, 4,975.

**ACHILLES, Tendon of**, the tendon which connects the heel bone with the muscles of the calf of the leg. It is so named from Achilles, a Greek leader in the Trojan War. This tendon is capable of resisting a force equal to 1,000 pounds weight, but is occasionally ruptured.

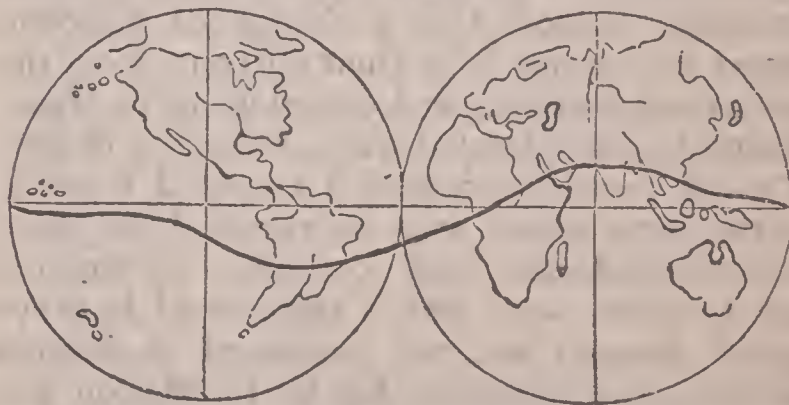
**ACHMIM**, or **Akhmim**, a town in Middle Egypt, on the right bank of the Nile. It is the Chemmis of Herodotus, and near it are ruins of two temples. The hills in its vicinity have many excavations, made originally to receive mummies, but which afterward served as a refuge for Christians during the persecutions of Diocletian.

**ACHROMATISM** (ă-krŏ'mă-tĭzm). See **Prism**.

**ACID** (ăs'id), in chemistry, a compound of hydrogen in which all or part of the hydrogen can be replaced for a metal or a basic radical, thus forming a new compound. A majority of acids, when placed to the tongue, produce a taste called sour. They change the blue colors of vegetables to a red, while some colors, previously converted to green by alkalis, may be restored by acids. However, these properties are variable. The acids generally contain oxygen united with another element that gives the name to the particular acid, as sulphuric acid, which contains sulphur, oxygen, and hydrogen. Many organic gases occur in the juices of vegetables and some in animals, such as the acid of ants, commonly known as formic. Hydrochloric, nitric, sulphuric, and many other acids are important in the industries. Vinegar contains acetic acid; lemons, citric acid; grapes, tartaric acid; and currants, gooseberries, and apples, malic acid. Prussic or hydrocyanic acid is found in leaves, almonds, and several varieties of fruits. Prussic acid is used for flavoring in small quantities, but is usually classed as a poison.

**ACIREALE** (ă-chĕ-ră-ă'lă), a seaport of Sicily, at the mouth of the Aci River, nine miles northeast of Catania. It has a considerable trade in wine and fruit, and manufactures silk and cotton goods. Near it are celebrated mineral springs and the famous grotto of Galatea and the cave of Polyphemus. Population, 27,875.

**ACLINIC** (ă-klĭn'ic) **LINE**, a line imagined drawn around the earth near the terrestrial equator, on which the magnetic needle has no



ACLINIC LINE.

inclinations. When the compass is placed on this line, the needle balances itself horizontally. It is known as the magnetic equator, being about 90° from the magnet poles, though this line is variable and irregular.

**ACONCAGUA** (ă-kŏn-kă'gwă), a mountain of Chile, situated near 31° south lat. and 70° west long. Its height is 23,910 feet. It is counted the highest peak in America, being 1,422 feet higher than Mount Sorata, Bolivia.



On its southern slope rises the Aconcagua River, which, after a course of 200 miles, flows into the Pacific.

**ACONITE** (äk'ō-nīt), a genus of plants so named from Acone, in Bithynia, which is famous for its poisonous herbs. It belongs to the natural order *ranunculaceae*; many of its species have long been known for their poisonous properties. Several are cultivated in our gardens, and are known by the familiar names of wolfsbane or monkshood. The latter term designates the distinguishing mark of the genus, which is the uppermost segment of the calyx overhanging the petals and other parts in the form of a helmet. The roots and leaves of the *aconitum napellus* are used for the preparation of some powerful medicines, which act as drastic purgatives, which are also externally applied as an anodyne remedy in acute pains affecting the nerves, and in rheumatic and syphilitic complaints.

**ACOUSTICS** (à-kous'tiks), the science that treats of sound and of the laws of its production and propagation. Sound is produced by the vibration of particles in a sonorous body, and is induced by a blow or in some similar way. It requires an elastic body for its transmission to the tympanum of the ear, and is heard when brought in contact with air, but becomes inaudible in a vacuum. Its rate of progress through dry air, at a temperature of 32°, is about 1090 feet per second, but its motion through metallic rods is much more rapid. Refraction of sound is a change of direction and velocity, which is caused by passing from one medium to another of a different kind. Reflection of sound is a change of direction caused by meeting a medium different from the one passed through, and, in addition to transmitting to it a refracted wave, induces it to pass in a different direction with an equal velocity. In this way sound may be repeated, as from an echo-producing cliff or hill. Pythagoras and Aristotle were aware that sound is propagated through air, and attempted to develop the science of acoustics, but its foundation was not laid until the time of Bacon and Galileo. Newton demonstrated by calculations how the propagation of sound is due to the elasticity of the conducting medium. The science of sound owes its progress particularly to the researches of Newton, Laplace, and the German physicist Hermann Helmholtz (1821-1894).

The subject of acoustics merits earnest consideration, since many public buildings are illy planned, and many principles of acoustics disregarded. As a general rule, ceilings should be of a medium elevation, many ceilings being too

high to facilitate both hearing and speaking. Stretching wires across halls and hanging draperies have a moderating effect. The whispering gallery of St. Paul's, London, is a fine example of successfully taking advantage of the basic laws of acoustics in public buildings.

**ACRE** (ā'kēr), a quantity of surface equal to 4,840 square yards. It came into use as a standard of measurement on account of the amount of land one man could plow in a day. The size of the acre differs in different countries, because the capacity of plows formerly used differed widely. The chain with which land is measured is twenty-two yards long, and a square chain consists of 22x22, or 484 yards, hence an acre contains ten square chains. The acre is divided into four roods; a rood into forty perches, and a perch into thirty square yards. Below is a table showing the relative measurements of the most important nations as compared with the acre used in the United States and Great Britain.

English, Acre.....	1.00
Scotch ".....	1.27
Irish ".....	1.62
Austria, Joch.....	1.42
Belgium, Hectare.....	2.47
Denmark, Toende.....	5.50
France, Hectare.....	2.47
France, Arpent (common).....	0.99
Germany, Hectare.....	2.47
Holland, Morgen.....	2.10
Naples, Moggia.....	0.83
Poland, Morgen.....	1.38
Portugal, Geira.....	1.43
Russia, Deciatina.....	2.70
Sardinia, Giornate.....	0.93
Spain, Fanegada.....	1.06
Sweden, Tunneland.....	1.13
Switzerland, Faux.....	1.63
Switzerland, Geneva, Arpent.....	1.27
Tuscany, Saccata.....	1.22
United States, Acre.....	1.00
Roman, Jugerum (ancient).....	0.66
Greek, Plethron (ancient).....	0.23

**ACRE** (ä'kēr), or **Akka**, an important seaport of Syria, on the Mediterranean Sea, and anciently called Ptolemais. It has experienced many notable changes through the calamities of war and revolution. In 1799 it was defended by the Turks against Napoleon, who laid seige upon it for sixty-one days, and by Mehemet Ali, Pasha of Egypt, in 1831-32, against a seige of six months by his son, Ibrahim Pasha. Acre remained in the hands of the Egyptians till Nov. 3, 1840, when it was taken by the British. It again came into possession of the Turks in 1841, to whom it now belongs. The city has a moderately good harbor, and is connected with Kersha and other interior cities by railways. Population, 10,500.

**ACROPOLIS** (à-kröp'ō-līs), the name applied by the Greeks to a prominent place in a city, usually to an eminence from which the



city can be viewed. In ancient times the Acropolis of Athens contained the Parthenon and other fine buildings.

**ACROSTIC** (ă-krōs'tīk), a stanza or stanzas of poetry, the lines of which are so arranged that the initial letters taken in order constitute a name or a sentence. In Hebrew writings this plan was used largely in poetry, and frequently the initial letters were made to cover the entire alphabet. In the original, the 119th Psalm and eleven others are written in this manner. Acrostics are frequently used in writing complimentary verses, when the initial letters usually form the name of the person complimented. The following will serve as a sample:

Electric essence permeates the air,  
Lighting the heavens with its brilliant glare,  
Encircling planets in its huge embrace,  
Controlling all the elements of space;  
'Tis this that sways the immortal mind,  
Refines and elevates all human kind;  
In it the spirit finds its highest light,  
Celestial source of God, the Infinite.

**ACTINISM** (ăk'tīn-iz'm), the peculiar property or force of that portion of the sun's rays which produce the chemical effects shown in photography, and the effect of causing the seeds of plants to germinate. That the actinic rays are different from those which produce heat and light was shown by J. W. Draper of New York, in 1842. The quantity of actinism in the sun's rays varies with the time of the day, and with the seasons. Its deficiency in the tropics renders it difficult to obtain good pictures there, except with the more powerful instruments. Its greater abundance in the spring of the year causes this to be the best period for taking pictures, as it is the season for the germination of seeds and the opening of buds. This principle is obstructed by the passage of rays of light through yellow glass. Hence the unsuitableness of this glass for greenhouses, while the use of blue or violet glass is recommended as a means to aid in the rapid growth of plants. Modern medical science has demonstrated the wisdom of employing blue and purple rays in treating certain diseases. That the different rays of sunlight possess a varying degree of power in producing chemical changes may be shown by spectrum analysis. See **Spectrum**.

**ACTIUM** (ăk'shi-ŭm), now called Akri, a town and promontory on the west coast of Greece, on the Gulf of Arta, and noted for the naval battle between Octavianus, who later became Emperor Augustus of Rome, and Mark Antony and Cleopatra, on Sept. 2, 31 B. C. Octavianus commanded 80,000 infantry, 12,000 cavalry, and 260 ships; while Antony had 100,000

infantry, 12,000 cavalry, and 220 ships, and was supported by Cleopatra with sixty vessels. Antony was defeated and fled with Cleopatra to Egypt. To commemorate the victory Octavianus enlarged the temple of Apollo, and instituted games to be celebrated every four years.

**ACTS OF THE APOSTLES**, the fifth book of the New Testament, written in Greek about 63 or 64 A. D., and generally thought to be the work of Saint Luke, a physician and painter of Antioch, who had been converted by the teaching of Saint Paul. The Acts embrace the history of the church in Judea and Asia Minor during the period of about thirty years after the death of Christ, from the time of the Resurrection until the second year of Saint Paul's imprisonment in Rome. While Philip and Saint Peter are mentioned in the Acts, the principal personage is Saint Paul.

**ACUPUNCTURE** (ăk-ŭ-pŭnk'tŭr), a surgical operation employed among the Chinese and Japanese, in headaches, lethargies, convulsions, colics, etc. It is accomplished by piercing the part which is the seat of the malady with a silver needle. Modified forms have been adopted by American and European physicians for the treatment of neuralgia, rheumatism, and other diseases.

**ADAMS**, a town of Berkshire County, in the northwest part of Massachusetts, forty-seven miles northwest of Springfield. It is situated on the Hoosac River, near Mount Greylock, altitude 3,600 feet, the highest point in the state, and on the Boston and Albany Railroad. There are manufactures of machinery, clothing, textiles, utensils, flour, and tobacco products. Gas and electric lights, street railways, waterworks, and sewerage are among the public improvements. The town has excellent public schools and numerous churches. It was platted in 1749, as East Hoosuck, and was incorporated in 1778, when it was renamed in honor of Samuel Adams. Population, 1900, 11,134; 1905, 12,486.

**ADDA** (ăd'dă), a river of Italy, a tributary of the Po. It rises in the Rhaetian Alps, flows through Valtellina and Lombardy, and enters the Po about eight miles from Cremona. Its course is about 180 miles, of which 70 miles are navigable. Lodi, the scene of one of Napoleon's triumphs, and Cassano, at which Moreau was defeated in 1799, are on its banks.

**ADDAX** (ăd'dăks), or **Addas**, a species of antelope related to the oryx, native to the deserts of Northeastern Africa. The form is robust, the color nearly white, tinged somewhat with reddish, and the height at the shoulders is



about three feet. It has a long tufted tail and long ears, and the horns are twisted spirally, turn outward, and measure about four feet in length. The Arabs hunt it for its flesh and skin. Only a small number of this animal remain.

**ADDER** (ăd'dēr), a general name applied to venomous snakes, but also the name of the only poisonous serpent in Britain. The latter is about two feet long, has a triangular head, and a short tail. A species known as *asp* or *puff-adder* is found in South Africa, where it is dreaded for its fatal bite. Adder's-tongue is a plant, a species of common fern, whose spores resemble a serpent's tongue. Adderwort is a name applied to snakeweed on account of its supposed virtue in curing the bite of a serpent.

**ADDIS ABEBA** (ăd'dēs ā-bā'bā), the capital of Abyssinia, located in the province of Shoa. It has a picturesque location at an altitude of 8,000 feet, but its streets are irregular and the buildings are poorly constructed. On an eminence is the royal palace, which consists of several buildings and is surrounded by walls. The city has a large floating population and is the mecca of many caravans. The commission that concluded peace between Italy and Abyssinia met at Addis Abeba in 1896, when the independence of Abyssinia was recognized. Population, 50,000.

**ADDRESS, Forms of**, the formal manner of beginning a communication, either written or spoken. In countries where rank and title prevail the forms of address are quite complex and adherence to them is considered necessary. Common usage has established some form of address even in republics, though in such countries they are less varied and numerous. "His Excellency, the President of the United States," is the form of address sanctioned by law that is to be applied to the President of the United States, and the same form is used in addressing the governors of states and ministers to foreign countries. Senators and representatives of the United States, or of the several states, judges, and consuls are addressed *The Hon. —*, while the form of addressing the Vice-President is *The Hon. —, Vice-President of the United States*. The following table gives a list of the more important addresses used in Great Britain, its dependencies, and most countries in which the personages are recognized:

Archbishop: *His Grace the Lord Archbishop of —*.  
 Baron: *The Right Hon. Lord —*.  
 Bishop: *The Right Rev. the Lord Bishop of —*.  
 Countess: *The Right Hon. the Countess of —*.  
 Duchess: *Her Grace the Duchess of —*.  
 Duke: *His Grace the Duke of —*.  
 Earl: *The Right Hon. the Earl of —*.  
 King: *His Most Gracious Majesty the King*.  
 Knight: *Sir —*.

Lord Lieutenant (of Ireland): *His Excellency the Lord Lieutenant*.

Lord Mayor: *The Right Hon. the Lord Mayor*.

Marchioness: *The Most Hon. the Marchioness of —*.

Maquis: *The Most Hon. the Marquis of —*.

Members of Parliament: The letters *M.P.* are added to the usual address.

Prince: *His Royal Highness the Prince of —*.

Princess: *Her Royal Highness the Princess of —*.

Privy Councilor: *The Right Hon. —*.

Queen: *Her Majesty the Queen*.

Viscount: *The Right Hon. Viscount —*.

Viscountess: *The Right Hon. Viscountess —*.

Youngest son of Duke or Marquis: *The Lord —*.

Youngest son of Earl or Viscount: *The Hon. —*.

**ADELAIDE** (ăd'ē-lād), an important city of Australia, about six miles southeast of Saint Vincent's Gulf, in the province of South Australia, of which it is the seat of government. The Torrens River divides it into South Adelaide and North Adelaide, the two divisions being connected by extensive bridges, and the stream is beautified by dams and dikes. There are excellent botanical gardens, which cover an area of 120 acres and may be classed among the finest in the world. Besides substantial government buildings, it contains telegraph, telephone, and railway offices, and is the seat of fine schools and churches. The city has a number of institutions of higher learning, including commercial schools, colleges, and a university. Port Adelaide, its port, has a commodious harbor and is protected by two forts. The manufactures include clothing, leather, woolen goods, ironware, machinery, tobacco products, furniture, and earthenware. It has an important commercial trade, both locally and with foreign countries. Among the municipal improvements are gas and electric light, street railways, pavements, waterworks, and other modern conveniences. The city was founded in 1836, and named in honor of the queen of William IV. Population, 1901, 39,200, including suburbs, 162,200.

**ADELPHI COLLEGE** (ă-děl'phi), an institution of higher learning in Brooklyn, New York City. It was incorporated in 1896 by the regents of the University of the State of New York, and with it is affiliated Adelphi Academy, a school founded in 1869. In the first eleven years of its existence Adelphi College grew to have a student body of about 500 and a corps of instructors numbering 42. The courses are grouped under three divisions: History and Philosophy, Language and Literature, and Mathematics and Science. The college grants only the degree of A. B. To graduate a student must have completed 124 points, of which 54 points must be in one division, 24 points in a second, and 12 points in a third, and the others may be selected freely. The college possesses excellent physical, chemical, and biological laboratories, an adequate library, and a gymnasium.



In connection with the college a flourishing normal school of kindergarteners is maintained. This offers a two years' course, which leads to a special course in kindergarten work. There is also a school of fine arts, which is the oldest institution of its kind in Brooklyn.

**ADEN** (ä'den), a seaport city and territory of Southwestern Arabia. The city forms an important commercial center owing to the increasing trade through the Suez Canal. Over 2,000 vessels stop at the port of Aden annually. The import trade amounts to over \$17,000,000 annually and is slightly greater than the export trade. As a naval and coaling station it is quite important, and there are strong fortifications. The government is administered by an English local resident. Population, exclusive of troops, 43,974.

**ADEN, Gulf of**, an inlet from the Indian Ocean, located between Arabia on the north and the African peninsula of Somaliland on the south. Its length is 500 miles, extending from the Strait of Bab el Mandab to the Indian Ocean. Some geographers call it the Arabian Gulf.

**ADHESION** (äd-hē'zhün), in physics, the force that holds together molecules of different kinds. It is distinguished from cohesion, which is a force that holds together molecules of the same kind, acting at insensible distances. Adhesion takes place between two solids, between a solid and a liquid, or between a solid and a gas, but acts only at insensible distances. It differs from chemical affinity in that it acts between surfaces of any size without changing the character of adhering bodies, while chemical affinity acts between particles of substances and generally changes the appearance.

**ADIGE** (ä'dê-jä), (German, Etsch), a river of northern Italy, which rises in the Rhaetian Alps, flows in a southeasterly direction, and discharges into the Adriatic Sea. It forms the boundary between Lombardy proper and the old Venetian territories. It is 240 miles long and is a transit river for German and Italian trade.

**ADIRONDACK** (äd-ĩ-rön'däk), a group of mountains belonging to the Appalachian system, located between Lakes Ontario and Champlain, in northern New York. The region is a popular resort for tourists and sportsmen, who delight to spend the summer season among its mountain scenery, beautiful parks, and picturesque lakes in pursuit of game or in pursuing the pleasures of vacation. There are very complete provisions for pleasure and profitable pastime. Owing to the altitude, the nights are cool and the days generally pleasant.

Mount Marcy is the most remarkable and the highest peak; height, 5,337 feet.

**ADJECTIVE** (äd'jék'tiv), the part of speech used to describe or define the meaning of a noun or a word or phrase equivalent to a noun. Adjectives may be divided into two general classes, descriptive and definitive. Descriptive adjectives describe the meaning of a noun by denoting some quality, as *square, round, sour*, while definite adjectives define the meaning or application without expressing quality, as *that man, the Ohio, the third seal*. The articles *a, an, and the* are sometimes included with the latter class. Adjectives that express quality admit of comparison, and are said to be either positive, comparative, or superlative in expressing different degrees of quality. In the English language the adjective precedes its noun, except when used as a predicate adjective.

**ADJUTANT** (äd'jũ-tant), or **Argala**, a large wading bird of the stork family found in the tropical parts of India. It has a large beak, a pouch hanging from the under side of the neck, and when standing erect is about five or six feet in height. The general color is an ashen gray mixed with white. At the apprehension of danger it inflates the large pouch in front of the neck with air, which is capable of considerable distention. In India it is protected by law, owing to its value in devouring carrion, reptiles, and offals. The adjutant bird is allied to the marabou of Western Africa, and, like it, furnishes from under its wings the light downy feathers known in the market by the name marabou. There are a number of different species, that of Senegal being an allied bird to those found in Southern Asia.



ADJUTANT BIRD.

**ADMIRALTY** (äd'mĩ-ral-tỹ), the name usually applied to the department of government which is at the head of the naval service. Most maritime nations maintain departments of admiralty, and from them charts are issued for aid in navigation. The United States Coast Survey details information of value in the naval service by issuing annual reports. Admiralty courts are peculiar to many European countries, and take cognizance of civil and criminal



causes of a maritime nature. In Great Britain a board of admiralty comprises five lords commissioners, who decide on all important questions collectively, but each commissioner also has special duties assigned to him, such as naval discipline, sailing orders, purchase and disposal of stores, manning the navy, etc. In the United States the jurisdiction of the district courts embraces all civil and criminal cases arising in the maritime service. However, the graver and higher crimes are referred to the circuit courts as courts of admiralty. In Canada the exchequer court is a court of admiralty and has rights and remedies in all matters arising out of or in connection with navigation and commerce.

**ADMIRALTY ISLAND**, an island off the northwest coast of North America, belonging to the United States. It is about eighty miles long and twenty miles wide. There are forests of considerable value, but the climate is cold and the inhabitants consist chiefly of Sitka Indians. Killisnoo, located about forty-five miles northeast of Sitka, is the chief town.

**ADMIRALTY ISLANDS**, a group of about forty islands lying northeast of New Guinea. The group constitutes a part of the Bismarck Archipelago. These islands were discovered by the Dutch in 1616, and now belong to Germany. They abound in cocoanut trees, and have considerable productions of fruit, fish, rice, and domestic animals. The inhabitants consist chiefly of tawny-colored islanders.

**ADOBE** (ă-dō'bă), a name of Spanish origin applied to brick made of a mixture of sand and clay and sun-dried. Buildings constructed of this kind of material are quite common in arid and semi-arid districts of North America, especially in New Mexico, Arizona, and Central America. In size these brick vary somewhat, the usual dimensions being 4 by 12 by 16 inches. The material is thoroughly mixed and exposed for drying to the sun about two weeks, during which time they are turned daily, though the treatment varies somewhat with the condition of the atmosphere and the season of the year. Brick of this kind cannot be used where rainfall is abundant as they will not bear a considerable amount of moisture. The Egyptians and Babylonians constructed buildings of this class of material, or used brick made of clay mixed with straw and baked in the sun. In some sections where building material is scarce, as in portions of the plains of America, sod is used to lay up the walls and an adobe soil is mixed with sand for plastering both the exterior and interior. Sod houses treated in this way are quite serviceable, especially if the floor and roof are constructed of lumber.

**ADONIS**, a genus of herbaceous plants native to Europe and belonging to the same family as the buttercup. The corn-adonis grows as a weed in the wheat fields of Great Britain and has become naturalized in some parts of the United States. Several species of the adonis are cultivated as garden plants, and in these the petals are a bright scarlet.

**ADRIAN** (ă'drĭ-ān), a city in Michigan, county seat of Lenawee County, seventy miles southwest of Detroit, on the Wabash, the Lake Shore and Michigan Southern, and other railways. It has a considerable jobbing trade and manufactures of street and railway cars, furniture, brick, cigars, machinery, and earthenware. It is the seat of Adrian College, established in 1859 by the Methodist Church for the coeducation of the sexes. The city has fine public schools, an excellent county courthouse, an opera house, and a Masonic temple. Gas and electric lights, waterworks, pavements, and sewerage are among the improvements. It was incorporated as a city in 1853. Population, 1910, 10,763.

**ADRIANOPE** (ăd-rĭ-ān-ō'p'l), the second city of the Turkish Empire, capital of the vilayet of the same name, 130 miles northwest of Constantinople. It was founded by Hadrian on the Hebrus River, now called Maritza River. The city was the capital of the Turkish Empire from 1361 to 1453, but in the latter year the capital was removed to Constantinople. In 1829 it was occupied by the Russians, and also in the War of 1878. Its improvements include a splendid aqueduct, several elegant mosques, and other religious and educational institutions. There are manufactures of silk and woolen goods, cotton textiles, leather, tobacco products, and machinery. It has railroad connections with Constantinople and other important cities, and enjoys a considerable commercial trade. About half of the inhabitants are Turks and the remainder Jews, Bulgarians, and Armenians. Population, 80,250.

**ADRIATIC SEA** (ăd-rĕ-ăt'ĭk), an extension of the Mediterranean Sea in a northwesterly direction from the Strait of Otranto, lying between Italy, Austria, Montenegro, and Turkey. Its greatest length is 480 miles; average breadth, 100 miles, and area about 60,000 square miles. Into it flows the Po River, which is producing notable geological changes by alluvial deposits. The sea was so named from Adria, which was once an important seaport, but is now seventeen miles inland, owing to the deposits of silt from the tributary rivers, the Po and Adige. The most important seaports include Trieste, Sinigaglia, Ancona, and Venice.



**ADULLAM** (a-dŭl'lam), one of the cities of the plain, in the tribe of Judah, fortified by King Rehoboam. The Cave of Adullam, where David hid when pursued by the Philistines, was probably near the Dead Sea. (I Sam. xxii, 1-2).

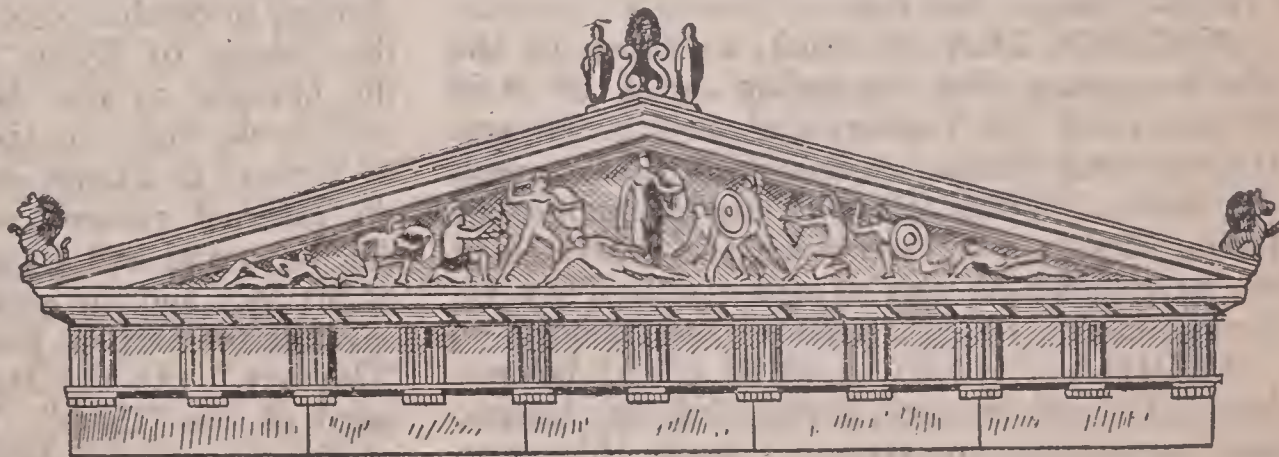
**ADULTERATION** (ă-dŭl-tēr-ă'shŭn), a term used to designate the debasement of a pure or genuine article by taking away some of its constituent parts, or adding to it some inferior article. The object of adulterations is usually for pecuniary profit, and has prevailed in all countries from ages far remote. It has been the subject of legislation, governments seeking thereby to protect the consumers of such products from deception by manufacturers and salesmen in many articles of commerce, particularly articles of food. Various European nations legislated regarding it as early as the 13th century, but none of the efforts have been more than partially successful. In the United States legislation has varied, but has been enacted more particularly by the states than the nation. Among the national laws is one regulating the sale of oleomargarine, an artificial form of butter.

The most common form of adulteration is the addition of a substance of little value to one of greater value, the design being to increase bulk and weight of different commodities, as mixing chicory with coffee, fat with butter, and water with milk. Fictitious value is often given to substances by improving the appearance or heightening the color, as coloring butter or pickles, or mixing salts of copper with preserves. Impurities are also frequent when it is designed to increase the flavor, as adding sulphuric acid to vinegar, while ingredients are often added to beverages to increase the thirst of the consumer, as the adulteration of beer by the addition of salt. While adulteration of food articles is quite common, it is not practiced so extensively as the public believe. As a rule the consumer of adulterated foods is more likely to sustain unnecessary expense than suffer a loss of health, yet many of these adulterations are extremely harmful, vicious in principle, and in direct violation of public policy.

**ADVENTISTS** (ăd'vent-ĭst), the name assumed by a Christian denomination, among whose tenets is the belief in the second advent

of Christ. Several branches have sprung from the teaching of William Miller, who prophesied that the world would come to an end in 1831. They differ more or less in points of doctrine, but the government is uniformly congregational. The Seventh-Day Adventists constitute the most numerous branch. They support forty educational institutions, issue numerous publications, and have a membership of 78,950 communicants, including 560 ministers. The denominational headquarters are at Battle Creek, Mich. The smaller denominations include the Evangelical Adventists, the Advent Christians, and the Church of God.

**ADVERB** (ăd'verb), in grammar, a word used to modify the meaning of a verb, adjective, participle, or an adverb. Adverbs are divided into five classes: adverbs of *time*, *place*, *cause*, *manner*, and *degree*. Most English adverbs are formed by adding the suffix *ly* to an adjective or its root, though many are not thus formed. A



TEMPLE OF ATHENA: WESTERN GABLE.

sentence or part of a sentence is frequently used to perform the function of an adverb. Many adverbs are compared by the use of *more* and *most*.

**ADVERTISING** (ăd-vēr-tĭz'ĭng), the method by which the sale or exchange of commodities is made known to the public. Advertising is not confined to the producing class, though this was originally the case, and the means to make known through publication the value and price of articles offered are very various. Many standard products useful in domestic economy are advertised on billboards, both in city and country, and in all the larger cities companies promote advertising in this way as a regular business. However, the greatest amount of advertising is done by circulars, catalogues, and through the columns of magazines and newspapers. The amount of money paid annually for advertising in the Dominion of Canada is estimated at \$60,000,000, while in the United States the annual expenditure for this purpose is placed at \$520,000,000.



The history of advertising may be traced to ancient times, especially to Greece and Rome, where signs were utilized to make announcements and criers gave information in regard to the value and price at which commodities were for sale at particular places. However, the invention of printing revolutionized advertising as a business, and at present there is scarcely a large periodical whose columns are not open to all classes of legitimate advertising. Indeed, the receipts from advertising in numerous classes of periodicals, especially magazines, are an important factor and in many cases exceed the money received for subscriptions. The value of modern advertising has secured such a hold upon business men and the public that success in almost any line depends in a great measure upon the manner of advertising. The theory and practice of writing advertisements is a branch of study placed in the curriculum of many schools and business colleges.

**ADZ** (ädz). See **Ax**.

**AEGEAN SEA** (ë-jě'an), a branch of the Mediterranean Sea extending west of Asia Minor, south of Turkey, and east of Greece. Its breadth is 200 miles, and the average length 400 miles. Within the sea are a number of fertile islands, many of which are cultivated in the production of cereals and fruit. They include Euboea, Lesbos, Lemnos, and Samos.

**AEGINA** (ë-jí'na), a small island belonging to Greece, situated in the Gulf of Aegina, and containing an area of about thirty-two square miles. The island is mountainous and sterile, except in the western portion, which is quite level and productive. The chief products include olives, almonds, grapes, and cereals. On the island are remains of the temple of Athena. In ancient times, about 256 B. C., the island belonged to the Athenians. Population, 9,135.

**AEGIS** (ë'jís), the shield of Jupiter and Minerva, which was covered with the skin of the goat Amalthea, by which Jove was nourished in infancy. According to Homer, Jupiter had but to shake the shield to cause thunder and lightning to descend upon earth.

**AEGOSPOTAMI**, or **Patamos**, a locality in the Thracian Chersonese, on the Hellespont, where the Spartans under Lysander defeated the Athenian fleet. This defeat, in 405 B. C., ended the predominance of Athens and brought the Peloponnesian War to a close.

**AENEID** (ë-ně'id), the great epic poem written by Virgil, which ranks with the "Iliad" and "Odyssey," and is classed as one of the three greatest poems bequeathed to posterity by the ancients. It was commenced about the year 30 B. C., and was left unfinished at the time of the

author's death. Virgil thought it of too little merit for publication and directed that his friends burn the manuscript, but Emperor Augustus saved it and gave it into the hands of two learned friends of the author for publication. The fact that many lines were left unfinished is proof that the poem was not carefully revised by the author.

The story of the Aeneid relates the adventures of Aeneas after the fall of Troy and his final settlement in Italy, where he and his followers became the founders of Rome. This writing consists of twelve books. The first accounts that Aeneas was driven by a storm on the coast of Africa, where he was hospitably entertained by Dido, queen of Carthage, to whom he related the story of the fall of Troy. His wanderings from Troy to Carthage are told in the second and third books. In the fourth book the poet relates the story of the passion conceived by Dido for her Trojan guest, the departure of Aeneas in obedience to the will of the gods, and the suicide of Dido. The visit to Sicily and the burning of the ships are described in the fifth book, while the sixth deals with the landing of Aeneas at Cumae in Italy and his descent to the infernal regions, where he saw his father, Anchises, and had a vision of the future glories of his race and the greatness of Rome.

While the first six books are modeled upon the "Odyssey," the six last books partake of the spirit of the "Iliad." They contain an account of the struggles of Aeneas in Italy, his alliances with Latinus, king of Latium, and his projected marriage with Lavinia, daughter of Latinus. The last volume closes with the fall of Turnus, king of the Rutuli, by the hand of Aeneas, and the projected marriage is left uncompleted. Virgil asserts that the Julian family of Rome descended from Aeneas, and traces the connection between him and Augustus Caesar, in whose honor the poem was written.

**AEOLIAN HARP** (ë-õ'lí-an), a harp played by Aeolus—that is to say, by the wind. It consists of a wooden sound-box with strings of catgut stretched over it. When exposed to the action of the wind, it produces a succession of pleasing sounds, bold when the breeze is forceful, but plaintive when slight. The invention was made by Athanasius Kircher (1601-1680), a German Jesuit of the 17th century.

**AEROLITE** (ã'ër-õ-lít), one of a class of meteorites, shooting stars, or meteoric stones which fall from the sky and generally, but not always, reach the earth. They are usually sub-angular, with the angular points rounded off, and generally reach the ground in an incandescent state. They usually contain quantities of mallea-



ble iron, nickel, magnesia, sulphur, alumina, lime, carbon, and other substances. The constituents are always the same as substances found in the earth, but the combination differs widely in different aerolites. Their origin is the same as that of meteors. See **Meteor**.

**AËRONAUTICS** (ā-ēr-ō-naŭ'tiks), the science that treats of aërial navigation. It embraces the two departments of pneumatics known as aërostatics and aërodynamics and involves the subject of fluid-friction and the resistance of the fluid to the motion of a solid body passing through its mass. Balloons, flying machines, and all other forms of apparatus used in aërial navigation are studied under this branch of science, which is a subject of growing interest. See **Balloon, Flying Machine**.

**AËROSTATICS** (ā-ēr-ō-stāt'iks), the department of science which treats of gases at rest, that is to say, with their particles at equilibrium. Aërodynamics treats of the phenomena observed when the forces acting within or upon aëriiform fluids produce motion, while aërostatics is confined to the relations of forces acting in or upon such fluids when no motion results. Both these are departments of pneumatics.

**AËROSTATIC PRESS**, a machine used for extracting by atmospheric pressure the coloring matter of dyewood and other materials, such as leaves, insects, etc. The material from which the color is to be extracted is placed in a vessel between two horizontal partitions pierced with small holes. An air pump, by which the air can be withdrawn, is placed at the bottom and the liquid to form the extract is poured on the top. When the suction pump is operated, the liquid is forced by the pressure of the air from the top through the material, carrying with it in solution the liquid coloring matter.

**AESTHETICS** (ēs-thēt'iks), the science that treats of the beautiful and pleasing. The term owes its origin to various writers, but primarily to Alexander Gottlieb Baumgarten (1714-1762), who held that as truth is the end and perfection of knowledge, and good that of the will, so beauty should be the end of all sensuous knowledge. According to Herbert Spencer, the aesthetic feelings have this characteristic, that they are not connected with the functions requisite to sustain life, and, for this reason, do not gain enough power to act until the functions necessary to sustain life have the proper scope.

The ancient Greeks, a people productive of noble and artistic creations, supply us with the first speculations on the culture of the beautiful and the aim of fine arts. They are gath-

ered from poetry and paintings, and particularly from Plato's "Dialogues." However, Socrates was the first Greek scholar whose views on this subject are definitely known. From Xenophon's exposition of the views of Socrates we learn that the latter regarded the beautiful as coincident with the good, and both susceptible to conversion into the useful. It was thought that every beautiful object serves some rational end, whether the gratification or security of man. From the "Dialogues" it may be concluded that Plato held to the theory of an absolute beauty. He tells us in the "Symposium" how love produces inspiration toward the pure idea of beauty. To his mind the only beauty that deserves the name is absolute beauty; that absolute beauty is beautiful in every respect, and the foundation of all beauty. Many modern writers agree that a delight in sculpture, poetry, music, the drama, painting, and even fine mathematical demonstrations is a source for the aesthetic growth. Kant held the view that the beautiful is the harmony between the imagination and the understanding, and this view is supported by a number of modern philosophers. Richter, Schlegel, Ruskin, Lessing, Hegel, Helmholtz, and Schelling are among the best known writers to contribute scientific treatises on aesthetics.

**AETNA**. See **Etna**.

**AETOLIA** (ē-tō'lī-à), a division of ancient Greece, bounded on the west by the Acheloüs River, on the north by Thessaly and Epirus, and on the south by the Gulf of Corinth. Along the northern part extends the range of Mount Pindus. In the time of Pericles the Aetolians were warlike and barbarous, but they became famous during the Macedonian wars and for their bravery in resisting the invasion of their country by the Gauls. Aetolia and Acarnania were united and now constitute a monarchy of Greece. The area is 3,013 square miles.

**AFFIDAVIT** (ăf-fī-dā'vīt), a legal document affirmed or sworn to before some authorized officer. A document of this kind is made without cross-examination and is much used in making various motions in court. It is customary to procure and place on record an affidavit to prove or correct conveyances of personal and real property.

**AFFINITY** (ăf-fīn'ī-tỹ), in law, the marriage relationship contracted between the husband and his wife's kindred, and between the wife and her husband's kindred. Marriage is forbidden by law in some countries between persons who are related by affinity within the third degree, which is the case in Great Britain,



and this is considered in accordance with the Scriptural injunction.

**AFFINITY**, in chemistry, the force by which union takes place between two or more elements to form a chemical compound, and which constitutes the force that produces all chemical phenomena. Unlike attraction of gravity, it does not act upon masses, but between atoms, and only when the atoms are at insensible distances. It differs from cohesion in that it unites atoms of different substances, while cohesion unites the particles of similar substances. The compounds formed by affinity are new bodies, often bearing no likeness in appearance or other properties to the elements by which they were produced, as water results from the union of two gases, hydrogen and oxygen. The strength of chemical affinity differs between different substances. Gypsum is formed by a combination of sulphuric acid and lime, but, if potash be added, the sulphuric acid repels the lime and unites with the potash. Affinity is dependent upon circumstances, such as the presence of light and a change of temperature. An increase of temperature has the effect of diminishing affinity in some substances and promoting it in others, and, when highly heated, the constituents of some compounds are separated. Heat is evolved by a combination of two elements in forming a compound, the amount evolved being termed a measure of affinity.

**AFGHANISTAN** (ăf-găn-ĭs-tăn'), a country in the southwestern part of Asia. Its boundaries are formed by India, Turkestan, Persia, and Baluchistan; the last named separates it from the Arabian Sea. The area is estimated at 280,000 square miles, and the population at 5,125,000. Its four provinces are Kabul, Kandahar, Herat, and Turkistan, and it includes the Badakhshan district. Kabul, in the east-central part, is the capital. Other cities of note include Kandahar, Herat, and Ghuzni.

**PHYSICAL FEATURES.** The region is mostly a mountainous country, including lofty uninhabited tablelands, barren plains, and numerous productive valleys. In the northern part are lofty ranges of the Hindu Kush Mountains, of which Mount Hindu Koh is the culminating peak, its snow-covered summit towering about 22,300 feet above sea level. The northern part is drained by tributaries of the Amu or Oxus River, while the southern and central sections drain westward by the Helmund into Hamoon, a salt-water lake. Though the climate is of a continental nature, the differences in elevation and unequal distribution of rainfall render it various. In the desert oases thrives the date

palm; cotton is cultivated in the sheltered valleys, while the elevated regions are exposed to severe cold and heavy fall of snow.

**PRODUCTIONS.** The chief industries are agriculture and stock-raising. The soil fit for cultivation is generally fertile and yields wheat, corn, rice, millet, barley, vegetables, and fruit. Much of the farming depends upon irrigation, and the supply of water is drawn by means of short canals from rivers and mountain streams. It has manufactures of carpets, silk and woollen goods, and utensils used locally. A mint and ammunition factory are operated at Kabul. The country has many minerals, but there is little mining, and the methods of farming have been little improved in the past decade. Cattle, sheep, horses, goats, and the dromedary are the principal domestic animals.

**GOVERNMENT.** The government of Afghanistan is a monarchy, semi-feudal in form, and the chief ruler is known as the ameer, who is a hereditary prince and whose power is absolute. Habib Ullah, the present ruler, has given encouragement to the construction of canals for irrigation, and has fostered the building of highways, bridges, and fortifications. Railroad and telegraph construction were long excluded on the ground that it is opposed to public policy, and trade is still carried on largely by camels and ponies, though wheeled vehicles are employed where highways have been built. India and Russia have had most of the trade, and both countries operate railway lines to the boundary, Russia from Merv on the north and the English through British Baluchistan on the south. Foreign enterprise has resulted in the construction of railways to some of the chief commercial cities, and there has been a perceptible extension of export and import trade. Most of the industries, particularly manufacturing, are in the hands of Europeans.

**INHABITANTS.** The word *Afghan* is of Persian origin, and the people themselves apply the term *Vilayet*, which signifies the original land of ancestors. The inhabitants are divided into numerous clans, of which the Ghilzais are the most numerous and the bravest. In their hands is the political ascendancy, and they occupy the country between Herat and Kandahar. It is thought that the Tafiks are the aborigines. They speak a Persian dialect, are scattered over the whole country, and are a frugal, industrious class. The Hazaras are of Mongol type and occupy chiefly the mountains of the northwest. Afghans proper, who are allied in blood to the Persians, constitute the larger part of the inhabitants. In language they have retained the essential characteristics of the Iranic group of



the Indo-Persian, but the spoken tongue is mixed with various Oriental dialects, and is written in Persian characters. The literature does not date back farther than the 15th century, and as a whole partakes largely of Persian features. Mohammedanism of the Sunnite sect is the chief religion, and much of the literature is based on the Koran.

**HISTORY.** The history of Afghanistan is an account of a mass of mixed elements held loosely together in one government. Most Afghans claim direct descent from King Saul and profess to be Bani-Israel, and their features show Jewish connection. The name was first found in the history of Sultan Mahmud, of the 11th century, and it is known that Alexander the Great reached India by the Kabul River. They were in the present country in the 13th century, and for a century and a half under Mongol rule, but later were under the dominion of the Persians. While the Persian people were in a state of discord, they attained independent power, and after the death of Nadir Shah finally became liberated from the Persian dominion by the Abdalli leader, Amed Khan, in the 18th century.

Dost Mohammed became ameer in 1826, having defeated Shah Suiah, who escaped to India and carried on futile intrigues to regain his sovereignty. In 1838 Afghanistan was invaded by a British army. Dost Mohammed lost his throne as a result of the invasion, but regained it two or three years later and reigned until 1863, when he was succeeded by Shere Ali Khan. A second British invasion occurred in 1878, when the ameer fled to Turkestan and was succeeded by his son, Yakub Khan, who concluded a treaty with the British and later with the Russians. Abdurrahman (q. v.) was accepted as ameer by the Afghan chiefs in 1880 and ruled successfully until his death in 1901. He was succeeded by his eldest son, Habib Ullah, who inaugurated reform by increasing the efficiency of the army and improving the system of taxation. The country occupies a position of importance between the territory of Great Britain and Russia, hence its political fortunes are uncertain.

**AFRAGOLA** (ä-frâ-gō'là), a city in Italy, five miles southeast of Naples, with which it is connected by a railroad. It is noted for its manufactures of straw goods. Population, 1901, 22,419.

**AFRICA** (ăf'rī-ka), a grand division in the Eastern Hemisphere, the second in size of the grand divisions, being exceeded only by Asia. Its length from north to south is about 5,000 miles, and the greatest breadth across the

Sudan is about 4,500 miles. The area comprises 11,514,985 square miles, about three times the size of Europe, and there is a coast line of fully 15,000 miles. The shape is that of an irregular triangle, with the vertex to the south. It is separated from Europe by the Mediterranean Sea, and from Asia by the Red Sea and the Gulf of Aden, and the only connection with other grand divisions is with Asia by the Isthmus of Suez, through which the Suez Canal has been cut. The eastern shore is washed by the Indian Ocean, and the western by the Atlantic.

**OUTLINE AND ISLANDS.** Among the larger gulfs and bays are the gulfs of Sidra and Cades on the north; Suez, Aden, and Delagoa on the east; Algoa Bay on the south, and the Gulf of Guinea on the west. The more prominent capes include Bon and Blanco in the Mediterranean, Guardafui on the Atlantic, Cape of Good Hope and Agulhas on the southern extremity, and Capes Verde and Blanco on the western shore. The four capes of Guardafui, Agulhas, Verde, and Blanco (in the Mediterranean) are the extreme points of the grand division. Few important islands and groups of islands belong to Africa, the most important being Madagascar, which is separated from the continent by Mozambique Channel. Among the chief islands are the Cape Verde Islands, St. Helena, St. Thomas, the Canaries, Fernando Po, Madeira, Ascension, Mauritius, and Prince's Island.

**PHYSICAL FEATURES.** The surface of Africa is mostly elevated, but not lofty, only three mountain regions having their summits above the snow-line. The southeastern one-third of the grand division is an elevated plateau, sloping largely toward the northwest, with a central elevation extending from the equatorial lakes to the Strait of Gibraltar. It may be said that a generally elevated region extends from the vicinity of Mount Kilimanjaro to the Mediterranean shore in Algeria. On the seacoast, along both sides of the continent, are plains more or less clearly defined. The surface in the northwest of the northern elevation descends toward the Atlantic nearly to the sea level, while to the east of it are portions below the surface of the Mediterranean. From the Mediterranean Sea to the southern extremity of the continent, along the eastern coast, extends the predominating mountain system. It is most highly elevated near the center, on the plateaus of Kaffa and Abyssinia, and in the region extending between Lake Victoria Nyanza and the Indian Ocean. The highest points are the volcanic peaks of Kenia and Kilimanjaro, both situated east of Lake Victoria Nyanza, whose





RELIEF MAP OF AFRICA.



estimated heights are about 20,000 feet. The highlands extending southward from Kilimanjaro are known as the Drakensberg Mountains, which culminate in peaks 10,000 feet high, and extend southward to the Cape of Good Hope. The Abyssinian plateau has a general elevation of from 6,000 to 8,000 feet, the highest peaks being about 15,000 feet. In the south are the Snow Mountains, with peaks of over 10,000 feet; on the west the Mocambe and Crystal Mountains, extending from the south to the Gulf of Guinea, and north of these are the volcanic peaks of the Cameroons, with altitudes approximating 13,000 feet. Along the northern shore of the Gulf of Guinea extend the Kong Mountains, and in the extreme north of Africa are the Atlas Mountains.

**RIVERS AND LAKES.** Africa possesses some of the greatest rivers of the world, among them the Nile, 3,900 miles long, the Congo, 2,800 miles, and the Zambezi, Niger, Orange, Limpopo, Tana, Juba, and Senegal. The rivers have their sources largely in the equatorial regions, where moisture is abundant. There also are located the principal lakes, including Lakes Tchad, Victoria Nyanza, Nyassa, Albert Nyanza, Albert Edward, Bangwedo, Tanganyika, Tzana, and Leopold. The fertility of the lake region is equaled only by the equatorial regions of South America. In these regions of the two continents thrives the most luxuriant vegetation of the world. Both toward the north and south of the equatorial region of Africa the rainfall diminishes and vegetation gradually decreases, and dense forests give way to shrubs and grasses. To the north this region is known as the Sudan, while in the south is included the grass country of the Zambezi River. Beyond these north and south lie deserts; the great Sahara on the north, and the Kalahari on the south. The extensive Sahara Desert (q. v.) is not a total sandy waste, but has a great variety of surface, rocky and mountainous in some regions, and level and fairly fertile in others.

**PRODUCTIONS.** In the western part of Africa vegetation is extensive and quite varied, particularly along the northern shores of the Gulf of Guinea and in the region of the Gambia and Senegal rivers. The desert regions contain numerous fertile oases, where grows the date palm, a tree of vast value on account of its food product for the natives and their animals. In the equatorial region the banana is the chief product. A large variety of European agricultural products are cultivated on the shores of the Mediterranean, while ebony and fine cabinet woods abound in the forests. In the valley of

the Nile agriculture is the chief occupation, but the methods are very primitive as compared with those prevailing in Europe and America. The soil is not plowed as in the highly civilized countries, but the work is done with rude machinery or the seeds are scattered and then trampled into the soil by oxen, though in some regions newer methods and machinery have gone into use. Extensive dikes and ditches have been built in many parts of the Nile valley, and other improvements have been made by which the water of the river may be utilized in irrigating the land. Southern Egypt contains some of the largest irrigation reservoirs maintained in the world, thus making it possible to utilize for agriculture and stock-raising areas formerly arid and sterile. The productions of this region include rice, cotton, corn, wheat, sugar-cane, live stock, and semi-tropical fruits. In the southern part of Africa agriculture, mining, and manufacturing have been developed largely by European people, who are rapidly introducing the modern appliances in all avenues of industry and civilized art.

**MINERALS AND TRADE.** Africa is rich in all kinds of minerals, though its geology is not known sufficiently to form a reliable outline of the extent of its mineral wealth. Diamonds in the rough valued at about \$460,000,000 have been taken out of the fields in the vicinity of Kimberley since they were opened in 1868. Coal deposits abound in the region of the Zambezi River and other sections. Johannesburg is the center of the gold fields, where mines were opened in 1883, and the annual product is valued at nearly \$60,000,000. Iron, copper, lead, granite, and many excellent building stones are widely distributed. The ivory and rubber trade continues to be important, especially in the west central region lying along the Gulf of Guinea and inland from that section. Chief among the exports are ostrich feathers, gold, diamonds, wool, ivory, hides, and fruits. Machinery, textiles, farming utensils, and drugs are imported. The exports for 1908 are placed at \$378,650,000, and imports at \$410,584,000. Great Britain and Germany had the largest share of trade, but important trade relations are maintained with the United States, France, Holland, Portugal, and Italy.

**TRANSPORTATION.** Railroad building is an important factor in the development of African trade, there being 15,450 miles in operation, and several thousand miles are projected and have been surveyed. The greatest single railway line projected is to extend from Cape Town to Cairo, a distance of 6,600 miles. One-half of this line is completed, and the entire enterprise



is expected to be finished by the year 1912. From Cape Town to the region beyond the Zambezi, which is about 1,950 miles, has been completed, and there are numerous branches into fertile regions. The line from Cairo to Khartum, 1,300 miles, is in successful operation, and telegraph connection extends much farther to the interior. The government of Egypt has given material encouragement to railroad and telegraph building, which is also true of Great Britain, France, Germany, and other European countries having African colonies. The estimated cost of the Cape-to-Cairo railway is placed at \$120,000,000. It is to extend north from Bulawayo along the east shore of Lake Tanganyika, passing through German East Africa, thence it will extend through British East Africa and follow the course of the Blue Nile to Khartum. The navigation of the Nile, Niger, Congo, and other streams, and on the equatorial lakes, is an important factor in developing trade. Transportation has also been improved by the building of wharfs and the deepening of harbors.

**ANIMAL LIFE.** Among the animals peculiar to Africa are the cape buffalo, two-horned rhinoceros, zebra, gorilla, quagga, gnu, giraffe, hyena, deer, aard-wolf, and many species of monkeys. The camel thrives throughout the desert region; the elephant is found in the central portion; crocodiles and hippopotami are met with in nearly all the great rivers, and the lion is common to all parts not inhabited by Europeans. An abundance of fish is common to the rivers and lakes, while ostriches roam in flocks upon the plains. In the warmer parts of Africa, as in all tropical regions, many varieties of insect pests prevail. The locust has been a scourge in some parts from remote antiquity, while vegetable and animal life is preyed on more or less by the scorpion, zebub fly, many species of ants, and other insects. All the domestic animals common to Europe and America have been successfully introduced in the regions partly or wholly occupied by Europeans, and there are considerable interests in raising buffaloes, elephants, and ostriches.

**INHABITANTS.** In population Africa occupies third place among the grand divisions, being exceeded only by Asia and Europe. The most accurate estimates made in 1909 place the total population at 148,388,682. Most of the vast populations are still savages, and are not well known to the civilized world. The people in the northern region may be classed as Hamitic and Semitic, while in the central and southern sections the natives belong to the Hottentot and Negro races. The Bushmen, Kaffirs, Hottentots,

and Hereros are the more important peoples of the southwestern sections. In the interior the different tribes are frequently at war with each other, though their primitive method of warfare is not particularly destructive. The weapons of the natives consist largely of such implements as clubs and spears, with which



AFRICAN NATIVES

they have shown great valor in the hopeless battles against conquest by the Europeans. As to religion, the people of Africa are classed largely as pagans and Mohammedans, though the Christian religion is professed by descendants of Europeans and by the people of some portions of Abyssinia and Egypt, and an effective missionary work is in successful progress.

**SOCIAL CONDITIONS.** The social conditions of Africa are transitory, with a tendency somewhat favorable to betterment, though polygamy and slavery are still widespread. Human life is not safe in large tracts of territory on account of the government being tribal, life is more or less savage, there is an absence of central authority, and many of the people are fettered with terrors and superstition. While European occupation is gradually tending to better social conditions by employment and education, many remote sections are densely populated by savages who wage persistent war against European progress. However, the savage and semi-civilized conditions are crumbling rapidly before the advance of European enterprise, and every department of life and industry is undergoing changes for the higher and better.

**PARTITION.** The partition of Africa has been going on for several decades and spheres of influence have been fixed to include various sections, but boundary lines between the several districts have been definitely fixed by only a number, and the remaining boundaries are yet to be established by surveys. At this time the following may be regarded approximately correct African possessions under the control of European powers:











COUNTRY	POPULATION	SQUARE MILES
France .....	32,800,000	3,950,000
Great Britain.....	41,650,000	2,690,000
Germany .....	15,350,000	1,000,000
Portugal .....	9,050,000	798,000
Turkey .....	1,250,000	400,100
Italy.....	450,000	198,800
Spain.....	135,500	81,000

The independent states are Liberia, Morocco, and Abyssinia, the Orange Free State and the Transvaal having lost their independence in 1902. Egypt is nominally subject to Turkey, though really under British control, and Great Britain and Egypt exercise concurrent jurisdiction over Eastern Sudan. The British colonies include Cape Colony, Transvaal, Rhodesia, British East Africa, British Central Africa, Natal, Gambia, Lagos, Orange River Colony, Gold Coast, Mashonaland, Matabeleland, Sierra Leone, Nigeria, British Somaliland, Uganda, Walfisch Bay, Zululand, and Zanzibar.

France possesses the largest scope of territory in Africa and also has Madagascar. Its continental possessions are Algeria, Tunis, Dahomey, French Guinea, French Congo, French Sudan, Algerian Sahara, Ivory Coast, Senegal, Sahara, French Somaliland, Wadai, and Obock. The Colonial possessions of Germany are German East Africa, German Southwest Africa, Kamerun, and Togoland. The colonies of Portugal are Angola, Portuguese Guinea, and Portuguese East Africa. Italy has Eritrea and Italian Somaliland. Spanish Congo and Rio d'Oro are Spanish colonies. The colonies of Turkey are Barca and Tripoli.

**HISTORY.** The history of Africa dates back to remote antiquity, in fact Egypt and Abyssinia ranked as ancient in the period when Greece attained to its height of power. It is uncertain when its historical era begins, possibly as far back as 5,000 B. C. The Romans came in contact with people who occupied the section of Northern Africa extending from the Red Sea to the Atlantic. Carthage reached its zenith before the rise of the Roman Empire. Cambyses conquered Egypt in 525 B. C. and Alexander the Great made a successful conquest of that country in 321 B. C., but even subsequent to the latter conquest the Egyptians were patrons of the arts and sciences. In the time of Solomon, about 1000 B. C., the Queen of Sheba visited Palestine, and at that time Ethiopia, now Abyssinia, ranked as a country of antiquity. Central and Southern Africa were less known for the reason that the powerful nations bordering on the Mediterranean prevented the exploration of the interior. Christianity was introduced into Africa in the second century, when synods

were founded at Carthage and Alexandria. The Vandals invaded the northern section in the second century, at which time Ptolemy flourished in Alexandria. The maps of Ptolemy indicate that the Nile basin was quite well known in his time, and he gave a fairly accurate account of the mountains and some rivers in the west central part of the continent. At the time of the Crusades Northern Africa was occupied by the Mohammedans and became a battle ground between the Cross and the Crescent, though the interior was not entered by Europeans at that time. In the 15th century the Normans visited the Gold Coast and in 1413 built a fort at Elmina.

Modern exploration of Africa may be said to have commenced in the year 1415, when Prince Henry of Portugal invaded Northern Africa and defeated the Moors at Ceuta. This stimulated interest in the unknown continent and caused explorations to be made both along its coast and toward the interior. Bartholomew Diaz discovered and sailed around the Cape of Good Hope in 1485, and in 1497 Vasco Da Gama doubled the Cape and sailed to India.

The more recent exploration of Africa may be said to date from 1768, when James Bruce, a Scotchman and consul for Great Britain at Algiers, began an exploration of the valley of the Nile. Mungo Park, also a Scotchman, in 1795 explored the Niger country. David Livingstone began his famous tour northward from Cape Town in 1840 and devoted more than 30 years to the exploration of the continent as far north as Lake Tanganyika. The peaks of Kenia and Kilimanjaro were discovered by the German missionaries Krapf and Rebmann in 1847, and Heinrich Barth, a German explorer, in 1850-52, explored the country from Tripoli to Timbuktu, whence he proceeded to Lake Tchad, and returned by way of Tripoli to Europe. Henry M. Stanley circumnavigated lakes Tanganyika and Victoria Nyanza in 1873, and about the same time two German expeditions under Gerhard Rohlfs and Dr. Nachtigal explored the region from Morocco to the Gulf of Guinea and the principal mountains in the Sahara and Sudan. The Portuguese made extensive explorations of South Central Africa, from Saint Paul de Loanda to Mozambique. The map of Africa as it appears at the present time is a fair indication of the explorations by European countries, since the partition of the continent is based quite largely on the tours made by explorers, though there have been some changes or modifications of boundaries. The present line of activity is concerned with the development of territory held by European countries rather than



an extension of possessions, especially in the development of mining and agriculture and the construction of railroads.

**AFRICAN METHODIST CHURCH**, the Negro branch of the Methodist Episcopal Church, which was organized in 1816. At present this branch includes 5,000 ministers and a membership of 750,000. The African Methodist Episcopal Zion Church is a branch of the African Methodist Church.

**AFRIKANDER** (ăf-rĭ-kăn'dĕr), a term of Dutch origin, meaning a white man of Dutch descent born in Africa. The term is used to distinguish from the word *Uitlander*, which signifies a foreigner.

**AGAÑA** (ă-găn'yă), a city of the Ladrones, capital of Guam, located on the Agaña Bay. Through the city flows a shallow stream, which is crossed by several stone bridges. The streets are wide and clean. It is the seat of an arsenal, a college, and several fine schools and churches. Though the bay is obstructed by reefs, the city has considerable shipping trade. Since its acquisition by the United States, in 1898, it has been improved by modern facilities, such as telephones and electric lights. Population, 7,595.

**AGANIPPE** (ag-a-nĭp'pe), a fountain of Greece, near Mount Helicon, discharging into the river Permessus. From it the Muses derive their name Aganippides, and it is said that its waters give a poetic inspiration.

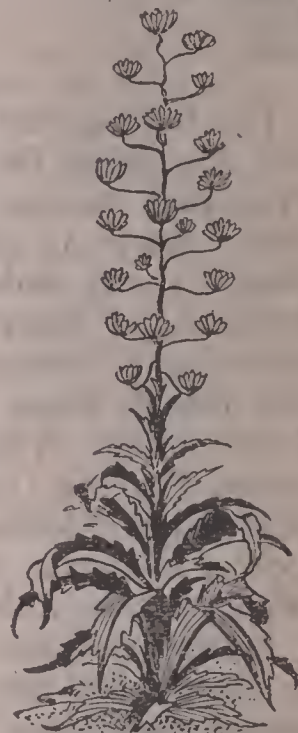
**AGARIC** (ăg'ă-rĭk), a fungus growth belonging to the genus *agaricus*, of which there are numerous species. True agarics have radiant gills, tinged with brown, pink, white, purple, or black. The common mushroom belongs to this class of plants and is cultivated extensively as a delicate article of food. Some species are popularly called toadstools and a few are dangerous poisons.

**AGASSIZ, Mount**, a volcanic peak in Arizona, located 70 miles northeast of Prescott. It is one of several extinct volcanoes of the San Francisco Mountains and towers 10,000 feet above the level of the sea. A peak of the same name in Utah has an elevation of 13,000 feet.

**AGATE** (ăg'ăt), the name applied to a stone of the quartz variety, in which the colors are in bands, in clouds, or in distinct groupings. The principal varieties are known as plasma, onyx, mocha, bloodstone, carnelian, and chalcedony. The chief constituents are forms of silica, and the colorings are due mostly to iron. When polished, agates assume a beautiful appearance, and are used in the manufacture of bracelets, seals, and brooches, and in mosaic work. They are found in various parts of the

United States, and in Brazil, India, Arabia, Scotland, and particularly at Oberstein, a small town near Mentz, Germany.

**AGAVE** (ă-gă'vă), a genus of plants popularly known as American aloes, native to Mexico and Central America, and now extensively naturalized in Eurasia and Northern Africa. There are various species, the best known being the so-called maguey of Mexico. Its chief uses are for feed, and ropes are made from the fiber of the leaves. The Mexicans extract its sap, which, when fermented, yields a beverage resembling cider, and is known as *pulque*.



AGAVE.

**AGE**, a period of time, used in a variety of senses, but usually to denote the whole or part of the duration of any particular being or thing. The term *age* is used in law to designate the period at which individuals become eligible to do what they are otherwise legally disqualified from doing for want of years or maturity of mind. In England and the United States both males and females attain legal age at twenty-one, though the latter become of age in most states of the latter country at eighteen years for some purposes, as contracting marriage, while males are eligible to election as representatives of the United States at twenty-five years and as senators at thirty years. The military age is from eighteen to forty-five. The stages of civilization are spoken of in history and mythology as five distinct ages; namely, the Golden Age, the Silver Age, the Bronze Age, the Heroic Age, and the Iron Age. The term *age* is also used in various expressions, as the Dark Ages, the Middle Ages. Geological ages include the Archaean Age, or the time which witnessed the dawn of life; the Palaeozoic Age, including the time during which animals and plants bore little resemblance to those now living; the Mesozoic Age, including the time during which the animals and plants began to resemble those now living; and the Cenozoic Age, including the time during which the animals and plants bore decided resemblance to those now living. These four ages are divided into still other periods or ages, as the Archaean into Azoic and Aeozoic Ages, the Palaeozoic into the Silurian, Devonian, and Carboniferous Ages, and the Cenozoic into the



Tertiary and Quaternary Ages; the Mesozoic comprises the age of reptiles. Shakespeare divided the life of man into seven ages, and men of science usually divide it into four or eight ages.

**AGEN** (ä-zhän'), a city in France, capital of the department of Lot-et-Garonne, 75 miles southeast of Bordeaux. It is noted as a market for prunes and has cotton, linen, and woolen manufactories. It has railroad connection with the principal cities of France. The surrounding country is fertile. A college, a public library of 20,000 volumes, and several fine bridges across the Garonne River are among the chief improvements. The city was known by the Romans as Aginnum. It has a cathedral which dates from the time of Clovis, and is the birth-place of Bory de St. Vincent. Population, 1901, 22,482.

**AGENT** (ā'jent), in law, a person employed to act for another, called the principal, in dealing with third persons. The term is not used by Blackstone and occurs rarely in the decisions and law dictionaries before the 19th century. The term *agent* differs in meaning from the word *servant* in that the latter is applied to one who renders personal services to his employer, while an agent is authorized to act for and represent another in business transactions. An agent may be special or general, the former limiting to special business, while a general agent has power to transact all of the business in which the principal is engaged as enumerated in the contract, either verbal or written, existing between the two parties. The form of contract under which an agent may be employed varies greatly, but in special cases where the agent is authorized to sign the name of the principal the contract must be in writing and acknowledged under seal of a notary public or a similar officer, and in such cases the authority conferred is called power of attorney.

The principal is bound by the act of an agent when under contract, or in case he has ratified the act in the absence of a contract, and is liable to the third party in the same way as if he had done the act himself. If an agent makes known the name of his principal no personal liability is incurred by the agent, but if an agent does not disclose the principal for whom he is acting, and it is not known by the third party that he is acting for someone else, the agent himself becomes liable. Both the principal and agent are liable to third persons in case the agent commits a civil offense, though ultimately the liability rests upon the agent, but his principal cannot be held for a violation of the criminal

code by the agent. If no contract as to remuneration exists between the two parties it is understood that the agent is to be compensated for his services, including all proper expenditures arising from the conduct of the business, but the relations and limitations are usually defined in the contract. In most countries an agent has a lien upon the property in his hands held for sale or in his possession for delivery to third parties, and it serves as security to the agent that the principal will carry out his part of the contract, and an agent is entitled to damages if the principal does not comply with the contract as specified. In like manner the agent becomes liable to the principal for failure to use reasonable diligence in carrying out the terms of the agreement.

**AGINCOURT** (ä-zhän-kōör'), a village in the department of Pas de Calais, France, famous for the victory of Henry V. of England over the French on Oct. 25, 1415, after a struggle of three hours' duration. The English army numbered about 15,000 and the French 50,000; the latter were commanded by Constable D'Albert. The former lost 1,600 slain and wounded, and the latter 10,000, including many officers.

**AGNOSTICISM** (äg-nōs'tī-siz'm), a word coined by Professor Huxley, which implies the mental attitude in regard to the Deity of those who professedly "do not know." This school teaches that, beyond what a man can know of God by his senses or feel by higher affections, nothing can be known. One who holds to this view is called an agnostic.

**AGNUS DEI** (äg'nūs dē'i), a title applied to Christ in John i, 29, and used as the fifth and last section of the Roman Catholic mass. The mass begins with the words "Agnus Dei, qui tollis peccata mundi," meaning "Lamb of God, who taketh away the sins of the world." Agnus Dei is the name of a cloth bearing an



AGOUTI.

image of a lamb and used in the Greek church to cover the cup in the communion service. Luther retained the singing of Agnus Dei in



his reformation of the church service. In a modified form it is still used in the Lutheran church.

**AGOUTI** (ä-gōō'tī), a small rodent mammal related to the porcupine and common to the West Indies and South America. The common agouti, about the size of a rabbit, is native to Brazil. This animal ravishes on sugar cane and vegetables, especially potatoes and yams, hence it has been killed in large numbers and the species is almost exterminated. The black agouti is common to the West Indies. There are nine species, some of which are hunted for their flesh, which is white and quite nutritious. (See illustration on page 27.)

**AGRA** (ä'grá), a city of India, situated 783 miles northwest of Calcutta, and 115 miles southeast of Delhi. In ancient times the city was surrounded by walls that embraced an area of about eleven square miles, but of this space only about one-half is occupied at present. The city is the seat of several noted mosques and the Taj Mahal, a mausoleum dating from the 17th century, built by Emperor Jehan for himself and his favorite wife. Agra is now a commercial market for cotton, salt, sugar, cereals, and various manufactured articles. There are excellent railroad conveniences, gas and electric lighting, rapid transit, several schools and hospitals, and a number of government buildings. It rose to importance in the 16th century, and from 1526 to 1658 was the capital of the Mogul sovereigns. Population, 1901, 188,310.

**AGRAM** (ä'grám), a city in Austria-Hungary, capital of Croatia and Slavonia, 165 miles southwest of Vienna. It is located near the Save River, at the foot of the Agram Mountains, and is important as a railroad and commercial center. The manufactures embrace linen and silk goods, leather, porcelain, and clothing, and it has a large trade in wine and grain. It is the seat of an archbishop, has a Gothic cathedral dating from the 15th century, and is the seat of the Franz Josef University. The city was founded by the Romans and was partially destroyed by the Tartars in 1242. Population, 1901, 57,930.

**AGRARIAN** (ä-grā'rī-an), the name of a political party in Germany, whose avowed principles relate to the ownership or tenure of land. The subject of legislation in regard to land tenure dates from ancient history. Agrarian laws in the ancient Roman Republic were advocated and adopted under C. Licinius Stolo in 367 B. C., who was then tribune of the people. These laws made a division of the lands and enabled the plebeians to come into possession

of titles as well as the patricians. The land to which these laws related was public property belonging to the state, and not private property, as is popularly supposed. However, they prescribed, under a penalty of heavy fines, that no one should possess more than 300 acres of the public domain.

**AGRICULTURAL EDUCATION**, the plan or system of instruction designed to disseminate knowledge of agriculture and render this department highly efficient and profitable. While instruction in the art of farming and animal husbandry dates from antiquity, the agricultural college is a product of the 19th century. Originally the plan was to provide institutions in which exclusive attention could be given to agricultural subjects, in which agriculture was designed to be the leading, if not the only branch of study, but more recently schools and colleges devoted to this subject of learning adopted a diversity of courses. Though a college may be said to belong to the class known as agricultural schools, it is now the general rule for the faculty to take up a vast diversity of subjects, though each student is required to pursue study in one or more subjects relating especially to agriculture, such as agricultural chemistry, live stock husbandry, forestry, bee-keeping, farm management, rural engineering, agricultural technology, etc. Instruction in agriculture has been encouraged by all civilized countries, even where such training has not been provided for in colleges that may be termed distinctly agricultural.

**GREAT BRITAIN.** The first college devoted to agriculture was established in England, near Cirencester, where a company headed by Prince Albert in 1845 founded the Royal Agricultural College. This institution still holds rank as one of the most important institutions of the kind in the world, and in attendance holds rank with the national school of agriculture at Berlin, Germany. The University of Cambridge founded a professorship of agriculture in 1899, and the government renders aid to education in agriculture by grants of money paid through the Department of Agriculture. Canada has a fine institution at Guelph, Ontario. A dairy school is maintained in New Brunswick, and there are secondary schools of agriculture in Quebec and Nova Scotia. Agriculture is taught as a branch in the normal and public schools in many sections of the Dominion. Australian institutions devoted to this branch of knowledge are numerous, including those at Richmond, New South Wales; at Gatton, Queensland; and at Dookie, Victoria.

**UNITED STATES.** The government of the



United States has expended large sums of money for the establishment of schools of agriculture and mechanic arts, in which farming is taught as a science. An agricultural college is now maintained in every State, and these are largely in connection with State universities. The general assemblies of many states have also made appropriations to encourage the organization of agricultural societies for the purpose of aiding in placing the industry upon a practical and scientific basis. A large number of periodicals devoted to the discussion of dairying, stock raising, horticulture, farm architecture, care and tillage of the soil, and other branches of the industry have come into general circulation and have had a molding influence. In 1862 Congress passed an act for the purpose of aiding in the establishment of colleges of agriculture. The act originally provided for the payment of \$15,000 to each State and Territory, which sum has been increased until it now amounts to \$25,000 annually. At present the attendance at these colleges aggregates 36,950 students.

**AGRICULTURAL EXPERIMENT STATION**, an institution devoted to the scientific and practical investigation for the benefit of agriculture and the dissemination of information relating to plants and animals. The purpose of governments promoting stations of this kind is to diffuse knowledge in regard to plants that are useful or injurious to certain localities, the plants and animals that thrive best under definitely known climatic conditions, and the art of cultivating plants and rearing animals. The principal stations in Canada are at the Agricultural College of Guelph, Ontario, and the Central Experimental Farm at Ottawa. The latter has branches in Manitoba, British Columbia, Nova Scotia, and in several places of the Northwest. The station at Rothamsted, England, is noted for having made valuable discoveries in the art of fertilizing and the nutrition of plants and animals. Germany and Russia each have more than one hundred stations, chiefly connected with universities. Austria has 47; Norway and Sweden, 45; Italy, 22; Belgium, 15; and Japan, 16.

The first station of this class in the United States was established in 1875 by Connecticut, at Wesleyan University, Middletown, under the direction of W. O. Atwater. About the same time E. W. Hilgard was placed in charge of a station at the University of California, Berkeley, Cal. At present there are fifty-seven stations in the United States, supported by the national government under the Hatch Act; the annual aid extended by the government

amounts to \$720,000, and State governments devote \$500,000 to their support. About 700 persons are employed in the administration of the stations, and 500 bulletins are distributed for general information. The stations and a large number of institutions at which agriculture is studied, such as agricultural and mechanical colleges, are bringing about a deeper interest and a more practical application of methods tending to render the business of farming more lucrative and rural life more genial. Education along agricultural lines is also promoted by farmers' institutes, by university extension work, by study of courses in common and secondary schools, by departments in general college courses, and by instruction in universities.

**AGRICULTURE** (ăg-rĭ-kŭl'tŭr), the science that treats of the cultivation of the soil, with the view of disseminating knowledge in the production of grasses, vegetables, and cereal crops. The process of human and economical and social development has been from a savage state to hunting and fishing; from these to a nomadic pastoral state; then to a rude form of agriculture, and finally to manufacturing and commerce. However, all the stages, except the first, are still represented in the more advanced countries. Agriculture as an industry has existed from a remote period of antiquity, and, by practical experience from time to time, has been materially bettered by improvements in the implements employed and a diversification of the crops. It is but recent that material success in the occupation of the farmer has been thought to result from education in the arts and sciences of farming. For



EGYPTIAN SCULPTURE—PLOWING AND SOWING.

this reason it may be truly said that agriculture is the oldest of the arts and the most recent of the sciences.

From sacred history we learn to know Egypt as a land so rich in corn that it produced an abundance for the sustenance of its own dense population, and that it yielded large quantities for exportation to distant countries. These statements of the Bible are verified by profane history. We learn from Diodorus Siculus that Egyptian farmers were acquainted with the benefits of a rotation of crops, and that they knew how to adapt plants and their cultivation to both soil and seasons. They transported annually to Rome about 20,000,000 bushels of



corn. The same author informs us that the Egyptians garnered hay for their cattle during the annual inundations, and at times confined the domestic animals to meadows and green clover. They were large producers of poultry, and, to facilitate the industry, practiced artificial hatching, not unlike incubating of modern times. Their flocks were shorn twice annually and their ewes yeaned twice a year.



PRIMITIVE METHOD OF CUTTING GRAIN.

From Egyptian decorations we obtain a fair insight into the state of agriculture among these remarkable people. They employed a superintendent to direct laborers, kept account of productions and expenditures, and showed much system in husbandry. Corn was ground by hand-mills or in structures propelled by oxen, seed was sown by hand from a basket, and the ground was cultivated both before and after scattering the seeds.

Babylonia, Egypt, Rome, and the Israelites were the great agricultural nations of antiquity. In Egypt the Israelites were trained for an agricultural life, which fitted them to take possession of Canaan, where virtually the whole population engaged in tilling the soil. They found Canaan occupied by a dense population fortified in cities. The Canaanites possessed great wealth and subsisted on the products of their highly cultivated soil, which gave forth cereals, supported large herds of cattle, and abounded with vineyards and oliveyards. The Israelites found sufficient corn in the land to sustain them from the time they crossed the Jordan. As the laws of Moses contained an agrarian clause which provided for an equal division of the soil among adult males, provisions were made to allot from sixteen to twenty-five acres of the land to each of the 601,730 able-bodied men among the Israelites.

The people of Greece were given to poetry, philosophy, history, and the fine arts, and their unrivaled literature affords us little information regarding the practical details of agriculture. This circumstance is accounted for at least partly by the fact that Greece possesses a surface quite unfavorable to agriculture. However, we find that in Boeotia the lakes and morasses

were drained, that mountain surfaces were covered with transported soil, and that the people possessed fine breeds of domestic animals. In ancient Rome agriculture was highly esteemed, and it was only at a later period that commerce, trades, and the arts were introduced. In recent centuries, beginning with the 18th, agriculture has been augmented scientifically, and farmers have become more skillful and enterprising. Perhaps this may be accounted for because of a gradual advance in the price of produce, which has been occasioned by the increase of population and wealth derived from manufactures and commerce. Besides, the labor of agriculture has been greatly lightened and its cost lessened by means of machines and improved implements. Railroads have brought the farm nearer to the factory; that is to say, transportation from one to the other has been cheapened and quickened. There has been a decided advantage in diversifying the products of the farm and in naturalizing plants and domestic animals to countries favorable to their production. The area of tillable surfaces has been greatly augmented by redeeming swamp lands by tile-draining and other improved methods of draining, as well as by rendering fit for cultivation large tracts in arid regions by means of irrigation. Thus, the field of agriculture has been enlarged on the one hand and the consumption of farm produce greatly extended on the other.

Agriculture in the United States and Canada has grown to be one of the great industries, and as a fundamental enterprise is no doubt more important than any other. The 12th census of the United States, published June 30, 1900, gives the value of all farming property at \$20,439,901,164. The following statistics published in this report give a clear idea of the growth and permanent development of agriculture in the United States:

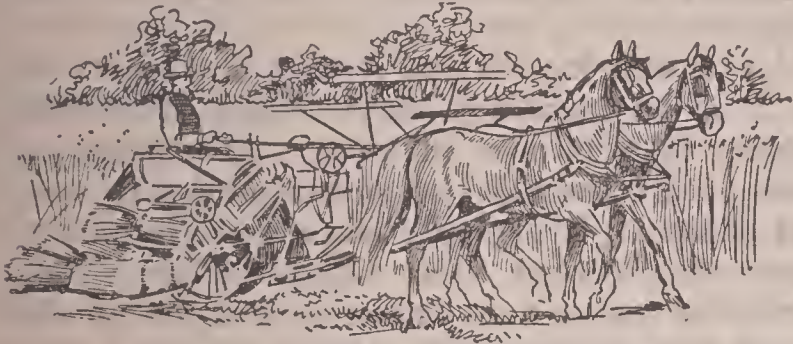
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YEAR.	NUMBER OF FARMS.	NUMBER OF ACRES IN FARMS.	AVERAGE NO. OF ACRES PER FARM.	VALUE OF FARM PROPERTY.
1850 ...	1,449,073	293,560,614	202.6	\$ 3,967,343,580
1860 ...	2,044,077	407,212,538	199.2	7,980,493,063
1870 ...	2,659,985	407,735,041	153.3	11,124,958,747
1880 ...	4,008,907	536,081,835	133.7	12,180,501,538
1890 ...	4,564,641	623,218,619	136.5	16,082,267,689
1900 ...	5,737,372	838,591,774	146.2	20,439,901,164

It will be observed that there has been a marked increase in the number of farms the past fifty years, which is more than equaled by the increase in value of all farm property, but there is a tendency to decrease the number of acres per farm as the country becomes developed and farming of a higher order is established. It is found that in general farming large scopes



of land are worked by improved farm machinery, the owner or lessee taking advantage of cultivating large tracts of land by modern methods, but as communities develop and settlements become more dense there is a tendency toward a more careful husbandry, under which



NEW STYLE OF HARVESTING.

lands are tilled and fertilized and the production per acre is enhanced materially. The possibility of increasing the fertility of the soil is fully borne out by experience in every section where rotation of crops and improvement in fertilization are practiced. Colored farmers cultivate tracts of land about one-third as large as those operated by white farmers, though 13.4 per cent. belong to the former class and 86.6 per cent. to the latter class. The value of farm implements and machinery, in 1900, was \$761,261,550, of live stock \$3,078,050,041, and of buildings \$13,114,492,056.

**AGRICULTURE, United States Department of**, a branch of the government, organized by an act of Congress in 1862, and whose chief officer, the Secretary of Agriculture, is a member of the presidential Cabinet. David P. Holloway published the first report as commissioner of agriculture, and his recommendation for such a department caused it to be established, but the chief officer was not a member of the Cabinet until 1889. The free distribution of seeds was begun by the commissioner of patents in 1836, and the practice has been maintained since with the view of introducing plants useful to different sections, the kinds depending upon climate and locality. The department issues bulletins and reports from time to time, which, together with the "Year Book," are published to be distributed gratis.

The Department of Agriculture as at present organized is effective in gathering and distributing knowledge useful in the cultivation of soils, the rearing of live stock and the propagation of plants. Its divisions are numerous, making it a serviceable working force. The library contains about 75,000 volumes relating to agriculture and agricultural science. In connection with it is the division of publication relating to printing, illustrating, and distributing of

publications. The division of biological survey deals with the geographical distribution of animals; the division of entomology relates to the distribution and repression of injurious insects. Experiments and information regarding road-making are directed from the office of public road inquiry, while the division of forestry has charge of research relating to forest trees. Students of agricultural physics and the investigation of soils are under the direction of the bureau of soils; research and agricultural chemistry, especially fertilizers and food-producing plants, are directed by the bureau of chemistry; and the bureau of animal industry investigates dairying and imports and exports of animals, and conducts research on diseases of animals. Forecasting weather and research in climatology and meteorology are under the direction of the weather bureau. The bureau of plant industry has charge of the publication and distribution of seeds, largely through members of Congress, the investigation of fruits adapted to various soils and climate, plant-breeding, the distributing and utilizing of forage plants, and the testing and propagation of useful plants. See **United States, Departments of**.

**AGRIGENTUM** (ag-ri-gĕn'tum), a city on the southern coast of Sicily, founded by a Greek colony in 582 B. C., now called Girgenti. In ancient times it was a rival of Syracuse in commercial importance and military power. The Carthaginians destroyed it in 405 B. C., and at the time of the Punic Wars it was occupied by the Romans. The Saracens had possession of it from 825 to 1086 A. D. It has ruins of ancient walls and several buildings of the Greek period, including the temple of Zeus. Though once a city of 200,000 people, its present population is only 22,500.

**AGRIMONY** (ăg'rĭ-mō-nĭ), the common name of a genus of plants belonging to the rose family, native to Great Britain and found in the southern section of the United States. The flowers are small and yellow and grow in a large cluster at the ends of the stems, and the whole plant has a bitter taste and slightly aromatic smell. The leaves are pinnate and are dried for a kind of herb tea, while the roots are used as a vermifuge.

**AGUE** (ă'gŭ), an intermittent fever accompanied by paroxysms, which occur at regular intervals. It is caused by effluvia from the surface of the earth, and is confined to warm, damp climates. Ague does not prevail within the polar circles, nor in arid and elevated regions. The malady is rather more troublesome than dangerous. Quinine, calomel, and cinchona bark are preventives. Ague contracted



in London caused the death of James I. and Oliver Cromwell.

**AGULHAS** (ä-gōōl'yās), **Cape**, the most southern point of Africa, situated about ninety-eight miles east of the Cape of Good Hope. Its highest elevation is 455 feet above sea level. In 1849 a lighthouse fifty-two feet above high water was built on its shore.

**AID-DE-CAMP** (ād'de-kän), a superior confidential attendant upon a general in active service, whose duty is to receive orders and communicate them to others. He exercises this function while battles are in progress, and at other times acts as secretary and confidential agent.

**AINO** (ī'nō), or **Ainu**, the name of an aboriginal people of Japan, found chiefly in Yezo, Saghalien, and the Kurile Islands. Though classed as uncivilized or barbarian, they are of a mild and amiable disposition. In stature they are short, averaging about five feet in height, but are active and strong. Hunting and fishing are their chief occupations. The complexion is dark brown or black. They are in general very hairy, the men wearing long beards. It is thought they were driven north by the advance of the Japanese, but more recently they have learned from their superiors, and many have been converted to the Protestant religion. It is estimated that the total number of Ainos does not exceed 15,000.

**AINTAB** (īn-tāb'), a city of Asiatic Turkey, in northern Syria, 60 miles north of Aleppo. It is important as a military post and is the seat of a Protestant missionary station for work among the Armenians. Being located on the route from Aleppo to Armenia, it has an important trade, especially in cotton and leather. The inhabitants are chiefly Armenians and Greek Christians. Population, 44,500.

**AIR**, the gaseous substance, composed of oxygen and nitrogen, which surrounds the earth. It is elastic, and is destitute of taste, color, and smell. Pure air is a mechanical mixture, containing by weight 23.10 parts of oxygen and 76.90 nitrogen, and by volume 20.90 of oxygen and 79.10 of nitrogen. To these must be added a nearly constant quantity of carbonic acid, usually about five or six parts to every 10,000 parts of air, and a very variable portion of watery vapor. Owing to a property of the gases called *diffusion*, these gaseous ingredients, though of different densities, are found in the same relative proportions at all heights. The oxygen and carbonic acid are the most important of the gases. Oxygen is necessary to the existence of animal life, since it supports combustion and respiration; carbonic acid is necessary to the existence of plant life, as it is composed of

carbon and oxygen, and is the source from which vegetation derives its woody fiber. In inspiration animals take in oxygen and give out carbonic acid; in sunlight plants take in carbonic acid and give out oxygen. This serves to maintain the relative proportion of substances necessary to the existence of animal and plant life.

Air is elastic; that is, it may be compressed so a given quantity may occupy a smaller volume than it does in nature, and, when the pressure is removed, it again assumes its original volume. It expands when heated and contracts when cooled. The oxygen of air is more soluble in water than nitrogen, and the air dissolved in water contains about one-tenth more oxygen than atmospheric air. The animals whose life is sustained by breathing in water, such as fish and polyps, and plants that thrive in water, take in oxygen less diluted with nitrogen, but more with water. The air in cities is less pure than in the country districts, since it is polluted by the breathing of large populations, and there are fewer plants to supply oxygen. In illy-drained districts, where miasma arises to pollute the air and gases from sewers and other impurities tend to poison it, the public health is endangered. A large number of persons breathing without sufficient ventilation soon poison the air by consuming the supply of oxygen and replacing it with carbonic acid gas. Thus, the ventilation of public buildings becomes a subject for considerate study, since health and public comfort depend largely upon the existence of pure air in sufficient quantities. See **Atmosphere**.

**AIR BRAKE**, a brake operated by condensed air, and used extensively on railway and street railway cars. The first patent on the air brake was issued in 1869 to George Westinghouse, an American engineer, but since that time it has been greatly improved. The first invention was what is known as the straight air brake, and in 1873 the automatic air brake was invented, which has an auxiliary reservoir and a triple valve as well as a train pipe and brake cylinder, thereby causing resistance to the several cars of a train instead of only to the forward cars, as was the case in the straight air brake. In 1897 a high-speed brake was placed on the market, which is used on passenger trains of very high speed. It uses very high air pressure when the train is at full speed, and by an automatic reducing valve the pressure is gradually reduced as the speed of the train diminishes. There are several forms of the air brake, being designed for light and heavy cars, and for cars used on steam railway, cable, and



electric railway lines. Labor organizations have been potent factors in securing the adoption of the air brake, and at this time it is very extensively used in Canada and the United States and to a less extent in other countries.

**AIR CELLS**, in physiology, the cells existing in the lungs, where they surround the lobular passages. They are very small, rarely exceeding one-hundredth of an inch in diameter. In birds they penetrate the quills and bones, thus facilitating flight through the air.—**Air engine**, a machine in which heated air is the propelling force, that is, air takes the place of steam in a steam engine. Air engines have an advantage over steam engines in that air can be raised with safety to a higher temperature than steam, and they have been found of much utility in mining and tunneling.—**Air shaft**, an opening from the surface of the earth to some portion of the galleries of a mine, constructed for the purpose of ventilation. Air shafts should be in two parts or at least have two longitudinal passages, the one for the ascending vitiated air, and the other for the descending pure air. Circulation can be induced by a fan, or by heat from a furnace.—**Air stove**, or furnace, a device used to generate hot air, which is then transmitted by means of an opening to the different apartments of a building.—**Air thermometer**, an instrument used in measuring the degree of heat by means of the expansion of air. Such an instrument can be utilized only to measure the lower temperatures, and agrees with the mercurial thermometer up to  $260^{\circ}$ , but above that point mercury expands more than air. It was invented by Santorio, a physician of Padua, Italy, in 1590.

**AIR COMPRESSOR**, a machine or air pump for compressing air by forcing it into a closed vessel. In the common bicycle pump, which is a simple form of an air compressor, there is a valve at the bottom of the cylinder opening outward, and in the piston is a valve opening downward. The cylinder is filled with air when the piston is raised, and the piston valve is closed with a downward stroke of the piston, hence the cylinder valve is forced open and the air escapes into the vessel. The air brake pump, with which nearly all locomotives are equipped, is a simple form of power air compressors. A  $9\frac{1}{2}$ -inch air brake pump consumes one pound of steam at 140 pounds pressure and yields 1.85 cubic feet of air at 90 pounds pressure, while a 2-stage Corliss air compressor with the same steam consumption yields 13.7 cubic feet of air at 90 pounds pressure. It will be seen that in the air brake pump economy of steam consumption is not

considered important, since the main consideration is to secure a machine light in weight, small in dimensions, and absolutely reliable in action. The principle on which air compressors act is the same in all machines, but the propelling force may be steam, electricity, or water power.

Otto von Guericke of Magdeburg, Germany, invented the air pump in 1650. William Cubitt, in 1851, invented the first modern air compressor and used it successfully in tunnel construction and for bridge work. In his machine and most others compressed air is drawn as needed from a reservoir, the machine storing it for use as required. In mining and tunneling very powerful compressors are employed, some exerting a pressure of 3,000 pounds to the square inch, and the highest known pressure obtained in laboratory experiments is 60,000 pounds to the square inch. Among other uses, air compressors are employed as rock drills, hoisting engines, polishing machines, sand blast apparatus, pumps, molding machines, air brakes on railroad and street cars, stone cutting apparatus, coal cutters, machinery in mines and tunnels, etc.

**AIR ENGINE**. See *Air*; *Air Cells*.

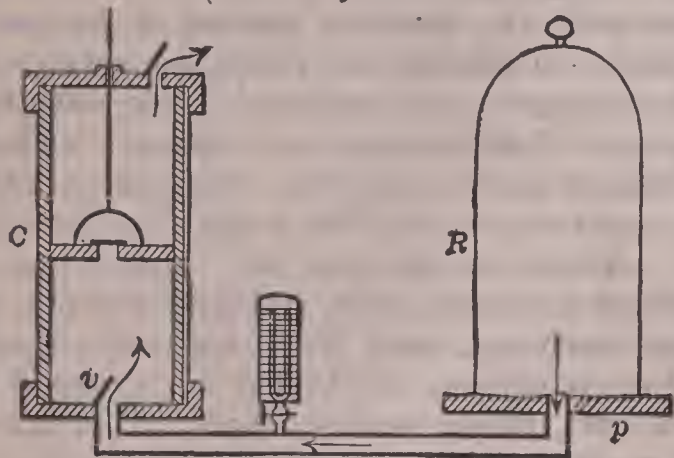
**AIR GUN**, an instrument for the projection of balls by the elastic force of compressed air, usually in the form of an ordinary gun. It contains a metallic globe furnished with a small hole and a valve opening into it, which contains a condensing syringe. By means of this apparatus the condensation is brought to a point of intensity. The globe is then detached from the syringe and fastened at the breech of the gun, which is of such construction that the valve may be opened by means of a trigger. A ball is then inserted, and, by pulling the trigger, is thrown with considerable force by the elasticity of the condensed air.

**AIR PLANT**, or *Epiphyte*, a plant attached to another plant and which derives its nourishment chiefly from the air. Plants belonging to this class receive no parasitic nutrition from the plants to which they are attached and the attachment is wholly mechanical. Orchids and ferns have many epiphytic forms, and in the tropics many tree trunks and evergreen forests abound with lichens and other forms of air plants. They are not numerous in the temperate and cold regions for the reason that they cannot endure drought or a low temperature, and in these sections are restricted to lower forms of plant life, such as mosses, liverworts, lichens, and algae. Nearly 300 species of air plants are common to Java, and numerous species abound in the tropical forests of America, Asia, and Africa.

**AIR PUMP**, an instrument invented by Otto



von Guericke (1602-1686), a German physician, in 1650. It is used to remove air or other gases from an inclosed space, or for compressing air within an inclosed space. Many improvements have been made on the air pump, but, since an actual vacuum can never result from the action of a pump, the machines now in use can do no more than reduce air to a high state of rarefaction. An air pump with a single cylinder is used to fill the pneumatic tire of a bicycle, while the machines used for general purposes contain two cylinders. The ordinary



AIR PUMP.

air pump contains a receiver of glass (R), which rests on a horizontal plate of strong glass (p), ground perfectly smooth. Under the receiver is an opening that has connection with the upright cylinder (C), and in the cylinder is a piston fitted sufficiently close to be air-tight. The piston is worked by a pinion, while in the cylinder is a valve (v) so constructed that when the piston is raised it communicates with the receiver, and the communication is shut off as the piston falls. As the machine is put in operation the air from the receiver fills the cylinder, and the longer the operations continue the more rarefied the air in the receiver becomes. By applying considerable force the air in the receiver can be almost wholly withdrawn. The air pump is used in preparing globes for electric lighting, in low pressure engines, for condensing milk and refining sugar, and in connection with many other processes in manufacturing.

**AIR SHIP.** See **Flying Machine.**

**AIX-LA-CHAPELLE** (āks-lā-shā-pěl'), or **Aachen**, an important city of Germany, in Rhenish Prussia, about forty miles west of Cologne. The city is the capital of an administrative district of the same name, and is the focus of an important network of railways connecting Germany, Holland, and Belgium. It is well and substantially built, has numerous schools, hospitals, and churches, and its appearance is that of a modern city aglow with life and activity, rather than that of an

ancient institution. There are gas and electric lights, stone and macadam pavements, rapid transit, sewerage, and many fine parks and monuments. It contains the magnificent coronation hall of the German emperors, whose length is 162 feet and width sixty feet, and there is a splendid fountain with the statue of Charlemagne, erected in 1620. The city enjoys a good trade with continental countries, and exports large quantities of manufactures to America. The chief articles of manufacture include shawls, silks, woolen goods, glass, pins, needles, machinery, tobacco, leather, and chemicals. Charlemagne made it the second city of his empire, and the seat of government of his dominions north of the Alps. It is generally assumed that this military leader was born here, while it is certain that he died in the city, and his tomb is in the beautiful cathedral. Aix-la-Chapelle was the place of coronation of the emperors of Germany from 813 to 1531, during which time it became one of the most important free cities, although it was twice ravished by the Normans, in 851 and in 882. The removal of the coronations to Frankfurt caused it to lose its leading position, and its prosperity was greatly injured by a destructive fire in 1666. At the time of the Revolution it was made a part of France, but in 1815 was ceded to Prussia. Population, 1905, 144,095.

**AIX-LA-CHAPELLE, Congress of**, the congress held in 1818 at Aix-la-Chapelle to regulate the affairs of Europe after the War of 1815. In this meeting were represented Austria, Prussia, England, Russia, and France, known as the five great powers of Europe, and the protocol agreed upon announced a policy known as the Holy Alliance. France was evacuated by the foreign forces as a result of this congress. Those in attendance included the King of Prussia, the Emperor of Austria, the Czar of Russia, Wellington, Metternich, Richelieu, and Castlereagh.

**AIX-LA-CHAPELLE, Treaty of**, the name given to two treaties concluded at Aix-la-Chapelle. The first, between England, Sweden, and Holland, known as the Triple Alliance, and Louis XIV., concluded May 2, 1668, settled the question of the possession of the Spanish Netherlands. After the death of Philip IV., Louis XIV. seized several forts and claim to that portion of the Netherlands which had been under the dominion of Philip. Holland, as a means of protection, concluded the Triple Alliance and France was forced to surrender possession except to the fortresses of Lille and Charlerois, while Spain retained



Franche Comté. The second, regarding the War of the Austrian Succession, was concluded in 1748. The treaty gave Maria Theresa possession of the throne of Austria. All the great powers of Europe had been involved in the war, but the treaty permitted the several states to retain possession of their territory nearly the same as before, though Silesia and Glatz were given to Prussia and Spain received Parma, Guastalla, and Piacenza.

**AJACCIO** (à-yät'chö), the capital of Corsica. It is important as a seaport and has a safe and commodious harbor. The surrounding country is fertile. Anchovy and pearl fisheries furnish the chief employment. The city has a good trade in wine and olive oil. It is the birthplace of Napoleon, and has a cathedral dating from 1585. Population, 20,197.

**AKABAH** (ä'kä-bä), **Gulf of**, an inlet at the north end of the Red Sea, extending into Arabia Petraea. It is from 12 to 17 miles wide and extends about 100 miles to the northeast. Golden Port, 29 miles east of Mount Sinai, is the only good harbor.

**AKHMIM** (äk-mēm'). See **Achmim**.

**AKRON** (äk'ron), a city of Ohio, county seat of Summit County, thirty-six miles south of Cleveland. It is situated on the highest elevation between the Ohio River and Lake Erie, about 500 feet above the latter, and has communication by the Pennsylvania, the Erie, the Baltimore and Ohio, and other railways. Among the public utilities are electric lights and street railways, waterworks, pavements, several libraries, and a fine system of public schools. The city is noted as a manufacturing center, employing about 8,500 persons, and the annual product aggregating about \$15,500,000. Among the chief manufactures are machinery, ironware, pottery, boilers, sewer pipes, books and stationery, rubber goods, cigars, and farming implements. It is the seat of Buchtel College, a Universalist institution of higher learning. In its vicinity are numerous lakes and hotels, hence it is popular as a summer resort. Population, 1900, 42,728; in 1910, 69,067.

**ALABAMA** (äl-ä-bä'mä), a southern State of the United States, bounded on the north by Tennessee, east by Georgia, south by Florida and the Gulf of Mexico, and west by Mississippi. Its greatest length from north to south is 334 miles, width, 154 miles, and area, 52,250 square miles, which is the exact area of North Carolina. It is popularly called the Cotton State.

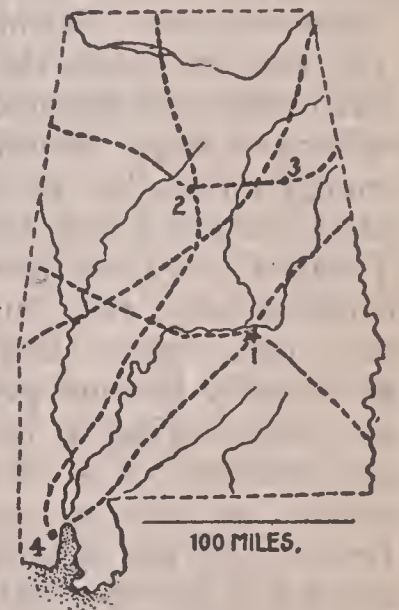
**DESCRIPTION.** Ranges of the Alleghany Mountains stretch into the northern portion from Georgia and Tennessee, but do not attain

to great elevations. These highlands include the Raccoon Mountains, sometimes called the Sand Mountains, which extend well across the northern part of the State, and the Lookout Mountains, which terminate about sixty miles south of the border. The mountains are generally flat-topped and have an altitude of not more than 1,600 feet, while the coastal plain has a general elevation of 600 feet. The Cumberland Plateau is a low range of hills in the southwestern part. Much of the drainage is toward the south into the Gulf of Mexico, but the northern slope belongs to the Ohio River basin.

The Tallapoosa and Coosa rivers unite about ten miles above the city of Montgomery to form the Alabama, the chief river of the State, which is joined by the Tombigbee about forty-five miles above Mobile. From the junction to Mobile Bay the combined rivers are known as the Mobile River. The Chattahoochee forms part of the eastern boundary, and the Tennessee flows through the northern part of the State. Other rivers include the Choc-tawhatchee and Black Warrior. The latter is a tributary of the Tombigbee, and is navigable to Tuscaloosa, while the Tombigbee is navigable to Columbus, and the Mobile to Wetumpka.

The climate is pleasant and varies with the altitude and latitude. Breezes from the Gulf tend to render the southern portion both healthful and enjoyable, but some of the river valleys and lower portions of the state are unhealthy, and show a tendency to malaria and fevers. The State is well watered with good springs and water veins, and in many portions are artesian wells. In the winter the thermometer seldom falls below 32°, while the summers are generally pleasant. The prevailing winds are from the south and southwest. Snow falls rarely in the south, but in the northern part it falls quite frequently in January and February.

**NATURAL RESOURCES.** The northern and northeastern section are rich in mineral deposits, including coal, clay, iron, aluminum, and quarry products, particularly sandstone and limestone. Salt is obtained in the southwestern



ALABAMA.

1, Montgomery; 2, Birmingham; 3, Anniston; 4, Mobile. Chief railways are shown by dotted lines.



part, and the State has more or less profitable deposits of asbestos, asphalt, marble, and copper. The mining of coal and iron has been developed extensively, and Alabama in the production of iron ore ranks next to Minnesota and Michigan. The greatest development in iron ore mining has been made in the Birmingham region. In the output of bituminous coal the State takes fifth rank. Extensive forests abound, yielding excellent material for building and manufacturing. The forest trees embrace oak, hickory, pine, cedar, elm, and chestnut, and in the southern part are fine forests of cypress, magnolia, and yellow pine.

**AGRICULTURE.** Farming is the chief industry. The soil, except in the region of mountains, is fertile and well adapted to fruit raising and the culture of many varieties of cereal plants. The annual production of cotton is about 1,300,000 bales, cotton being the most important crop. Tobacco is grown profitably. Other products embrace corn, rice, sugar cane, cowpeas, potatoes, oats, wheat, and hay. Stock raising as an industry has not grown extensively the past ten years, owing to the fact that cotton is the predominant crop, though there has been a marked growth in rearing horses and swine. Interest in the rearing of sheep, cattle, and mules has not been extended materially, though the state has large interests in these classes of animals. More than one-third of the cattle are milch cows. The title in land is chiefly in large landowners, and most of the farming is done in small tracts by Negroes.

**MANUFACTURES.** Manufacturing is an important enterprise, owing largely to the fact that the State has much available timber and productive iron and coal mines. The construction of cars and machinery takes rank as a leading manufacturing enterprise, though it is exceeded in the value of the output by the manufacture of timber products, cotton goods, and iron and steel. Phosphates obtained from Florida are used in making fertilizers from cotton-seed meal. Other manufactures embrace boots and shoes, turpentine, flour, wagons and carriages, and farming implements. The output of coke has increased rapidly the past five years, owing to the large production of coking coal. Few states have enjoyed an equal growth in the total manufactures produced annually.

**TRANSPORTATION AND COMMERCE.** Although the State has only one good harbor on the Gulf, at Mobile, it has extensive transportation facilities by the Alabama, Tombigbee, Mobile, and Tennessee rivers. Iron products are transported in large quantities to Mobile as a result

of improving the water course of the Black Warrior River. In 1908 the State had 4,320 miles of railroads in operation, which provide transportation facilities in nearly all parts of the state, though some counties are still without steam railways. A considerable mileage of electric lines is operated, chiefly in the cities and more densely populated regions. Mobile has the larger part of foreign trade, but large quantities of products are transported through the ports of New Orleans, La., and Pensacola, Fla. Cotton, lumber, coal, pig iron, machinery, live stock, and fertilizers are the principal exports.

**GOVERNMENT.** The present condition was adopted in 1901. It vests the executive authority in the governor, lieutenant governor, attorney general, secretary of State, auditor, treasurer, commissioner of agriculture and industries, and superintendent of education, each elected for terms of four years. Legislative authority is vested in the General Assembly, which consists of a Senate and a House of Representatives, the former being limited to a maximum of not more than thirty-five and the latter to not more than 105 members. While members of the General Assembly may be reelected from time to time, none of the executive State officers is eligible for reelection. Judicial authority is vested in a system of courts, consisting of the supreme court, circuit courts, chancery and probate courts, and justices of the peace. Local government is administered by the counties, municipalities, and townships. In order to be eligible to vote, the citizen must have resided within the State two years, in the county one year, and in the precinct three months, and must be able to read and write in the English language.

**EDUCATION.** Educationally, Alabama is making rapid strides of advancement, both in its system of common schools and its numerous institutions of higher learning. There are four normal schools, located, respectively, at Marion, Tuskegee, Huntsville, and Florence, and normal instruction is given in several other institutions. Tuscaloosa is the seat of the University of Alabama; Mobile, of the State Medical College; Auburn, of the Agricultural and Mechanical College; and Greensboro, of the Southern University. Tuskegee is the seat of the Industrial Institute (colored), which is under the administration of Booker T. Washington. There is an insane asylum at Tuscaloosa, a blind asylum at Mobile, and an institution for the deaf, dumb, and blind at Talladega. The State has made ample provision for other classes demanding State care. It has many excellent public and private libraries, and numerous pri-



vate commercial and denominational institutions of learning. All the leading religious denominations are well represented by growing societies, though the Baptist denomination is the most numerously represented. The educational forces as a whole are represented in about fifty high schools, seventy private secondary schools, nine colleges and universities, and many scientific and educational associations.

**INHABITANTS.** A large proportion of the population is rural, and only about ten per cent. of the people reside in cities of 4,000 population and over. Montgomery, on the Alabama River, is the capital, and ranks as one of the largest cities in the State. Mobile is the only seaport and is important for its large export trade in lumber, coal, and cotton. Birmingham is noted for the extensive manufacture of iron and steel products. Other cities include Anniston, Bessemer, Florence, Huntsville, Opelika, Selma, Talladega, and Tuscaloosa. In 1900 the State had a population of 1,828,697. This included a Negro population of 827,307. Population, 1910, 2,138,093.

**HISTORY.** The history of Alabama begins with 1541, when De Soto made his famous exploring expedition to the Mississippi. In 1702 the first permanent settlement was established by the French on the Mobile River, and in 1712 the city of Mobile was founded. The region occupied by the State was originally a part of the Territory of Georgia, though the southern portion was the subject of dispute with Spain. Georgia ceded all its western lands to the Federal government in 1802, and what is now Alabama became a part of the Territory of Mississippi. Alabama was organized as a Territory in 1817, and so named from an Indian word meaning "Here we rest." It was admitted as a State in December, 1819, and since then has enjoyed rapid growth and development. In 1861 it seceded from the Union, but the act of secession was revoked in 1865, and a new constitution was adopted in 1868. The constitution adopted in 1901 requires a higher standard for voting, hence the right of suffrage is restricted largely to the white citizens.

**ALABAMA,** an important river of the State of Alabama, formed by the junction of the Tallapoosa and Coosa rivers, about ten miles above the city of Montgomery. It then flows about 300 miles toward the southeast until uniting with the Tombigbee forty-five miles above Mobile, where it assumes the name of Mobile. These rivers drain the northern part of the states of Mississippi, Georgia, and Alabama, and flow into Mobile Bay, an inlet from the Gulf of Mexico.

**ALABAMA, The,** a British vessel built at Birkenhead, England, by Laird & Sons, and used as a privateer to promote the interest of the Confederate States. She was provided with stores, coal, and guns at Terceira, one of the Azores, and on Aug. 24, 1862, was placed under command of Raphael Semmes, a native of Maryland, and manned chiefly by British subjects. Though she had no acknowledged flag or recognized nationality, she roamed the seas plundering and destroying vessels belonging to the Federal States and Union merchantmen. For more than two years she sailed upon the seas, captured 65 vessels, and destroyed property valued at \$4,000,000. Her policy was to avoid contact with American armed vessels, but in the summer of 1864 she finally encountered the Kearsarge off Cherbourg, France. On June 19 an encounter took place outside the harbor of Cherbourg, about seven miles from the Cherbourg breakwater, and after a fight of an hour the Alabama was sunk. Three men on board the Kearsarge were wounded, while the Alabama had nine men killed and twenty-one wounded. Captain Semmes was taken on board by an English yacht, the Deerhound, and escaped.

**ALABAMA, University of,** an institution of higher learning organized at Tuscaloosa, Ala., in 1831. At the time of the Civil War it was in a prosperous condition, but was burned by a force of Federals. It was rebuilt in 1868. It is coeducational, has 50 professors and instructors, and is attended by about 500 students. The endowment fund is \$300,000, which is about equal to the value of the buildings, and the annual income is \$42,000. The medical department is located at Mobile. A library of 25,000 volumes and a good working laboratory are maintained.

**ALABAMA CLAIMS,** the name applied to the claims of the United States government against Great Britain, which were settled after extended negotiations at Geneva, Switzerland, and are sometimes termed the Geneva Award. These claims were made on account of damage done by certain vessels, particularly the Alabama, which were equipped and manned from British ports at the time of the Civil War. A decision was reached by the commissioners on Sept. 14, 1871, to the effect that Great Britain was liable for equipping the Alabama and the Florida, two vessels that wrought serious devastation to the property of the United States and to property of certain citizens. The purport of the decision was that the general principles governing such cases are as follows: "Due diligence should be exercised by neutral govern-



ments in exact proportion to the risks to which either one of the belligerents may be exposed by failure to fulfill the obligations of neutrality on their part. The government of Great Britain cannot justify itself for its failure in due diligence on the plea of the insufficiency of legal means of action which it possessed." In making the decision the commission did not allow any claims by the United States for national losses, and the award was entirely restricted to compensate the American citizens for damages sustained by them. The award amounted to the sum of \$15,500,000 in gold. Sir Alexander Cockburn, one of the British representatives on the commission, was the only commissioner to cast a dissenting vote.

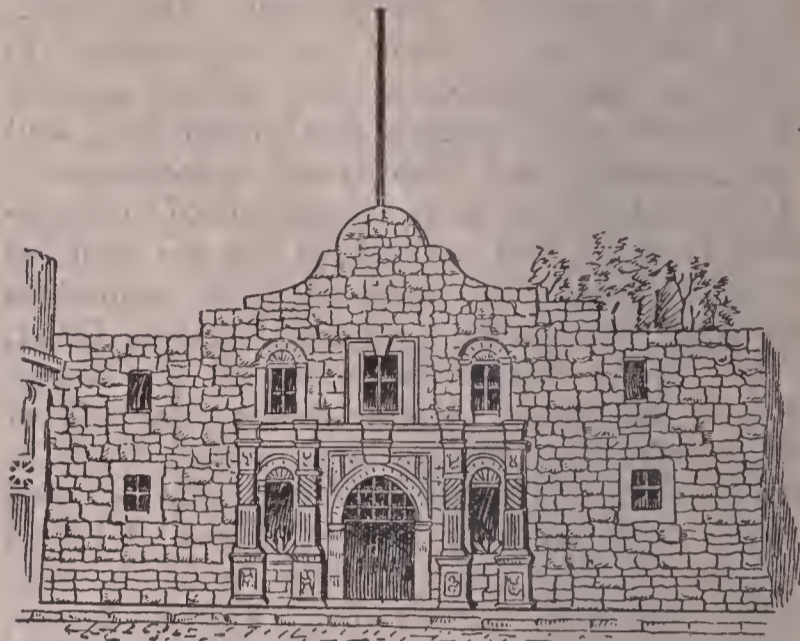
**ALABASTER** (äl-ä-bäs'tēr), the name applied to a very fine variety of gypsum, or hydrated sulphate of lime. The harder variety is used in the manufacture of statuettes, clock frames, and other ornamental commodities, while the softer serves in the manufacture of an inferior cement, known in the markets as plaster of Paris. Deposits of white granular gypsum are found in various portions of the United States, which occurs in pure and sound blocks, and from which the merchantable article is manufactured. However, the largest quarries are in Tuscany, Italy, where a fine grade is obtained. There are also deposits in Egypt and various regions of Asia.

**ALADDIN** (ä-läd'in), the hero of a tale of the "Arabian Nights' Entertainments." He is represented as the possessor of a remarkable ring and lamp, which, on being rubbed, would cause two genii to appear, whose office it was to do the bidding of the possessor of the ring and lamp.

**ALAMEDA** (ä-lä-mä'dä), a city of California, in Alameda county, about eight miles east of San Francisco, on the Southern Pacific railroad. It has extensive electric railway and steamboat facilities, and enjoys a considerable commercial trade. The chief industries embrace shipbuilding, refining of petroleum, and manufactures of machinery, earthenware, clothing, and utensils. Gas and electric lights, pavements, and sanitary sewerage are among the improvements. The city has excellent public schools and a number of substantial church buildings. It was incorporated in 1854. Population, 1900, 16,464; in 1910, 23,383.

**ALAMO** (ä'lä-mo), a fort near San Antonio, Texas, and frequently mentioned as the "Thermopylae of America." It is noted on account of the heroic bravery with which about 150 Texans resisted an attack of 2,500 Mexicans under Gen. Santa Anna from Feb. 11 to March

5, 1836. In the engagement 1,600 Mexicans and all but six of the Texans were killed. However, the latter were cruelly butchered after they had surrendered to the Mexicans. "Re-



THE ALAMO.

member the Alamo" became a popular war cry in the struggle for the independence of Texas from Mexico.

**ALAND** (ö'län), an archipelago of about 300 islands at the entrance of the Gulf of Bothnia and forming a possession of Russia. About eighty of these islands are inhabited, the balance being rocky and uninhabitable. Formerly they belonged to Sweden, and near them a decisive victory was won by Peter the Great over the Swedes in 1717. They were ceded to Russia in 1809. The population, consisting mostly of fishermen of Swedish descent, aggregates about 19,150. The islands have a total area of 468 square miles.

**ALASKA** (ä-läs'ka), a Territory of the United States, forming the northwest portion of North America, and comprising an area of 590,884 square miles. It is about twelve times as large as New York, and comprises a scope of country greater than the combined areas of France, Germany, Bulgaria, and the British Isles. The northern boundary is formed by the Arctic Ocean, eastern by the Dominion of Canada, southern by the Pacific Ocean, and western by the Bering Sea and Strait. About one-third lies within the Arctic Circle. From north to south it has a width of 800 miles, and from southeast to northwest the distance across the mainland is 1,150 miles.

**PHYSICAL FEATURES.** The territory is very mountainous, though it includes much level and gently undulating surface. Chains of the Rocky Mountains and the Alaskan Mountains, a coast range, embrace the chief elevated sections. Mount McKinley, 20,464 feet in alti-

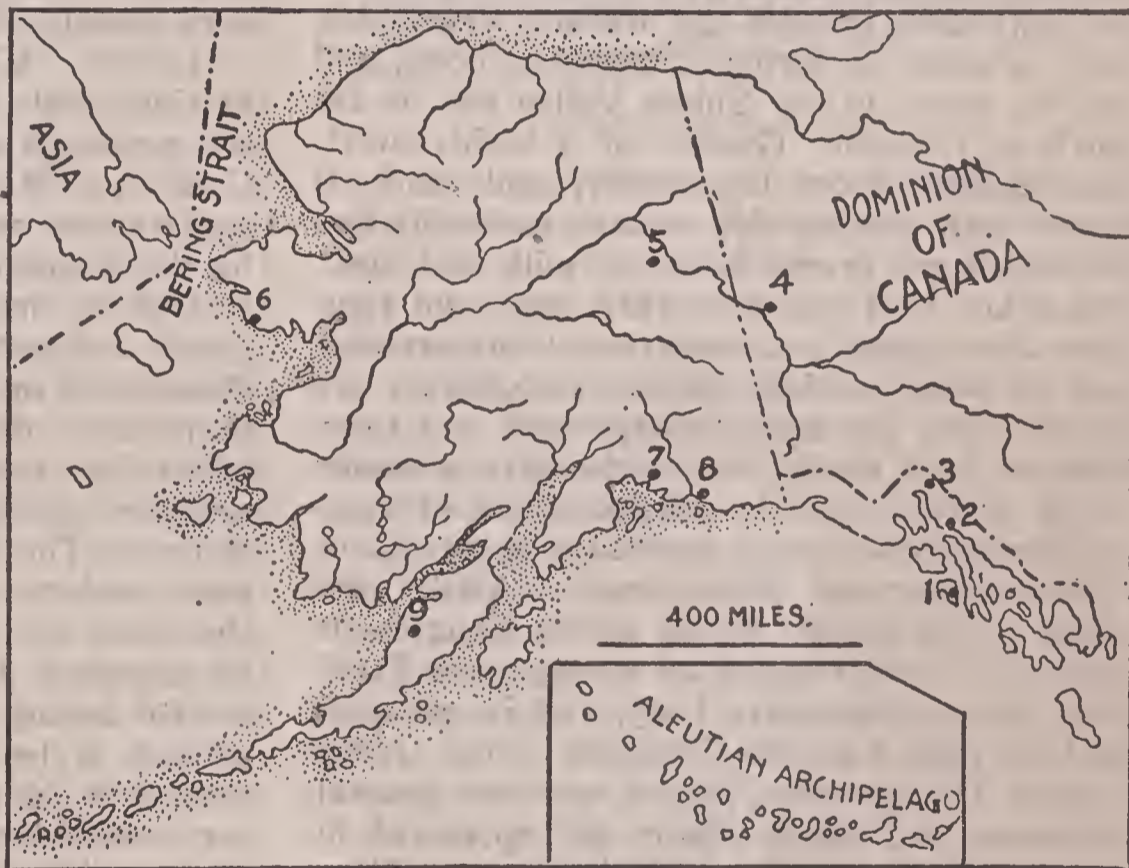


tude, 100 miles north of Cook's Inlet, is the highest peak in North America. Its climate is extremely cold, almost unfit for habitation, and large portions are covered by snow, while the earth in the northern part is frozen the entire year. The Yukon River, which has been explored by steamer for 1,400 miles, is the most important water course, and has an estimated length of 2,000 miles. Besides the Yukon, the principal rivers include the Copper, Kuskokwim, Colville and Tanana, the last mentioned being an important tributary of the Yukon. The coast line of Alaska is placed at 7,875 miles, and is more or less indented by extensive inlets, particularly on the southern and western shores. Among the chief inlets are Kotzebue, Norton, Bristol, Cook, and Yakutat sounds or bays. Numerous glaciers discharge into the Pacific and Bering Sea, among them Muir Glacier, which is estimated the largest in the world. The discharges into the sea average a thickness of about 500 feet, and the river of ice has a length of 150 miles and a breadth varying from one to ten miles.

**MINERAL RESOURCES.** Lignite coal deposits occur on the Yukon, near Cape Lisbourne, at the head of Prince William Sound, and on the Aleutian Islands. The quality is not of a high grade, but it is used to a considerable extent for domestic purposes and for steam-making. Copper in paying quantities is found on Prince of Wales Island and in the Copper River country, and there are deposits of petroleum, silver ore, sulphur, and building stones. Gold is the chief source of wealth in Alaska, and is secured chiefly in the Yukon district, where valuable deposits were discovered in 1897. The following year large companies of people from the United States and other countries visited Alaska in the interest of the mining industry. The richest gold-producing region is situated at Dawson in the Klondike region, just east of the eastern line of Alaska, in British America, but rich discoveries have since been made farther west and at Cape Nome. While Cape Nome may be reached by water navigation, it has been quite difficult to make trips to the Klondike region. Expeditions to the latter region are usually made by way of Sitka and Skagway, and

thence through the mountain region toward the north, but it is possible to pass up the Yukon. The yield of gold in Alaska is placed at from \$7,000,000 to \$12,000,000 annually, the output varying greatly with climatic conditions.

**TRANSPORTATION.** The transportation facilities of Alaska depend largely upon navigation, and numerous excellent harbors are accessible the entire year as far north as Juneau and Sitka. River traffic on the Yukon is closed a greater part of the year, which is the case with many of the coast inlets, as they become filled with pack-ice in the winter, such as Cook's Inlet. Public stages and dog sledges are used in carrying passengers and the mails in some sections. A railway line extends from Skagway to Whitehorse Rapids, and several other railway routes have been projected, and work is being done to push them inland. The Alaskan Central railway, when completed, will furnish



ALASKA.

1, Sitka; 2, Juneau; 3, Skagway; 4, Dawson; 5, Circle City; 6, Nome; 7, Sunrise City; 8, Chitka; 9, Igagik.

transportation from Skagway to Nome, the line running through the Copper River valley to Tanana, thence to its terminus on the sea. An improved highway passes from Port Valdez to the Copper River. A telegraph cable extends from Saint Michaels to Nome, and telegraph lines are in operation between Saint Michaels, Nulato, and Eagle City.

**FISHERIES.** Edible fish abound in the rivers and coast waters. However, salmon fishing is the most important, and in value the output closely approaches the production of gold. The chief salmon fisheries are off the shore of



Kodiak Island, Kuskokwim Bay, and near the mouth of the Yukon River. An abundance of herring, cod, smelt, whitefish, and halibut are known to exist, though the fisheries have not been developed to their full productive ability. Formerly the fur-seal was abundant on most islands in Bering Sea and on both coasts of Bering Strait, but these fisheries are now restricted to the Pribilof or Seal Islands. Whaling continues to attract attention, especially the white whale and the great Arctic whale, and considerable fossil elephant ivory is collected by the Eskimos.

**AGRICULTURE.** In the coast district the soil is especially fertile, but the possibility of development in agriculture is limited by climatic conditions. Rye and barley can be grown quite successfully south of a line drawn from Eagle City to Saint Michaels, and there has been considerable development some distance south in the cultivation of oats and wheat. Vegetables, such as potatoes, turnips, rutabagas, beets, and carrots, thrive in the Yukon Valley and as far north as Dawson. Grasses of a highly nutritious quality grow luxuriantly, and stock is reared with considerable success, especially cattle, which are grown both for milk and meat. Foxes are bred for their furs, dogs and reindeer are reared and used for transportation, and in some sections ponies and horses are grown. The fur trade is important, and those engaged in it during the winter give attention in the short summer to the production of vegetables and other crops necessary as provision.

**EDUCATION AND GOVERNMENT.** Alaska was made a civil district by an act of Congress in 1900, but it still remains an unorganized Territory, has no legislative body, and is governed by laws passed by the Congress of the United States. The governor, judges, surveyor general, attorneys, and other officers are appointed by the President of the United States. Three judicial districts have been organized with courts at Juneau, Eagle City, and Saint Michaels. The bureau of education of the United States supports a system of public schools in the Territory, and the incorporated towns may appropriate for educational purposes one-half of the money collected from license fees. A number of industrial schools are maintained, and several mission schools are promoted under the direction of Protestant and Roman and Greek Catholic supervision. The first college in Alaska was established as a coeducational institution in Skagway in 1899 with an attendance of 50 students.

**INHABITANTS.** Three races of native inhabitants are found in Alaska. The Alutes occupy

the Aleutian Islands, the Eskimos are chiefly in the country north of the Yukon, and the Athabaskan Indians are the principal inhabitants of the valley of the Yukon and the region as far south and west as Cook's Inlet. A race nearly extinct, the Thlinkets, formerly occupied the section lying between Yakutat Bay and Puget Sound. Sitka, on Baranof Island, is the oldest town and was the capital of the Territory until 1906, when the seat of government was removed to Juneau, a thriving city of 3,000 people at the entrance of Taku Inlet. Eagle City, on the Yukon, and Skagway, the seaport of the White Pass Railway, are commercial centers. Nome, on Norton Sound, had a population of 12,486 in 1900, and its estimated population in 1908 was 25,500. Other towns include Circle City, Sunrise City, Chilka, and Igagik. In 1916 the Territory had a population of 64,356, as compared with 63,592 in 1900. With the latter were included 3,116 Chinese and 29,536 Indians.

**HISTORY.** Vitus Bering, a Danish navigator, in 1740, while in the Russian service, explored the peninsula and islands of Alaska. Captain Cook in 1778 visited the coast of Alaska, and explorations were made about the same time by the Spaniards and a company of Russians. In 1784 the first settlement was made on Kodiak Island and named Three Saints. The Russian-American Fur Company was chartered in 1799 to promote the furring trade but after futile efforts to establish a profitable business its members became dissatisfied and gave up the project. The Western Union Telegraph Company explored certain sections in 1864-67 with the view of connecting America with Europe by telegraph at Bering Strait, though the successful laying of the Atlantic Cable caused the project to be abandoned. The United States purchased Alaska of Russia in 1867 at a monetary consideration of \$7,200,000, and in the same year a military force at Sitka took formal possession.

Two international controversies, one relating to the control of the sea fisheries and the other to the boundary between Canada and Alaska, were made the subjects of negotiation between Great Britain and United States. In regard to the former the United States claimed that Russia and the United States had exclusive control of Bering Sea, but when this was referred to a commission it was decided that the claim was not well founded, but the commission recommended the restriction of the killing of seals in order to save the industry. The controversy as to the boundary was settled in October, 1903, when a commission of three representatives of the United States



and three of Great Britain decided that the boundary should follow the coast and be fixed ten marine leagues inland from the coast of the mainland. The decision divided the gold fields about equally between the two countries, but the United States secured exclusive control of the Pacific Coast.

**ALATAU** (ä-lä-tou'), a range of lofty mountains in Asia, forming the boundary between Mongolia and Turkestan. The Alatau mountain range is located at the northern limit of the vast tableland of Central Asia. The formations are largely granitic and the elevations approximate 15,000 feet.

**ALBA LONGA** (äl'ba löngä), a city of Latium, in Italy, situated near Lake Alban, about 16 miles southeast of Rome. According to tradition, it was founded by Ascanius, son of Aeneas. Tullus Hostilius, third king of Rome, destroyed it, and its inhabitants removed to Rome. At the time of its prosperity it was the most powerful city of Latium.

**ALBANIA** (äl-bä'ně-ä), the name applied to an extensive region in the southwestern part of Turkey in Europe, lying along the coast of the Adriatic and Ionian seas and the Strait of Otranto. It is about 300 miles long, and has a width ranging from fifty to eighty-five miles. The area is about 21,500 square miles. Though this region has been under Turkish dominion since the 15th century, it still retains some degree of independence. The surface is largely mountainous, embracing ancient Epirus, Illyris Graeca, and parts of Dalmatia. Most of the inhabitants consist of Albanian mountaineers, but there are also a considerable number of Turks and Greeks. Agriculture, fruit-growing, stock raising, manufacturing, and commerce are the chief industries, though there are also productive fisheries and some mining. A majority of the people are Mohammedans, but a considerable number of them belong to the Greek and Roman Catholic churches. The Albanians have made numerous efforts to throw off Turkish dominion, including the revolt under Ali Pasha in 1807 and the insurrection of 1908. Population, 1,500,000.

**ALBANY** (äl'bä-nÿ), a city of New York, county seat of Albany county, and capital of the State. It is finely situated on the Hudson River, 145 miles north of New York City, and is the focus of a large number of railroads, including the New York Central, the West Shore, and the Delaware and Hudson lines. It has additional transportation facilities by steamboats on the Hudson River, by numerous electric interurban lines, and by the Erie Canal, the latter connecting the city with Lake Erie. Near the

river is a narrow plain, but the ground rises gradually toward the west, hence the location is both convenient and healthful. State Street runs westward from the river, forming a fine thoroughfare, and the principal streets running parallel to the river are North and South Pearl



STATE CAPITOL, ALBANY.

and Broadway streets. The city has 150 miles of street more or less improved, and about 90 miles are paved substantially with stone, asphalt, and macadam. Washington Park, in the western part of the city, is the largest public resort. It contains a fine lake and Calverley's bronze statue of Robert Burns. Rural Cemetery, about four miles north of the city, is the burial place of President Arthur.

The architecture of Albany is substantial, and the buildings are constructed chiefly of brick and stone. The capitol building, constructed of granite in the Renaissance style, is one of the finest and most costly structures of its kind in America. It is 390 feet long by 290 feet wide, situated on an elevated plat of ground in the heart of the city, and was erected at a cost of \$23,500,000. Other notable buildings include the city hall, the customhouse, the Cathedral of the Immaculate Conception, the Albany Academy, the Union Station, the First Dutch Reformed Church, the post office, the Masonic Temple, and the State armory. Albany has a well-organized system of public schools and many charitable and educational institutions. It is the seat of a State normal school, of Dudley Observatory, and of the law and medical departments of Union University at Schenectady. The State library of 435,000 volumes is located in the capitol building, and several school institutional libraries are maintained within the city.

Albany is important as a manufacturing center and has a large trade in cereals, mer-



chandise, and live stock. The leading manufactures include ironware, clothing, tobacco and cigars, boots and shoes, machinery, spirituous liquors, books and stationery, and farming implements. It maintains adequate police and fire departments, has extensive systems of waterworks and gas and electric lighting, and has modern means of conducting its sewage and storm drainage. As a wholesaling and jobbing center it takes high rank, having a large trade with points in the New England states and Canada.

The city is the second oldest permanent settlement founded within the thirteen colonies. Verrazano, the French navigator, visited the region as early as 1524, and a trading post was planted soon after on the present site of Albany by the French. In 1614 it was known as Fort Nassau, but the name was changed to Fort Orange in 1624, when the first real settlement of colonists was made. When New Netherlands was transferred to the English, in 1664, the name was changed to Albany in honor of the Duke of York and Albany, who afterward became James II. The Albany Convention was held here in 1754, at which plans for uniting the colonies were discussed, and it became the seat of the State government in 1797. Its rapid growth began in 1825, when the Erie Canal was opened, and its larger commercial and manufacturing period began with the construction of railroads. Population, 1905, 98,370; in 1910, 100,253.

**ALBANY**, a city of Oregon, county seat of Linn County, 60 miles southwest of Portland. It is located on the Willamette River, which supplies good water power, and has transportation facilities by the Southern Pacific and other railroads. The river is crossed by a fine steel bridge. It has manufactures of furniture and farm machinery, flouring mills, brickyards, and a public high school. Electric lights and waterworks are among the public utilities. The first settlement on the town site was made in 1850, and it was incorporated in 1864. Population, 1900, 3,149.

**ALBANY**, or **Albion**, an ancient name for Scotland and sometimes applied to the whole of Britain, but later used to designate only the Scottish highlands. It is thought to be of Celtic origin. In 1398 a Scottish council at Scone conferred the title of Duke of Albany upon the brother of King Robert III. Subsequently the title was conferred upon a number of princes of the British royal family, though it soon became extinct. In 1881 it was restored and conferred upon Prince Leopold (1853-84), the youngest son of Queen Victoria.

**ALBATROSS** (ăl'ba-trōs), an aquatic bird allied to the petrels and gulls. It is the largest of the web-footed birds, weighing about twenty pounds, and its wings measuring from tip to



ALBATROSS.

tip twelve to seventeen feet. The beak is large and unusually straight and strong, and the upper mandible is characterized by sutures and a hooked point. These birds are frequently seen a great distance from land. They are most numerous in the South Seas, particularly near the Cape of Good Hope, but frequent the Arctic region as far as the extreme northern part of Bering Strait. A single albatross is often seen in the act of following ships several days in succession, though, more commonly, several fly within sight of each other, and appear to glide through the air rather than fly like other birds. When food is abundant, they gorge themselves like the vultures and then sit motionless on the water. The eggs are about four inches long, and are favored as articles of food. Natives of the Kurile Islands and Kamchatka blow up the entrails to make floats for their fish nets, and their wing bones are used for tobacco pipes and various domestic purposes. Sailors regard the albatross with superstitious affection, a fact made use of in Coleridge's "Rime of the Ancient Mariner."

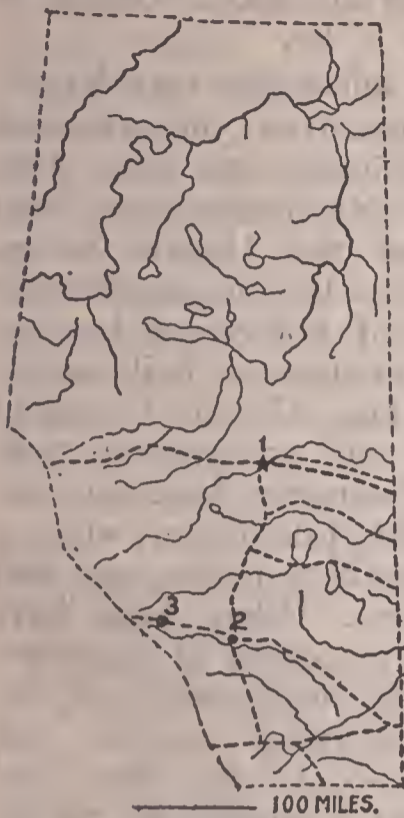
**ALBAY** (ăl-bī'), the name of a bay, volcano, city, and province in the southwestern part of Luzon, an island of the Philippines. The bay is a fine landing place, and the surrounding mountains make it an important strategic point. Albay, the mountain, is an active volcano. The city of Albay is regularly platted, carries a considerable trade, and has a population of 14,360. The province has a population of 296,850.

**ALBEMARLE SOUND** (ăl'be-măr1), an inlet from the Atlantic Ocean, extending into the eastern part of North Carolina. Its length is sixty miles, the breadth is from four to fifteen miles, and it has a number of small coastal indentations. The Roanoke and the Chowan rivers flow into it, and it is connected by an artificial channel with Chesapeake Bay. An island separates it from the ocean.

**ALBERTA** (ăl-běrt'ă), a province of the



Dominion of Canada, bounded on the north by Mackenzie, east by Saskatchewan, south by the



ALBERTA.

1, Edmonton; 2, Calgary; 3, Banff.

Chief railways are shown by dotted lines.

United States, and west by British Columbia. Its length from north to south is 720 miles, the southern boundary is 175 miles, and the northern boundary, which reaches the parallel of  $60^\circ$ , is 220 miles in length. Its area is 254,559 square miles, being somewhat larger than Saskatchewan. The water surface is about 20,000 square miles.

**SURFACE.** The surface is mainly a great plain, with open prairie in the southern portion, extensive forests in the northern section, and elevated ranges of the Rocky Mountains in the western part. The drainage of the southern part is toward the southeast, and the streams of the northern portion flow into Great Slave Lake, from which the water flows through the Mackenzie River into the Arctic Ocean. In elevation above sea level the surface varies considerably, Fort Smith, on the northern border, being the lowest elevation, 680 feet above the sea, while the prairie steppe at the eastern side of the province is nearly 3,000 feet, and the highest peaks of the Rocky Mountains approximate 14,000 feet. The highest range of the Rocky Mountains in this section trends northwest and southeast, forming the southwestern boundary between Alberta and British Columbia. In the northern part are the Buffalo Head Hills, the Clear Hills, and the Cariboo Mountains, whose summits rise from 600 to 1,000 feet higher than the surrounding plain.

**RIVERS AND LAKES.** Alberta has four distinct drainage basins, one in the northern and three in the southern section. The Mackenzie basin is in the northern part and occupies two-thirds of the province. The most important streams of this system are the Peace and Athabaska Rivers, which merge and form the Slave River near the western end of Lake Athabaska, though the last mentioned is really the Mackenzie, being known as the Slave River between Lake Athabaska and Great Slave Lake and as the Mackenzie from Great Slave Lake to the

ocean. Both the Peace and Athabaska rivers are navigable, the former from the mountains to the lake, except below Fort Vermilion, where navigation is obstructed by Vermilion Falls. The Athabaska River rises in the mountains within Alberta, and is important as a highway for the trade carried between points in Alberta and the posts along the Slave and Mackenzie rivers. In the southeastern part the drainage is by the Saskatchewan River and its tributaries. The North Saskatchewan is important for navigation, and carries considerable trade from Edmonton to the country lying toward the east. Besides the Saskatchewan basin, the southern part of Alberta has sections lying in the basins of the Churchill and Missouri rivers. Lake Athabaska, partly in Alberta and partly in Saskatchewan, is the largest and most important body of water. Other lakes of considerable extent are Hay Lake, Lake Claire, Lesser Slave Lake, Whitefish Lake, Lac la Biche, Beaver Lake, and Sullivan Lake.

**CLIMATE.** The winters are dry and cold and the summers are warm. The average temperature at Fort Chipewyan, on Lake Athabaska, in July, is about  $61^\circ$ , and a temperature of  $90^\circ$  has been recorded at that place. Though extremely cold in the winter, a dry atmosphere makes the severity less oppressive, and in the southern part the warm Chinook winds sweep across the country from the mountains and influence the temperature favorably. In the northern part rainfall is abundant for the germination and growth of all crops adapted to the country, but in the southern part it is more or less deficient and agriculture is extended by means of irrigation, water being drawn from numerous mountain streams and rivers.

**INDUSTRIES.** Agriculture, stock raising, mining, lumbering, and commerce are the chief industries. Wheat is a staple product, especially in the section lying east of Calgary and between the Bow River and the Red Deer River, where irrigation canals designed to supply water to irrigate fully three million acres have been constructed. The beet sugar industry has received marked attention, especially in the vicinity of Raymond, near the international border. Stock raising is one of the chief business enterprises, large areas being devoted to ranching and dairying. Progress in lumbering has been slow on account of a lack of transportation facilities, but the improvement of several rivers as highways and extensive building of railroads are causing a great impetus in developing immense wealth from timber resources. Coal deposits are extensive below the



parallel of 56°, the veins in the southern section being bituminous, but in the mountains occur anthracite deposits of considerable extent. Salt and petroleum exist in the valley of the Athabaska River, and gold is worked east of Edmonton, on the Saskatchewan River. Oats, barley, flax, vegetables, and small fruits are profitable crops and considerable attention is given to the rearing of sheep, swine, horses, and poultry. Wild animals, such as antelope, geese, grouse, and partridges, are common. Deer and moose are met with in the northern section. The streams and lakes abound with edible fish.

**GOVERNMENT.** The chief executive power is vested in a Lieutenant Governor, appointed for five years by the Governor General of the Dominion. Four members constitute the executive council, each of which is at the head of a department, known as minister of education and provincial treasurer, attorney general, minister of public works, and minister of agriculture and provincial secretary. The legislative assembly has 25 members, chosen by popular vote. Support is given to public education through land grants and by taxation, and ample provision has been made for the training of teachers and improvement of facilities to promote collegiate and higher instruction. The towns and counties have charge of local administration, and common pleas and higher courts have jurisdiction of judicial affairs.

**EDUCATION.** Notwithstanding the recent establishment of the Province of Alberta, its educational facilities are remarkably well developed. The organization of elementary public schools follows close upon the advance of settlement, and such schools are maintained by a revenue derived from a moderate self-imposed tax and supplemented by very liberal legislative grants. The programme of studies for these schools is so formulated as to give the pupils whose education ends therein an equipment for life as practical and complete as possible. Secondary schools, where students may prepare for the professions or obtain a liberal general education, exist as an outgrowth of the elementary school system and are similarly maintained. The higher courses of these schools permit of specializing to a moderate degree. The regulations provide for uniformity in the system of inspection of schools and licensing of teachers. A number of private colleges of considerable importance have been established in the larger centers. The Provincial Normal School for the training of teachers is located at Calgary. The building is a magnificent one and is equipped in every department with modern appliances. The University

of Alberta, situated in Strathcona, received its first classes in the autumn of 1908. The courses already provided are those leading to the degrees of B. A. or B. Sc.

**INHABITANTS.** The inhabitants are largely Canadians who have come from the provinces farther east in the Dominion, but since 1905 there has been considerable immigration from European countries and the United States. Encouragement was given by the government through the enactment of homestead laws in the Dominion, and by extensive building of railroads. The trunk line of the Canadian Pacific passes through the southern section, with branches from Dunmore Junction and Macleod to Calgary and Edmonton, while a line of the Canadian Northern passes east and west through Edmonton. Other lines have been projected and are in course of construction. Edmonton, on the north bank of the Saskatchewan, is the provincial capital, and Calgary, at the confluence of the Bow and Elbow Rivers, is noted as a commercial center. In 1906 the former had a population of 11,163 and the latter 11,967, but since then both have grown materially in population and commerce. Strathcona, on the south bank of the Saskatchewan, has 3,500, and Medicine Hat, on the South Saskatchewan River, is an important business center. The census of 1906 credited Alberta with a population of 184,000. In 1908 the inhabitants were estimated at 275,000.

**HISTORY.** The territory now included in Alberta was long a part of the portion of the Dominion known as the Northwest Territories. In 1882 the district of Alberta was established for administrative purposes. Then autonomy in local affairs was not granted and the area was 106,400 square miles. The province of Alberta was organized in 1905, when the boundaries were extended by annexing to it parts of the districts of Athabaska, Saskatchewan, and Assiniboia. George Hedley Vicars Bulyea was appointed the first lieutenant governor, who, assisted by efficient deputy heads and executive councilors, rendered efficient services as administrator of public affairs.

**ALBERT EDWARD NYANZA** (-nĭ-än'-zä), an important lake of Africa, about fifty miles southwest of Lake Albert Nyanza, with which it is connected by the Semliki River. It was first discovered by Baker in 1862, and was visited by Stanley in 1876, who also visited the region while on his famous expedition to relieve Emin Pasha. Lake Albert Edward Nyanza is somewhat smaller than Lake Albert Nyanza, and its elevation above sea level is somewhat greater. Stanley named it in honor of the



Prince of Wales, now Edward VII. In its vicinity are excellent forests, and it abounds in fish, crocodiles, hippopotami, and many aquatic birds.

**ALBERT LEA** (lē), a city of Minnesota, county seat of Freeborn county, 108 miles south of Minneapolis. It is located on a small lake of the same name, and on the Minneapolis and Saint Louis, the Chicago, Milwaukee and Saint Paul, and other railroads. The surrounding country is a fertile farming and dairying region. It has manufactures of flour, machinery, lumber products, and earthenware. The city has several fine county buildings, excellent schools, and good municipal improvements. It is the seat of Albert Lea College, a Presbyterian institution for women. Population, 1905, 5,657.

**ALBERT MEMORIAL**, a monument erected in Hyde Park, London, to the memory of Prince Albert, husband of Queen Victoria. It was built from plans of George Gilbert Scott, who was knighted for his skill in designing the memorial. Four marble sculptures representing engineering, commerce, manufacture, and agriculture are at the four corners of the base, and in the center is a splendid statue of the prince. A Gothic spire, surmounted by a cross, crowns the canopy above the hall in the interior, which is elegantly ornamented with mosaics and has a height of 175 feet.

**ALBERT NYANZA** (nī-ān'zà), a lake in East Central Africa, one of the headwaters of the Nile. It is 22 miles wide and 100 miles long. Sir Samuel Baker first explored the lake in 1864, and estimated its surface 2,720 feet above sea level. It receives the White Nile from Victoria Nyanza, and its overflow is carried toward the north into the Mediterranean Sea. It is noted for its excellent fisheries. Extensive forests abound in the surrounding country, and its vicinity is infested with crocodiles and hippopotami.

**ALBIGENSES** (äl-bī-jěn'sēz), a religious sect organized in the 12th century, and which was formerly well represented in France. It differed in doctrine and practice from the Roman Catholic Church, by which it was severely persecuted, and was somewhat similar in origin and doctrine to the Paterins of Italy, the Catharists of Germany, and the Bulgarians of France, but was not identical with any one of them. This sect seems to have originated from the Paulicians, a branch of the Greek Catholic Church, which sprang into existence in the 6th century. In 1209 a severe war broke out between them and their allies on one side and the Catholics on the other. After many

thousands had perished on both sides, a peace was concluded in 1229. By the end of the 13th century this sect had totally disappeared.

**ALBINO** (äl-bī'nō), the name applied to a person whose skin and hair are perfectly white, a remarkable peculiarity of the physical constitution of some individuals. While albinism occurs in all parts of the world and in all races, it is most marked in Indians and Negroes. The skin has a pale, unhealthy white color, and the iris of the eye is pink or red. While the vision of albinos is better in the dark than that of others, they are unable to bear a strong light. The peculiarity of albinism is always born with the individual. It is not confined to the human race, but has been observed in rabbits, rats, mice, fishes, and birds, especially in those whose color is commonly black.

**ALBION** (äl'bī-ŭn), a city of Michigan, in Calhoun County, 20 miles west of Jackson. It has municipal waterworks and a public library, and is important as a railroad center, being on the Michigan Central and the Lake Shore and Michigan Southern railroads. Albion College is located here. Flouring mills, plowworks, and machine shops are its chief manufactories. The first settlement at Albion was made in 1830, and its charter dates from 1896. Population, 1910, 5,833.

**ALBION**, a town in New York, county seat of Orleans County, 30 miles west of Rochester. It has transportation facilities by the Erie Canal and the New York Central and Hudson River Railroad. Farming and quarrying are leading industries in the vicinity. It has several public institutions, including the Western House of Refuge for Women and a modern county courthouse. Population, 1900, 4,447; 1910, 5,016.

**ALBUMEN** (äl-bū'měn), an organic compound found both in animals and plants. It abounds in the blood and chyle, and more or less in all the serous fluids of the animal body. It is the principal ingredient in the white of eggs. Albumen occurs in the sap of vegetables, in their seeds, and in other parts of vegetable growth. Among the chief constituents are nitrogen, oxygen, carbon, hydrogen, and small proportions of phosphorus and sulphur. It is soluble in water, in which state it is found in the juices of flesh, serum of the blood, juices of vegetables, and in the egg, but when heated to a temperature of 140° to 160° it coagulates and becomes insoluble in water. When put in tannic acid, ether, creosote, and alcohol, it also coagulates. Since it contains more nutritious matter and is more easily digested than any other food, it constitutes one of the most important of food materials. The meat of young animals is more tender than that



of older ones, because in it are found larger quantities of this substance. Some forms of albumen are used to clear liquids, such as coffee and sorghum, because when boiled it collects impurities and rises as scum to the surface or sinks to the bottom, this depending upon the weight of the liquid containing it. With the knowledge of the amount of albumen contained in the different kinds of food, and the effect of heat upon it when mixed with other substances, the skillful cook can turn the art of cookery into channels both pleasing and healthful.

**ALBUQUERQUE** (ä-böö-kâr'kâ), a city of New Mexico, county seat of Bernalillo county, 72 miles southwest of Santa Fé, on the Atlantic and Pacific and the Atchison, Topeka and Santa Fé railways. It is finely situated on the Rio Grande, has a considerable local and jobbing trade, and contains a number of fine school and church buildings. Among its chief buildings is the University of New Mexico, founded in 1892, at which time an annual territorial appropriation of \$14,000 was granted. The university is non-sectarian and is open alike for the education of both sexes. The surrounding country is farming and stock raising. Electric lights, telephones, and waterworks are among the municipal improvements. The first settlement in its vicinity was made by Spaniards in 1706. Population, 1900, 6,238.

**ALBURNUM** (äl-bûr'nüm), or sapwood, the part of the wood of exogenous trees which is of most recent growth and near to the bark. In color it is pale or white. It gradually hardens with age, when it is converted into duramen, or heartwood, which is harder and more valuable than alburnum.

**ALCHEMY** (äl'kě-mÿ), the ancient name for the science of chemistry, and which in former times was much studied. Modern sciences may be said to date from three discoveries — that of Copernicus, whose effect was to expel the astrologers from the society of the astronomers; the discovery of the weight of the atmosphere by Torricelli and Pascal, which laid the foundation of physics; and the discovery of oxygen by Lavoisier, which destroyed the theory of Stahl, the last alchemist who can be excused for not being a chemist. The objects of former alchemists included the discovery of a universal solvent; the acquirement of ability to transmute all metals into gold or silver, especially the former; and to obtain an elixir or universal medicine which might cure all diseases and indefinitely prolong human life. In this they were open to ridicule rather than the object they aimed at. All these objects were

essentially laudable, and it could not be known whether or not they were attainable without vast experiments covering prolonged periods of time. To achieve success in the study of alchemy it was thought necessary for one to obtain first the *philosopher's stone*, which was described as a red powder with a peculiar smell, and was thought to possess the essential property necessary to turn to gold everything with which it came in contact. Though the alchemists failed in their immediate object, they discovered muriatic, nitric, and sulphuric acids, and laid the foundation for the whole science of modern chemistry. A skillful alchemist was called an *adept*. Alchemy flourished in the Middle Ages, but later sank gradually in repute, and ultimately became the object of ridicule to real scientific inquirers and the civilized world at large. However, it is to be noted that when the science of chemistry was fully established there were still many researches for the *philosopher's stone*, by which gold might be produced successfully. Jean Baptiste Dumas (1800-84), the eminent French chemist, thought the necessary solution might be found in the doctrine of molecular isomerism, while Sir Humphry Davy, the celebrated English chemist, refused to give an opinion contrary to its possibility. The much-discussed problem of producing gold as a manufactured product is still receiving attention from some of the leading scientists.

**ALCOHOL** (äl'kô-höl), the name applied to a series of substances formed of the same elements, alike in essential properties, but varying in composition. Wood alcohol is the simplest form, known in the markets by the name of methyl, and is obtained by distilling wood. While it has nearly the same properties as common alcohol, it has an unpleasant taste and gives off an offensive odor. It is used in manufactures and in the arts as a substitute for common alcohol largely on account of its cheapness. Amyl alcohol, or fusel oil, is made in considerable quantities by the fermentation of potatoes. It has a nauseous fermentation and odor, and is far more poisonous than common alcohol. After standing for some years, amyl alcohol is converted into the ordinary alcohol. Ethyl alcohol is the common alcohol made from beer, wine, and other beverages.

Fermentation of sugar or of saccharine matter is the only source of alcohol. Some plants contain free sugar, and others are rich in starch that can be converted into sugar. The vegetable substances best adapted for the manufacture of alcohol are those that contain the greatest abundance of sugar or starch. It cannot be



produced in a pure state by a single distillation, owing to its attraction for water and its tendency to mix freely with it. Common spirits, such as brandy, whisky, and others, contain from forty to sixty per cent. of alcohol; in other words, they are about half water and half alcohol. The milder beverages, such as beer, cider, and the light wines, contain from four to fifteen per cent. of alcohol. Distilled liquors are made by a process called distillation. The process requires an apparatus in which the substance to be distilled is heated. The alcohol rises and passes into a coiled tube, called the worm, which is located in a vessel called the worm-tub. The worm-tub is kept full of cold water, by means of which the alcohol passing through the worms is cooled and condensed and flows out of the end of the worm-pipe into a tank. Some watery vapor or steam always passes with the alcohol, hence distilled liquors usually contain from ten to sixty per cent. of water, but this can be largely extracted by a second or third distillation, or by mixing with the alcohol fused chloride of calcium, quicklime, or fused carbonate of potash. If the whole be allowed to stand for twelve hours and then distilled a second time, the resulting alcohol is quite free from water.

Alcohol is employed largely by some schools of medicine, while others discourage its use and claim it possesses no valuable medicinal properties for which some other preparation may not be successfully substituted. It is quite probable that there are conditions under which a limited and careful use of alcohol may be applied for preventive and curative medicinal purposes, though it is very injurious to the young or immature of either sex. Its effect is more marked in females than in males, and in the weak than in the strong. In hot climates it is a prolific source of disease, and scarcely possesses a compensative advantage. The Russian authorities do not permit a man who has indulged recently in the use of liquors to undertake a long march in the cold season. Livingstone found in his exploration tour of Africa that those addicted to the continual use of alcohol are most easily overcome by sustained exertion or excessive heat, while in the celebrated tour of Greely to the North Polar Sea it was proven that users of intoxicants more easily succumbed than nonusers. It is certain that alcohol is not a necessity nor beneficial in cold regions, and the majority of those addicted to it would be more vigorous if they did not use it in any form. Its present employment by mankind is more powerful for evil than good. While this is true, it is certain that

alcohol is one of the most valuable products in the culinary arts, in manufactures, and for preservative purposes. According to a report issued in 1900, the four countries consuming the largest quantities of alcoholic beverages per capita rank in the following order: Belgium, England, France and Germany.

**ALCYONARIA** (ăl-sī-ō-nā'rī-à), a group of invertebrate animals, mostly marine, in which the stomach and other cavities are united. They comprise a group of coral polyps, and are characterized by having eight tentacles around the mouth. Some writers extend the group to embrace sponges.

**ALDER** (ăl'dēr), a group of trees and shrubs native to the temperate and colder regions, and usually found in wet places. The wood has the property of remaining in an undecayed state for a long time while under water, hence it is used extensively in building sluices, pumps, millwork, and bridges. Tanners find the young roots of value, while the bark is used in the manufacture of bitters, astringents, and medicine useful in treating ague. The young twigs yield dyes of value in coloring different shades of red and yellow.

**ALDERNEY** (ăl'dēr-nī), or **Augrigny**, an island in the English Channel, eight miles from Cape la Hague, France, and about 60 miles from the nearest point in England. The area is three square miles. It is located about 15 miles from Guernsey, another of the Channel Islands. The climate is healthful and mild. The inhabitants are mostly of French extraction and are noted for rearing the Alderney cows, a small breed celebrated for their rich milk. Population, 1901, 2,062.

**ALDERSHOT** (ăl'dēr-shōt), a town in England, in Hampshire, 14 miles east of Basingstoke. Near it is the famous Aldershot military grounds, a permanent camp of the British army, at which splendid maneuvers are conducted in the spring and summer. The town is important as a railroad junction. It has a public library, a number of churches, and several benevolent institutions. Population, 1901, 31,120.

**ALDINE EDITIONS**, the title of various works published at Venice, Italy, by Aldus Manutius and his family. This family flourished in 1490-1597, and its members became famous as scholars because of the correctness and beauty of their publications. The editions include works of Latin, Greek, and Italian writers, all of tasteful manufacture, and many were counterfeited by printers in France and Italy. The establishment produced 908 works and remained the property of the family more



than a century. "The Hours of the Blessed Virgin" is one of the finest productions.

**ALE** (āl), a fermented beverage now extensively manufactured, and said to have been made originally in Egypt. It is brewed like beer, and differs from it chiefly in having a smaller proportion of hops. The value of ale depends largely upon the proportion of sugar that is converted into alcohol, which process takes place in part after the liquor has been drawn off into a barrel, hence age greatly increases its strength. See **Beer**.

**ALEMANNI** (äl-ê-män'e), the name applied to a large union of German tribes on the Upper Rhine, with whom the Romans first came in collision in the reign of Caracalla. Dion Cassius was the first to mention them in history, and he describes a victory over them in the year 213 A. D. by Emperor Caracalla. Being powerful and persistent enemies to the Romans and Gauls, they were attacked and defeated by nine Roman emperors at different times, but were never wholly conquered. Their later history is included with that of Germany. The Swabian and Swiss dialects of the German language have been traced more or less distinctly to these people, and the former is known generally as the Alemannic.

**ALENÇON** (â-län-sôn'), a city in France, capital of the department of Orne, situated near the junction of the Sarthe and Birante rivers. It is well built, has a public library, and is the seat of a church built in the Gothic style, dating from the 16th century. Alençon is noted for the manufacture of artificial flowers, embroidered fabrics, and a point lace known as point d'Alençon. In the vicinity are granite quarries from which fine rock crystal called Alençon diamond is obtained. Population, 1901, 17,280.

**ALEPPO** (â-lëp'po), a city of Syria, situated near the northwest extremity of the Syrian Desert. It is a place of great antiquity, and occupies the site of ancient Beroea. After the destruction of Palmyra, it became the great metropolis of trade between the Mediterranean and the nations of the East. The Saracen invaders conquered it in 638 and again in 1260, and in 1401 it was plundered by the Tartars. In 1517 it came into possession of the Turks, under whose dominion it has since remained. At the beginning of the 19th century its population numbered over 200,000, but at present it does not exceed 125,000, of whom 25,000 are Christians and 5,000 Jews. It has a large export trade in cotton, wool, oil, cereals, and live stock. The prevailing language spoken is Arabian.

**ALESSANDRIA** (ä-lës-sän'drê-ä), a fortress in northern Italy, capital of a province of

the same name, situated near the junction of the Tanaro and Bormida rivers. It is strongly fortified, the citadel being one of the most important in Europe. It has manufactures of silk and linen textiles, woolen goods, porcelain, and machinery. The surrounding country is rich in fruit and flowers. Marengo, the site of a battle in which Napoleon defeated the army of Austria, is not far from Alessandria. The city was founded in 1168. Population, 1901, 71,293.

**ALEUTIAN** (ä-lū'shan), the name of an American archipelago, including about 150 islands, of which about eighty are of considerable size. They are situated west of Alaska, separating Bering Sea from the Pacific Ocean, extending nearly 1,000 miles from east to west, and embracing an area of 6,391 square miles. The islands are of volcanic origin, and contain a number of volcanoes still active. The climate is cold, but somewhat modified by oceanic influences, and the entire group belongs to the United States. Hunting and fishing are the chief occupations, and there is a considerable trade in fish and fur. The natives are known as Aleuts and belong to the Eskimo stock. Most of the inhabitants have embraced Christianity as a result of active work of missionaries of the Greek Church. The Aleutian Islands were discovered in 1741 by Vitus Bering (1680-1741), and were subsequently acquired and occupied by Russia together with Alaska. They came into possession of the United States by the Alaskan purchase in 1867. Population about 8,275. See **Alaska**.

**ALEXANDRIA**, an important city of Egypt, on the Mediterranean Sea, 112 miles northwest of Cairo, and seven miles west of the Canopic mouth of the Nile. The city was founded by Alexander the Great after the destruction of Tyre, in 332 B. C., and at one time had a population of fully a million people, possessed great wealth, and was cultured by learning and civilization. It became celebrated for its lighthouse, situated on the island of Pharos, reckoned among the seven wonders of the world, and the island itself was connected with the mainland by a dike, through which vessels could pass by means of movable bridges. Much of its early success was due to Greek scholars, who fostered learning and aided in founding its great library. After the death of Alexander the Great, it became the residence of the Ptolemies and was next to Rome and Antioch the most magnificent city of antiquity. At this time it rose to prominence as the seat of Grecian learning and literature, which not only augmented its material prosperity, but spread its



influence over the greater part of the ancient world. The Romans came into possession of it about 30 B. C., from which period dates the decline of the city, largely because its wealth and treasures were carried to Rome, and many of



PHAROS LIGHTHOUSE, ALEXANDRIA.

its institutions were laid waste and pillaged. Besides, the rise of Constantinople, its powerful rival, aided in the declining tendency. The city wasted away so rapidly that in the 4th century A. D. the only building of any importance remaining was the Temple of Serapis. In the 7th century it was sacked by the Arabs, and in the 9th century was conquered by the Turks. It had a population of only about 6,000 in 1778, but soon after the conquest of Egypt by the French it began to regain importance.

The modern development of Egypt has again placed Alexandria with the foremost commercial cities on the Mediterranean. Among the causes affecting its modern growth may be named the discovery of America, the passage of commerce from India by the way of the Cape of Good Hope, and the construction of the Suez Canal. The former two had a more or less depressing effect by diverting its trade with India, but the building of the Suez Canal more than compensated by giving to the prosperity of Egypt a decided impetus. The present city is not situated on the exact site occupied by ancient Alexandria, but is built mostly on the island of Pharos and the mole connecting it with the land opposite. Though the mole was originally an artificial dike, it has been broadened by alluvial deposits into a considerable stretch of land, and occupies a position between the two harbors. Formerly two obelisks, known

as Cleopatra's needles, sculptured in the time of King Thothmes III., in the 16th century B.C., adorned the city, but these have been transported, one to the United States and the other to England. The city has exports valued at \$17,500,000, and imports aggregating about one-half that amount. It is the focus of many railways, and has rapid transit, electric lights, and other modern facilities. Among the leading exports are cotton, sugar, rice, grain, and fruits. The manufactures are chiefly clothing, utensils, jewelry, chemicals, toys, and articles of food. Its inhabitants are greatly diversified, including Turks, Greeks, Arabs, Persians, and many European tradesmen. Population, 325,575.

**ALEXANDRIA** (ăl-ĕgz-ăn'drĭ-à), a city of Indiana, in Madison County, 48 miles northeast of Indianapolis, on the Lake Erie and Western and the Big Four railways. It is surrounded by a fertile farming country and has a growing trade in produce and merchandise. The manufactures include glass, clothing, ironware, and machinery. Waterworks, sewerage, electric lighting, and pavements are among the public utilities. The first settlement in its vicinity was made in 1834. Population, 1900, 7,221.

**ALEXANDRIA**, a city in Louisiana, capital of Rapides parish, on the Red River, about 195 miles northwest of New Orleans. It is on the Southern Pacific, the Iron Mountain and Southern, the Texas Pacific, and other railroads. Having excellent steamboat and railway facilities, it exports large quantities of fruits, cotton, rice, and sugar. There are a number of fine parish and school buildings, numerous churches, and many municipal conveniences. Among the manufactures are tobacco products, machinery, and utensils. Alexandria was settled in 1820 and incorporated in 1840. Population, 1900, 5,648.

**ALEXANDRIA**, a city of Virginia, county seat of Alexandria county, on the Potomac River, seven miles south of Washington, D. C. It has transportation facilities by steamboat lines and by the Baltimore and Ohio, the Pennsylvania, the Southern, and the Chesapeake and Ohio railways. The streets are regularly platted, and improved by gas and electric lights, pavements, waterworks, and an extensive system of street railways. There are manufactures of machinery, tobacco products, earthenware, clothing, and farming implements. The city has excellent public schools and numerous churches, and carries on a considerable interior and foreign trade. General Braddock made it his headquarters in 1755, and the citizens contributed to the British in 1814 in order to save them-



selves from an attack by a fleet. Federal troops occupied the city during the Civil War. Population, 1900, 14,528.

**ALEXANDRIAN LIBRARY**, the most remarkable and largest collection of books of antiquity, founded by Ptolemy Soter in Alexandria, Egypt, and greatly enlarged by succeeding Ptolemaic rulers. It embraced the collected literature of Egypt, India, Greece, and Rome, and at the time of its first manager, Demetrius Phalereus, contained 50,000 volumes, but was subsequently enlarged to 700,000. A part of the library was situated in a museum in the portion of the city called Bruchium, near the royal palace of the Ptolemies, and the other part was in the temple of Jupiter Serapis. The former portion was destroyed in the siege of Alexandria by Julius Caesar, but was largely replaced by Mark Antony and presented by him to Queen Cleopatra. The portion of the library situated in the temple of Jupiter Serapis was destroyed in the time of Theodosius the Great, and the collection of Mark Antony was burned in 640, when the city was conquered by the Arabs. Some writers contend that this portion of the library was destroyed by fanatical Christians in 391, who were led by Archbishop Theophilus. See **Libraries**.

**ALEXANDRIAN SCHOOL**, a term used to designate the age or time, after the decline of Greece, when Alexandria, Egypt, became the seat of science and literature. It is usually divided into two periods, the first embracing the reign of the Ptolemies, from 323 to 30 B. C., and the second from 30 B. C. to 640 A. D., including the Roman supremacy and ending with the conquest by the Arabs. To the founder of the Alexandrian Library, Ptolemy Soter, is also ascribed the introduction of science and literature. The grammarians and poets of this period included Egyptians, Greeks, and Jews, and later also Romans. Their chief aim was to collect and preserve for future generations writings then existing, and to add to these the literature of subsequent years. The language of Alexandrian writers was remarkable for correctness, purity, and elegance of expression. Though distinguished for fine rhetoric, their productions lacked the spirit that animated Greek poetry. In a school where imitation and rule were substituted for inspiration, each generation became more artificial and lifeless than preceding masters. However, the school was long distinguished for culture in mathematics, astronomy, and physical sciences. It was here that Euclid in the 3d century B. C. wrote his great work on geometry, and Archimedes, Eratosthenes, and Philadelphus declared well-established mathe-

matical and scientific principles. For four centuries the Alexandrian School was the chief seat of learning and science of the world, and from its origin to its fall includes a period of 1,000 years.

**ALEXANDRIAN VERSION**, or **Alexandrian Codex**, an important manuscript written on parchment with uncial letters, now in the British Museum. It constitutes a transcript of the Old and New Testaments in the Greek language, but there are some omissions from the New Testament. The Old Testament is written in the translation known as the Septuagint, and, in connection with it, are epistles of Clemens Romanus. The manuscript is thought to date from the 6th century.

**ALFALFA** (äl-fäl'fä), or **Lucerne**, a deep-rooting clover-like perennial plant. It is cultivated extensively for forage in America and



Hop Lucerne.

ALFALFA.

Sand Lucerne.

in the European countries bordering on the Mediterranean Sea. Owing to rooting deep into the ground, it is the best known plant for dry localities, and is profitably cultivated in such regions. It yields from ten to thirty tons of fodder per acre, and has the advantage of being both nourishing and healthful as a food for stock. The stem is upright and branching, the leaves are purple colored, and the flowers grow in clusters. It has been cultivated in Europe as a forage plant more than 2,000 years and is grown extensively in the arid regions of Nebraska, Kansas, Texas, Colorado, and other states.

**ALGAE** (äl'jē), the general name applied to numerous plants that grow in water, both fresh and salt, comprising seaweeds and other species. In size they range from forms too small to be seen by the naked eye to the giant kelp common to the west coast of America, which attains a length of from 800 to 1,500 feet. They are devoid of true roots, and usually adhere to the bottom of the water or to rocks, and frequently are seen afloat on the surface.



In structure they are of cellular tissue, as the common carrageen, which, when bleached, is the Irish moss of commerce. This plant and many others are edible. Some species are used in the manufacture of iodine, kelp, and bromine, and many are of value as manure. Masses of gulfweed many miles in extent are met by navigators, such as the Sargasso Sea. Most species common to salt water are brown or red, and the fresh-water plants are greenish in color.

**ALGEBRA** (ăl'jê-brà), a branch of pure mathematics, which, like arithmetic, treats of numbers. This department of mathematics enables one to generalize by the aid of symbols, and therefore to abbreviate the method of solving propositions relating to numbers. It is a valuable medium in the solution of intricate problems, and by means of it results can be obtained that by arithmetic are impossible. Comte defines algebra as the calculus of function, to distinguish it from arithmetic, which he defines as the calculus of values, but this definition places some algebra in common arithmetic and some arithmetic in school algebra. However, in practice, this condition now exists in many common schools, since authors of texts in arithmetic have introduced more or less extensive applications of algebra with each division of arithmetic.

The symbols used in algebra are of three kinds, those of quantity, those of operation, and those employed as abbreviations for ordinary words. Symbols of quantity may be *known* or *unknown*, and consist of letters of the alphabet and of ordinary numbers, as  $2a+3b$  by  $2a-3b$ , meaning that the former quantity is to be multiplied by the latter. Numerals or the first letters of the alphabet are generally employed to represent known quantities, as  $a, b, c$ ; and the last letters of the alphabet to represent unknown quantities, as  $x, y, z$ . The symbols of operation are  $+, -, \times, \div, =$ , etc., and the symbols used as abbreviations are  $\sqrt{\quad}$ , denoting square root;  $\sqrt[3]{\quad}$ , cube root,  $<$ , greater than, etc. The divisions of algebra are addition, subtraction, multiplication, division, involution, evolution, and equations, though some authors of text-books and many institutions of learning make the last mentioned a distinct branch of study.

An equation is the statement of the equality of two algebraic expressions, the expression to the left of the sign of equality being the first member and the one to the right of the sign being the second member. Equations are designated by degree: one of the first degree is called a simple equation; of the second, quadratic; of the third, cubic; of the fourth, quartic or

biquadratic, etc. It has long been possible to solve general equations of the second, the third, and the fourth degree, but whether an equation of the fifth degree can be solved was in dispute for many centuries. This question was finally settled by Niels Henrik Abel (1802-29), an eminent Norwegian mathematician, who demonstrated the impossibility of solving general equations of any degree higher than the fourth. However, it is possible to construct special equations of the fifth or of a higher degree which admit of being solved, but such problems belong to the highest branch of algebra. Diophantus of Alexandria, Egypt, is thought to have originated this science in the 4th century, when that city was the seat of culture and learning. Europeans first learned of algebra from the Arabs, who derived it from the Hindus. The work from which Europeans drew largely was that of Mohammed Ben Musa, who lived in the 9th century. Leonardo Bonaccio, an Italian merchant, while traveling in the East, about 1200, acquired a knowledge of algebra, and on his return introduced it among his countrymen. Later it was introduced into all European countries, and its signs and symbols were greatly enlarged. It began to be taught with much enthusiasm in the early period of the revival of learning. It was first applied in a case of one cubic equation in 1505, later to two cubic equations, and still later to biquadratic equations. Descartes applied algebra to geometry, and was the first to represent the nature of curves by means of equation. Other eminent scholars applied algebraic methods to the sciences, including formal logic, economics, and psychology.

**ALGECIRAS** (ăl-jê-sê'ràs), a city of Spain, in the province of Cadiz, six miles west of Gibraltar. It is important as a seaport, has a well-protected harbor, and carries on a profitable trade. The Moors seized it in 711, and it remained in their possession until 1344, when it was besieged and captured by Alfonso XI. It was the seat of the Algeciras Conference in 1906, which considered the rival claims of Germany and France in Morocco. Population, 1900, 13,131.

**ALGERIA** (ăl-gê'rî-à), a colony of France in North Africa, bounded on the north by the Mediterranean Sea, east by Tunis and Tripoli, south by the Sahara Desert, and west by Morocco. The length from east to west is about 550 miles and it extends inland about 375 miles. It has an area of about 343,500 square miles, but the area exclusive of the Sahara region is 184,474 square miles.

**DESCRIPTION.** Algeria comprises a portion of



the plateau of North Africa, which rises from the sea in three terraces, but along the Mediterranean is an extensive and fertile coast plain. The Atlas Mountains traverse the entire northern part from east to west in two chains, known as the Great Atlas and the Middle or Maritime Atlas. These chains are more or less parallel to the coast, the former bordering on the Sahara and the latter trending between it and the sea. The Great Atlas includes some of the highest summits of Algeria, as Mount Shelia, which is 7,600 feet above sea level. Deep and tortuous defiles furrow the mountains in many places. The portion of the Sahara lying within Algeria is a rocky plateau with an elevation of about 1,500 feet. All of the streams are small and unimportant. They are confined almost exclusively to the coastal plain of the north, since the region included in the Algerian Sahara is arid. The Sheliff, which flows into the Mediterranean near Mostaganem, is the largest river. Numerous small lakes abound in the highland, some of which are saline and have deposits of salt on the bottom during the dry season.

The climate is moderate and healthful, but it varies largely with differences in elevation and local peculiarities, being generally arid toward the south and moderately humid in the northern part. The most productive and best watered section of the country is along the sea, extending inland about fifty miles, and most of the European settlements are within this belt. This section has a moderate temperature, but the summers as a whole are hot and dry. A large number of fertile oases are located in the desert on the south slope of the highlands. They are covered with vegetation and are well watered, but the greater part of the desert is devoid of vegetation and unfit for occupation.

**PRODUCTIONS.** Many minerals abound in the highlands, but mining has not been developed to any great extent. The more extensive deposits are those of iron, copper, zinc, lead, and quicksilver. Building stone, especially granite, is found in large quantities. Extensive deposits of salt occur in the southern part. Agriculture and stock raising are the leading industries, and these enterprises are largely in the hands of natives, while commerce is monopolized by Europeans, mostly Frenchmen. Wheat is the leading cereal, but comparatively large interests are vested in growing barley, oats, potatoes, alfalfa, and grapes. Other products include coffee, tobacco, onions, and fruits. A fine grade of horses are reared for draft purposes. Other domestic animals include cattle, sheep, camels, and poultry.

Algeria has large interests in timber and is an exporter of lumber and lumber products. As a wine-producing country it takes high rank, and it has manufactures of pottery, cotton and woolen textiles, clothing, utensils, and esparto goods. The foreign trade is chiefly with France, Great Britain, Spain, Italy, and Germany. The leading exports include cereals, wine, minerals, cork, alfalfa, and live stock. Among the imports are clothing, furniture, textiles, and machinery. Railroad building has received marked attention under grants made by France, and the lines in operation in 1908 included a total of 2,250 miles. Tramway lines have been constructed in the larger cities and in some of the mining districts, and a system of national highway has been inaugurated.

**GOVERNMENT.** The administration is vested in a governor general, who is responsible to the national assembly of France. He is assisted by a ministry, although a part of the territory is governed under military rule. For the purpose of government the country is divided into three provinces, called departments. These include Algiers, Constantine, and Oran. Each department has its own council, and these councils send delegates to the superior council, which meets annually at Algiers. Judicial authority is exercised by justices of the peace, commercial courts, courts of first instance, and a court of appeal located at Algiers. As a whole the country is organized and governed under the system of French laws, both in civil and criminal affairs. The state gives support to education and religion, but the instruction in elementary schools may be either in French or Arabic. Several institutions of higher learning and a number of commercial and technical schools are maintained under encouragement by the government.

**INHABITANTS.** Although Algeria has been a dependency of France since 1830, only about 350,000 of the inhabitants are French, and the total foreign population is given at 765,500. The two chief classes are Arabs and Berbers, the former being largely nomadic and engaging extensively in pastoral occupations. Formerly the region was occupied wholly by Berbers, who are generally termed Kabyles, and there are parts of the country which are still occupied almost exclusively by these people. The Berbers have a language peculiar to themselves, but they have been influenced more or less by the Arabs and Jews and use the Arabic characters in writing. Mohammedanism is the prevailing religion, but Judaism is well represented and many of the natives profess Christianity. A small element of the inhabitants consist of



Negroes and Turks. Algiers, the capital of Algeria and of the department of Algiers, is the largest city. Other cities include Oran, Constantine, Bona, Mustapha, Tlemcen, and Gardaja. Population, 1906, 5,231,850.

**HISTORY.** The region occupied by Algeria was known to the Romans as Numidia, but anciently it included Tunis. The Vandals conquered it in 1830 A. D., but it was occupied by an army of the Byzantine Empire in 1833, and became a possession of the Saracens in the 7th century. When the Jews and Moors were driven from Spain by Ferninand and Isabella at the close of the 15th century, large numbers of them located in Algeria, where they developed the arts and industries of the Europeans. Spain undertook a war against Algeria at the beginning of the 16th century, and by 1510 made much of the country tributary. The Turkish pirate, Horush Barbarossa, made himself Sultan of Algeria in 1516, but he was captured soon after and beheaded by the Spaniards. In the 16th century the country became a part of the Turkish domain, but the Turks did not establish complete supremacy over all the tribes, and in 1830 it became a colonial possession of France. At the time of the Franco-German War, in 1870-71, an uprising took place to throw off the dominion of France. Subsequently other attempts were made to secure independence, but in the main the country has been prosperous and peaceable. French occupancy has greatly facilitated commerce and manufactures, extended internal improvements, and stimulated a development of the natural resources.

**ALGIERS** (äl-jēr'z'), a seaport city on the Mediterranean, capital of Algeria, on the west shore of the Bay of Algiers. It occupies a fine site on the slope of a hill fronting the sea, the mountains back of it giving a beautiful background effect. The city consists of two parts, the old and the new divisions. In the former the streets are platted irregularly, giving an Oriental appearance, while the latter was planned and built by the French and is both modern and beautiful. Four aqueducts supply water, and the newer part of the city is lighted with gas and electricity. The old part is built in the Moorish style, and the architecture is plain from the outside, but the interiors are beautifully decorated in the Moorish art. Formerly the city had about one hundred mosques, but they have been partly displaced by synagogues and Christian churches. Among the educational institutions are schools of science, law, and medicine, and many secondary schools are maintained by the French and the Mussulmans.

The harbor is well fortified and spacious, furnishing landings for a large number of vessels. Considerable export trade is carried on with France and other European countries, and it is the most important coaling station on the Mediterranean. Tourists visit Algiers in large numbers during the winter, owing to its pleasant and healthful climate. Population, 1906, 138,240.

**ALGOA BAY** (äl-gō'a), an inlet on the southeastern coast of Africa, in Cape Colony, about 425 miles east of the Cape of Good Hope. The Sunday and Baasher rivers discharge into it, and it affords excellent anchorage for vessels. On the west coast is Port Elizabeth, near Cape Recife, which is the seat of a considerable export and import trade.

**ALGONKIAN** (äl-gön'ki-an), a division of geologic time, preceded by the Archaean and succeeded by the Cambrian. Traces of this period are most distinct in the vicinity of Lake Superior, both in the United States and Canada, and its name was derived from the Algonquin Indians who originally inhabited that region. The rocks are sedimentary and metamorphic, and consist chiefly of marble, schist, gneiss, quartz, granite, and conglomerates. Few fossils occur and those found are indistinct. In some regions volcanic rocks are imbedded in shale and limestone, while in other sections rich deposits of copper and iron are abundant, the former particularly in Upper Michigan and the latter in Northern Minnesota. The Hudson Bay country, Ontario, New England, and the Black Hills have large areas of the Algonkian system.

**ALGONQUINS** (äl-gön'kwinz), a family of North American Indians, the most prominent of three aboriginal races found in the great basin of the Saint Lawrence. They include the Mohegans, Pequots, and Narragansetts of New England; the Delawares, Powhatans, and Shawnees; and many tribes living in the vicinity of the Great Lakes. During the Colonial period they were friendly to the French and fought against the English, especially in the French and Indian wars, but later they became greatly scattered. At present about 81,200 of these Indians are living, the larger part of which are in Canada, notably in the provinces of Quebec and Ontario. The tribe known as Algonquins has dwindled down to about 1,200, and about two-thirds of these are in Canada.

**ALHAMBRA** (äl-häm'brä), a noted palace in Spain, situated about a mile from the city of Granada, to which it forms a citadel or acropolis. It was formerly the residence of the Moorish kings. It was founded and commenced



by Ibnu-l-ahmar, and completed about 1348. There are two oblong courts; the smaller one, known as the Court of the Lions, contains a fountain ornamented with twelve lions in marble, and is 66x115 feet; the other, called the Court of the Blessings, is 74x138 feet. The Alhambra is surrounded by gardens, in which are beautiful waterfalls, exquisite fountains, and decorative vines. Within are gorgeous colorings, whispering galleries, and geometrical designs interwoven with passages from the Koran. An Arab poet likened the Alhambra to "a pearl set around with emeralds," while it was once described as "the gem of Arabian art in Spain, its most beautiful and most perfect example." Washington Irving's "Alhambra" is the best known description written of this place in the English language.

**ALIAS** (ā'lī-ās), a term used in law to designate a name assumed by a person who wishes to conceal the name by which he passes or is known. An alias is usually assumed for purposes of deception, though this is not always the case, as it is quite proper under certain conditions to employ an alias, such as pseudonyms adopted by writers, stage names used by actors, and descriptions employed by detectives, all of which are properly comprehended under the term. The name is frequently used in law to describe a writ given after one of the same kind has been issued for an identical purpose.

**ALICANTE** (ä-lê-kän'tâ), a city of Spain, in the province of Alicante, located on the Mediterranean. Many of the buildings are of stone, and the streets are well improved and regularly platted. It is well fortified and ranks next to Cadiz and Barcelona as a seaport in Spain. The manufactures include tobacco, clothing, and machinery, and the city has a large trade in grain and fruit. It is the seat of two nunneries, a collegiate church, and several consulates. The Romans named it Lucentum. Population, 1900, 50,495.

**ALIEN** (äl'yen), a term used to designate a person born outside of the jurisdiction of the country in which he resides and who has not acquired the full rights of citizenship. In Great Britain the alien may become a citizen under the Naturalization Act of 1870. On the other hand, in the United States, the status of an alien is determined under the provisions of the National Constitution, or under the Constitution of the State in which such alien may reside. An alien, even after naturalization, is restricted in a number of respects, as, for instance, he is not eligible to a seat in Congress until after seven years after naturalization, and

may not hold the office of President or Vice President.

**ALIEN AND SEDITION LAWS** (sê-dī'-shŭn), the name applied to certain enactments of Congress passed in 1798, while John Adams was President. They raised the number of years necessary for naturalization from five to fourteen; provided for the arrest of subjects of any foreign power with which the United States should be at war; provided for the punishment of any person maliciously slandering the government or any of its officers, and gave the President power to banish or arrest any aliens he might deem dangerous. These laws proved a political blunder and were never enforced to any extent. They aided largely in the downfall of the Federal party.

**ALIMENTARY CANAL** (äl-ī-mën'tä-rŷ), the name of that portion of the digestive apparatus through which food passes after mastication. It includes the pharynx, aesophagus, stomach, and small and large intestines. These organs are lined with a mucous membrane, which possesses the function of absorbing certain substances and rejecting waste matter, and is modified in each region according to the function of the part. The length of the alimentary canal is five to six times the height of the individual, usually about thirty feet in the adult, measured from the base of the skull to the extreme end of the large intestines.

**ALIZARIN** (ä-liz'ä-rĭn), a coloring matter, derived from the root of the madder. This plant is cultivated in Southern Europe for its coloring principles, but alizarin is now derived largely from anthracene, a hydrocarbon contained in the refuse of coal tar. From it the Turkish red dyes are obtained.

**ALKALI** (äl'kä-lī), a term of Arabic origin, alki being the name of the plant from which an alkaline substance was first derived. The name is now applied to a class of substances that have similar properties, the most conspicuous being solubility in water, power of corroding vegetable and animal substances, ability to neutralize acids and with them to form salts, and the property of changing the tint of various coloring matter. Properly, there are four alkalies—soda, lithia, potash, and ammonia. The first three are oxides of metals; the last is called the volatile alkali, being in the form of gas, and compounded of nitrogen, oxygen, and hydrogen. Potash is called the vegetable alkali, being largely found in the ashes of plants, and soda is termed the mineral alkali, owing to its predominating in minerals. Alkalies have a soapy taste, form soap with fats, and act on the skin. They turn most



vegetables green, turmeric brown, and reddened litmus blue. When united with an acid, the peculiar qualities of each are destroyed or neutralized, as is exemplified when mixing soda with sour milk; the former an alkali, and the latter an acid. The term *alkali* as employed in commerce usually implies caustic soda or potash, and both are used in the arts for the manufacture of glass, soap, and many other products. Caustic potash is used in surgery for cauterizing.

**ALKALOID** (ă'l'kă-loid), a compound of vegetable origin, usually complex in composition, and found in living plants. All the alkaloids contain nitrogen and certain properties in common with ammonia, especially the power to form salts when combined with acids. Their properties, which are extracted from the plants by treating with dilute acids, are poisonous and medicinal. The list of alkaloids embraces quinine, cocaine, morphine, caffeine, strychnine, aconitine, narcotine, codeine, coniine, nicotine, theobromine, etc. Artificial alkaloids are derived from coal tar products.

**ALLAH** (ă'l'là), the Arabian name of God, whose attributes are thus summed up by the Koran: "There is no God but God. This only true, great, and most high God has his being through himself; is everlasting; is not begotten and begetteth not; is all-sufficient in himself; fills the universe with his infinity; is the center in which all things unite, as well the hidden as the manifest; is Lord of the world of bodies and spirits, creator and ruler, almighty, all-wise, all-loving, merciful; and his decrees are unchangeable." Allah Akbar, meaning God is great, is a popular war cry among the Mohammedans.

**ALLAHABAD** (ăl-lă-hă-băd'), an important city of India, capital of the Northwest Provinces, at the junction of the Ganges and Jumna rivers. It is strongly fortified, has extensive railroad facilities, and is regarded the holiest of all places by the Hindus. Those people make it one of their chief resorts, and thousands make pilgrimages to bathe at the junction of the two rivers. The Mohammedans also hold it sacred, and to them it is known as the "City of Allah." There are a number of fine government buildings, numerous mosques, temples, and educational institutions, and it is the seat of a famous annual industrial exposition. The manufactures include clothing, carpets, textiles, leather, pottery, and machinery. It was founded in the 3d century B. C., and has long ranked as an important trade and manufacturing center. Population, 177,210.

**ALLEGHANY** (ăl-le-gă'nî), a name some-

times applied to the great mountain system in the eastern part of the United States, though it is more commonly known as Appalachian. The Alleghany mountains proper are the ranges of the Appalachian system that traverse the states of Virginia, Maryland, and Pennsylvania. They comprise a number of parallel chains that trend from the southwest to the northeast. Their average elevation is about 2,500 feet, reaching their highest summits in Virginia, where they are over 4,000 feet high. These mountain ranges are well wooded to the summit and throughout the region are many fertile valleys. Large quantities of iron, bituminous and anthracite coal, limestone, and other minerals and quarry products are obtained.

**ALLEGHANY SPRING**, a village and post office of Virginia, in Montgomery County, 80 miles west of Lynchburg, near the line of the Norfolk and Western Railroad. It is noted for the large number of highly saline springs that are located in the surrounding country. The vicinity is known as Alleghany Springs and is much frequented as a summer resort. Shaws-ville, three miles distant, is the railroad station.

**ALLEGHENY**, a river of the United States, rises in Potter County, Pennsylvania, and unites with the Monongahela at Pittsburg to form the Ohio. It courses through a fertile valley; is about 365 miles long, and is navigable some distance above Pittsburg.

**ALLEGHENY**, formerly a city of Pennsylvania, in Allegheny County, opposite Pittsburg, but united with the city of Pittsburg since 1906. It is finely situated on the Allegheny River, is the focus of a network of railroads, and ranks as a favorite residence place for Pittsburg business men. A large number of bridges cross the Allegheny River, both for pedestrians and commercial traffic, and it has extensive electric railway facilities with many points within the State. It is important as a center for the manufacture of ironware, boilers, spirituous liquors, salt, locomotives, machinery, clothing, stoves, white lead, and leather. There are extensive municipal improvements, including waterworks, pavements, gas and electric lighting, and sewerage. Among the chief buildings are the Western University of Pennsylvania, the Allegheny Observatory, the Western Theological Seminary, and numerous libraries, schools, hospitals, and churches. Allegheny was first settled in 1788, and its incorporation as a city dates from 1840. Population, 1900, 129,896.

**ALLEGIANCE** (ăl-lē'jans), the term used to express that duty which a citizen owes to the State to which he belongs. or the tie or obli-



gation to one's country. The English doctrine which asserted that allegiance is indelible was early adopted by the United States, but this theory has since been modified by the enactment of naturalization laws.

**ALLEGORY** (ă'lĕ-gō-rĭ), a narrative or discourse in which the principal subject is described in a manner that really refers to another, which resembles it in many important characteristics. In a complete allegory, the characters or leading circumstances refer to some underlying thought. This is the case in Bunyan's "Pilgrim's Progress," in which is described a journey from the City of Destruction to the Celestial City by the faithful Christian. Chaucer's "House of Fame" and Tennyson's "Idylls of the King" are other examples of English allegories.

**ALLENTOWN** (ă'lĕn-town), a city in Pennsylvania, county seat of Lehigh county, on the Lehigh River. In its vicinity are extensive coal and iron ore mines and factories producing brick and tile. The city has convenient railroad facilities, being on the Central of New Jersey, the Lehigh Valley, and other railways. It is an important market for farm and dairy products, and has extensive manufacturing and commercial interests. The chief manufactures include leather, boots and shoes, machinery, boilers, hardware, furniture, and clothing. It is the seat of Muhlenberg College and of Allentown Female College, and has excellent public schools, numerous churches, and a fine county courthouse. Gas and electric lights, pavements, street railways, several libraries, and a number of parks are among the conveniences. William Allen, then the chief justice of Pennsylvania, after whom it was named, platted the town in 1752. It was incorporated as Northampton in 1811, but its original name was restored in 1838. Population, 1900, 35,416; in 1910, 51,913.

**ALLIANCE** (ă'lĭ-ans), a city of Stark County, Ohio, on the Mahoning River, fifty-seven miles south of Cleveland. The city has transportation facilities by the Pennsylvania, the Lake Erie, and other railways. It is surrounded by a rich agricultural country, which produces cereals, dairy products, fruit, coal, and mineral oil. Among the manufactures are hardware, carriages, farming implements, pottery, machinery, and clothing. Gas and electric lights, pavements, street railways, public parks, and extensive railroad facilities are among the conveniences. The city has fine public schools and churches, and near it is Mount Union College. Population, 1900, 8,974.

**ALLIGATOR** (ă'lĭ-gā-tĕr), a large carnivorous reptile peculiar to America, and found

mostly in the swamps and streams of the warmer regions. It is closely allied to the crocodile family, with which it is classed, but has a broader head, larger number of teeth, and feet less webbed, and its habits are less aquatic. Alligators are often seen in groups by day basking on the dry ground in the warm sun, but at night they become active and noisy. They burrow in the mud of swamps in the winter, where they lie torpid until the return of warm weather. The chief food of both alligators and crocodiles is fish, but they also devour small animals and carrion, and when pressed by hunger show considerable determination in attacking man. Some writers assert that the alligators possess a musky fluid secreted by the glands of the throat, which they throw out as a sort of bait to attract the fish on which they prey. The female lays a large number of eggs, ranging from forty to two hundred, which she buries in the sand or in heaps of vegetable matter to be hatched by the warm sun. At fifteen years the alligator is not more than two feet



ALLIGATORS.

long, and it requires from sixty to ninety years to develop the full growth of the adult. The skin on the back of mature alligators is so hardened by horny scales that a large rifle ball is required to inflict a fatal wound. These plates form two upright denticulated crests, which gradually converge toward the middle of the tail, and there unite and form a single row to the extremity. The skin of alligators is used in the manufacture of boots and shoes. A full-grown alligator is very large, attaining a length of eighteen to twenty feet, and its body is about eight times longer than the head. The flesh is sometimes eaten, though mostly by savages. A species known as *spectacled cayman* is native to South America.

**ALLIGATOR LIZARD**, a class of reptiles



common to Mexico and the southwestern part of the United States. These animals are active and are frequently seen on the sides of stone walls and adobe houses, and in forests hide near fallen trees or ascend to the branches of standing trees to escape from intruders. They are characterized by flat scales and the absence of spines, and when the head is raised the brilliant colors of the throat become visible. They multiply rapidly, laying their eggs in the sand to be hatched by the sun.

**ALLITERATION** (ăl-līt-ēr-ā'shŭn); the repetition of the same letter at the beginning of two or more words immediately succeeding each other, or at short intervals. It was used extensively in the Middle Ages, and in old German and Scandinavian poetry it took the place of rhyme. Spenser employed this style of writing extensively, and uses of it are made in the works of Pope and Gray. Tennyson employed alliteration combined with the distribution of vowels and in this practice was joined by many poets, but prose writers usually avoid it. "The fair breeze blew, the white foam flew" and "Many men of many minds" are examples of alliteration.

**ALLOPATHY** (ăl-lŏp'ā-thŷ), the term originated by Hahnemann (q. v.) to distinguish the ordinary practice of medicine from homeopathy. It was founded on the theory expressed by Hippocrates that "opposites are remedies for opposites." However, the term is gradually going out of use, since practitioners cannot confine themselves to such limitations in the treatment of diseases. In the development of new branches of science, as, for instance, bacteriology, new resources have become prominent and have been extensively developed.

**ALLOY** (ăl-loi'), a name given by the French to a compound or combination of two or more metals fused together. It is now applied to any mixture of metals, excepting cases in which mercury is one of the metals, when the compounds are called amalgams. Most metals mix in any proportion, but some form true mechanical compounds by uniting only in definite proportions, while others resist homogeneous combination and form a conglomerate of distinct masses. A very great variety of changes are produced by the combination of metals. An alloy may differ in color from either of the components, or may be very similar to one of them. While an alloy is generally harder than its components, it usually constitutes a body less malleable and ductile. Its specific gravity is sometimes less than the average of that of its ingredients, while it is always more fusible. Bronze, brass, pewter, and

type metals are alloys. The silver money of the United States is made up of nine parts of silver and one part of copper; the gold coins contain nine parts of gold, and the other part is one-fourth silver and three-fourths copper. The reason other metals are mixed with gold and silver is that they are too soft for money unless hardened by mixing with other metals. Some of the valuable bronze alloys compounded in recent years contain aluminum. In electrotyping, alloys are made by using thirteen parts tin with aluminum to form a nonshrinking combination. Arsenic adds strength to copper, while other chemicals increase the brightness of gold. Besides these, there are many other useful combinations.

**ALL SAINTS' DAY**, or **Allhallows**, a Christian festival instituted in 835, and celebrated in honor of the saints in general. This festival is observed by the Anglican, Lutheran, and Roman Catholic Churches on November 1, and by the Greek Church on the Sunday after Whit Sunday. It was introduced because a separate day could not be set apart for every saint.

**ALL SOULS' DAY**, a festival observed on November 2 by the Roman Catholic Church. It was instituted in 998 as a day for prayers offered publicly at the Eucharist for the faithful departed who have not attained to perfect life.

**ALLSPICE** (ăl'spīs), or **Jamaica Pepper**, a tree-like plant of the West Indies, whose fruit combines the flavors of cinnamon, nutmeg, and cloves. The fruit is used extensively in medicine and cookery and in the manufacture of an essential oil and other products. It also serves as an aromatic, and forms the basic ingredient of distilled water. The tree is of an ornamental character, usually twenty to thirty feet in height, with oval leaves and small flowers. A single tree produces about 100 pounds of the dried spice.

**ALLUVIUM** (ăl-lŭ'vī-ŭm), the deposits of soil by the action of water, consisting chiefly of clay, loam, marl, and sand. The term is used in reference to transported matter by the action of fresh water, which was deposited both during the Pleistocene and recent periods. When used in the former sense, it includes



ALLSPICE.



deposits formed on large bases in all geological ages, but in the latter sense it is confined more strictly to the action of oceanic waves, deposits of rivers as seen in deltas, and washes from hill sides, caused by recent rains. Lands made in this way are said to be alluvial in their origin. This action is going on constantly by various agencies. It is exemplified by the Ganges, Nile, Volga, Mississippi, and other rivers, particularly at their mouths, where the silt is deposited and forms deltas of considerable extent. An estimate recently made places the silt carried annually by the Mississippi at a volume sufficient to cover 275 square miles of land with a layer one foot deep.

**ALMA** (äl'mä), a small river in the Crimea, coursing in a westerly direction to Kalamita Bay, near Sebastopol. Prince Menschikoff, the Russian commander, selected the southern bank of this river as a defensive position in the Crimean War, where he was attacked by the allied army Sept. 20, 1854. The Russian army of 35,000 men was defeated by the allies numbering 62,000, and as a result of the battle the road to Sebastopol was opened.

**ALMANAC** (äl'mä-näk), a small book primarily designed to furnish a calendar or table of the days belonging to the several months of the year for which it is published. Besides serving as a guide to designate the days of the month, calendars usually contain data of the rising and setting of the sun and moon, the phases of the moon, the position of the heavenly bodies, important dates observed by the church and state, and much other information of use to the public. The term is of Arabic origin, but it is known that an almanac was published at Alexandria by the Greeks about the 2d century A. D. Almanacs were first published in Europe by Solomon Jarchus in 1150, and subsequently came into extensive use. Benjamin Franklin began the publication of an almanac in 1732, pretending it was written by one Richard Saunders, and his publication came to be called "Poor Richard's Almanac." Besides the monthly calendar and movements of the heavenly bodies, his almanac contained anecdotes, scraps of useful information, and odds and ends of literature, and was published annually for twenty-five years. In more recent times almanacs came to be published in connection with advertisements of large manufacturing and publishing companies, and many are now distributed free of charge to the public. Some of the great daily newspapers of the United States and Canada publish annually almanacs in which valuable information is detailed, many of these publications embracing

500 to 800 printed pages. A publication known as "The Nautical Almanac" is published annually by the United States Bureau of Navigation, and serves the purpose of a guide for navigators. By means of it any locality on mid ocean can be determined by the sailor. The computations are made for three years, and the publications serve for that period of time. Similar almanacs are published by the governments of France, Germany, and Great Britain.

**ALMERIA** (äl-mä-rí'ä), a seaport of Spain, in a province of the same name, 60 miles southeast of Granada. It is located at the head of Almeria Bay, an inlet from the Mediterranean, and the country adjacent is devoted to the culture of fruits and cereals. The manufactures include macaroni, sugar, white lead, and clothing, and there is a considerable trade in iron ore, fruit, and wine. It is the seat of a bishop, a Gothic cathedral, and several nunneries. The Church of San Pedro, a fine edifice, occupies the site of a Moorish mosque. Almeria was founded by the Phoenicians and by the Romans was called Magnus Pontus. Population, 1900, 47,202.

**ALMOND** (ä'münd), the fruit of the almond tree, which is native to Africa and Asia, but has been naturalized in America and Europe. There are two varieties, the bitter and the sweet. The sweet almond is an article of food, and when taken in moderate quantities is quite nutritive. Almond oil is obtained from the kernel of either the bitter or the sweet species, and is alike valuable for medicine and as a perfume. Prussic acid is obtained from the bitter almond.

**ALOE** (äl'ö), the name of a number of plants belonging to the order of lilyworts, some of which are not more than a few inches high, while others attain a height of thirty feet. The different species include herbs, shrubs, and trees, and are characterized by erect spikes or clusters of flowers. In the West Indies they serve as hedges. The juice is purgative in large doses and laxative in small quantities, and the fibers yield a product useful in making coarse cloth and cordage. See **Agave**.

**ALOES WOOD**, or **Eagle Wood**, the inner part of the trunk of trees native to the tropical parts of Asia. These trees are supposed to be the *lign aloes* mentioned in the Bible. They yield a fragrant resinous substance, which has a pleasant odor when burned, and is highly prized as a medicine by Asiatic people. Several species of this class of trees are found, some of which yield wood that takes a high polish and is used for ornamental work. The younger wood is white and almost devoid of scent,



while the older growth has a dark color and yields the most fragrant resinous substances.

**ALPACA** (äl-päk'ä), an animal native to the mountain regions of Peru and Chile, where it subsists on the coarse and scanty forage growing on the sterile soil. It is shaped much like a sheep, but is larger, and its color varies from grayish white to almost black. The wool is soft and silky, usually light chestnut brown,



ALPACA

nearly a foot long, and is strong and almost as fine as that of the Cashmere goat. Thin cloth called alpaca is made from alpaca wool mixed with cotton or silk. It is an important article of commerce, and is used largely for shawls, light clothing, and umbrellas. The alpaca is a mammal of the cud chewing class, and is classed with the same family as the camel. Its flesh is pleasant and wholesome.

**ALPENA** (äl-pē'na), a city of Michigan, county seat of Alpena county, on the shore of Lake Huron, at the head of Thunder Bay, on the Detroit and Mackinaw Railway. It has an excellent harbor and enjoys considerable trade advantages. It is the seat of a United States fish hatchery, and has a fine public school system, numerous churches, and several libraries. There are manufactures of furniture, machinery, cigars, canned fruit, and clothing. Electric lights, rapid transit, waterworks, sewerage, and several parks are among the conveniences. It has an extensive export trade in lumber. The first settlement in its vicinity was made in 1835, and it was incorporated in 1871. Population, 1904, 12,400; in 1910, 12,706.

**ALPHA AND OMEGA** (äl'fä ô-mē'gä), the first and last letters of the Greek alphabet, used as a symbol to denote the Divine Being, and often made to signify the beginning and

the end, or the first and the last of anything. The term is also used to signify the chief aim, as: "Ambition was the Alpha and Omega of his existence."

**ALPHABET** (äl-fä'bět), a list of symbols that represent to the eye the sounds heard in speech. The name originated from the first two letters of the Greek alphabet—alpha and beta. The alphabets of the different languages show marks of wide differences. In the English alphabet and many others are characters to represent both vowels and consonants, but the Hebrew alphabet contains letters only for the consonants, the vowels being distinguished by slight changes in some of the consonant letters. The alphabet of the Cherokee Indians and a number of others represents each syllable by a letter, while the Chinese have no alphabet as that term is understood, but instead use a sign or character for every word in their language. The English alphabet, like most of those of modern Europe, is of Latin derivation, the Latin in turn came from the ancient Greek, and that again from the Phoenician. The Phoenician alphabet is believed to have originated, like the Hebrew, from Egyptian hieroglyphics.

Most of the European alphabets agree in many respects, but some do not represent all the English sounds and do not contain all the letters. The Russian language has many sounds not common to other languages and contains thirty-six letters. The French have not the w; the Portuguese no k and w, and the Italian no k, w, x, and y. In the German alphabet are all the letters common to the English, but they differ somewhat in sound and in the number of sounds represented by the vowels. The English alphabet is both defective and redundant, and is a very imperfect instrument to serve the purpose for which it is intended. Its imperfection is at least partly due to a want of characters to represent all the simple sounds, and in having more than one symbol for the same sound. However, since sounds change as well as grammatical forms, it may never become possible to secure a perfect alphabet in any language.

**ALPS** (älp), the most extensive system of mountains in Europe, covering a region of 90,000 square miles, which lies chiefly in Italy, France, Germany, Austria, and Switzerland. The average height is about 7,700 feet, and many of the summits extend far above the snow line, and are covered with perpetual snow and ice. Mont Blanc, 15,781 feet, and Mont Rosa, 15,217 feet, are the culminating peaks, but several others rise almost as high. The system of



ranges is grouped as Eastern, Western, and Central Alps. They occupy the form of a semi-circle, with the Apennines, Balkans, Vosges, Hartz, and Carpathians extending out from the principal chain. On the north is the great glacier called Mer de Glace, which is five miles wide, fifteen miles long, and 100 feet thick. Other glaciers abound in different parts of this region of snow-capped peaks, from which great masses of snow and broken ice move into the valleys, bearing with them rocks and trees, and destroying many objects in their way. Forests and villages have often been buried beneath the avalanches of snow and ice, and when melted they have caused great floods in the valleys. There are now many roads leading over the Alps, some passable for carriages, and others only for travelers on foot. A number of these highways were built by Napoleon to convey his army and supplies over the Alps to the country beyond.

In ancient times it was thought a great feat to cross the Alps, the most successful exploit of the kind being achieved by Hannibal at the passage of the Little Saint Bernard in the year 218 B.C., when he set out from New Carthage to invade Italy. The Duke of Alva led 10,000 men over Mont Cenis in 1567, and in 1800 Napoleon crossed from Switzerland into Italy with 30,000 men. All the mountains being barren and covered with snow, it was thought a remarkable piece of military skill to take an army with horses, cannon, ammunition, and supplies safely over dangerous precipices and land them securely on the other side. In recent times railroads have been constructed over two mountains, and two great tunnels have been built for other railways. Saint Gothard Tunnel, leading from Switzerland to Italy, is the largest railroad tunnel in the world, being nine and one-half miles long. Next to it is Mont Cenis Tunnel, which is nearly eight miles in length. Vegetation in the Alps is varied, owing to the great altitude, and there are valuable deposits of iron, manganese, marble, and many other minerals. With the ascent of every thousand feet is a marked difference of temperature, until the region of perpetual snow shuts out all signs of plant life. The chamois and the mountain goat are animals peculiar to the Alps.

**ALSACE-LORRAINE** (äl-säs'lö-rän'), an imperial territory of the German Empire, situated north of Switzerland and east of France, and including an area of 5,668 square miles. The region lies largely in the valley of the Upper Rhine, is traversed by a network of railroads, and its inhabitants engage largely

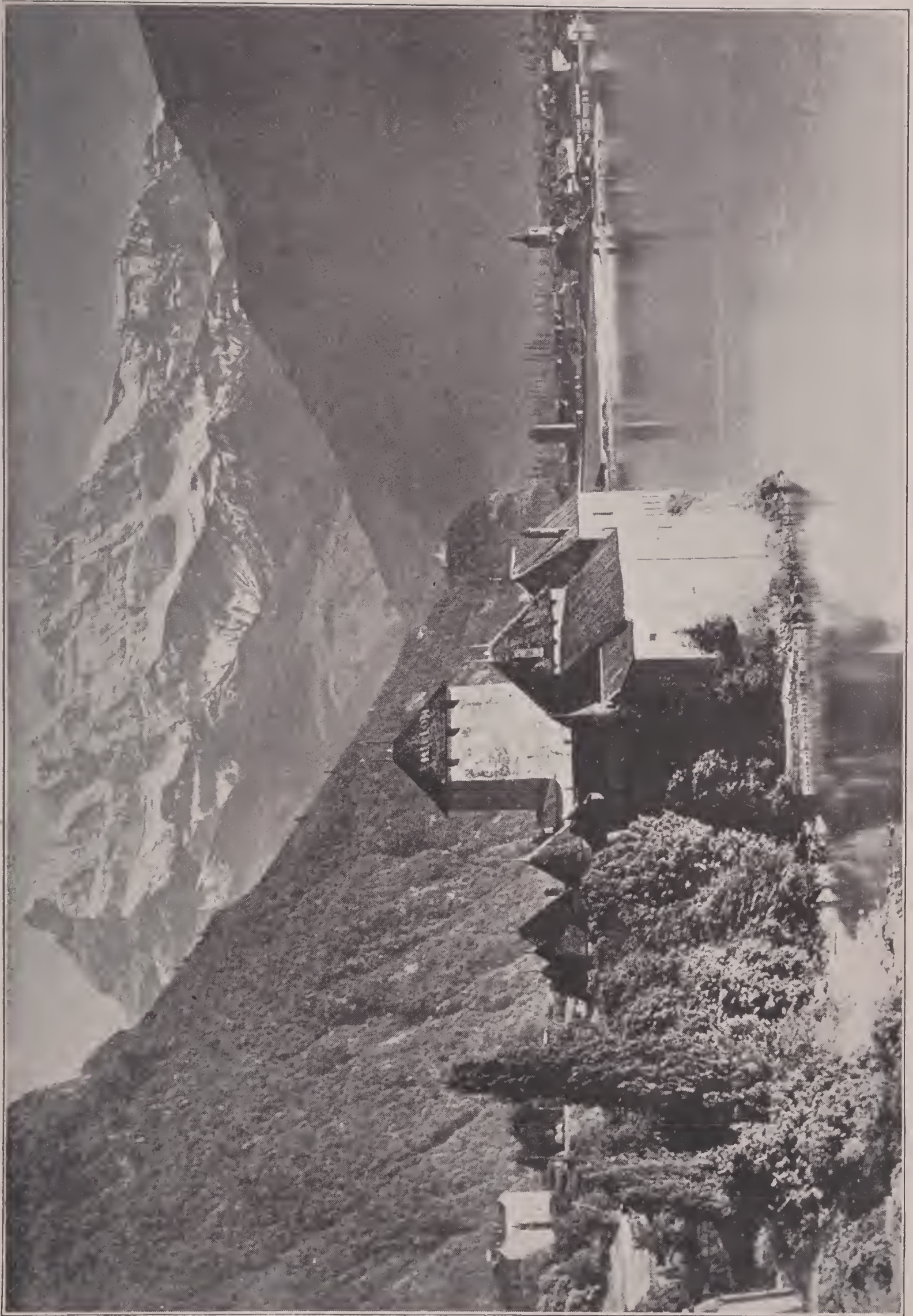
in agriculture, fruit growing, and manufacturing. It was a part of the kingdom of Lothaire in the 9th century. When his dominions were partitioned between France and Germany in 969, it became an object of contention between these two powers, and has since been a source of dispute at various times. The region was the scene of several decisive battles in the Franco-German War of 1870-71. Strassburg and other fortified cities were besieged and captured by the German army. At the peace negotiations, Germany demanded the cession of Alsace together with what is called German Lorraine, this being one of the early conditions of peace laid down by Count Bismarck, and was accepted by M. Thiers, and afterward ratified by the national assembly at Bordeaux. The language spoken is German and the people are prosperous. Compulsory school attendance laws and a system of free schools are maintained. Strassburg, a beautiful city on the Upper Rhine, is the capital and chief commercial center. Population, 1905, 1,814,564.

**ALTAI MOUNTAINS** (äl-ti'), an important range of mountains in Asia, forming a part of the boundary between China and Siberia. Among the great rivers having their sources in these mountains are the Obi, Irtish, Yenisei, and Amur. The different chains lie partly in Russian and partly in Chinese territory. Byeluka is the highest peak, elevation 11,000 feet. A celebrated trade route from Peking to Saint Petersburg crosses these mountains some distance southwest of Lake Baikal, but it is not used as extensively as formerly, owing to the construction of the Trans-Siberian Railway. The Altai Mountains are rich in minerals, including iron, copper, silver, gold, and petroleum. Many of the people inhabiting the mountain region are Russians. Barnaul is the chief city.

**ALTAMAHA** (äl-tä-mä-hä'), a river in Georgia, formed by the confluence of the Oconee and Ocmulgee rivers. Its general course is southeast through a sandy plain, and it flows into Altamaha Sound, an inlet from the Atlantic. The Ochopee is its principal tributary. Darien, a thriving commercial town, is about 12 miles above its entrance into the sea.

**ALTAR** (äl'tur), an elevated place of worship in Christian churches. Altars are constructed of wood, stone, or marble, though they are of great variety in shape and structure. Most of the Protestant churches have not retained the altar, but generally apply the same name to the table-like structure on which communion is offered. The altar is still used in some of the Lutheran churches, and both the





SCENERY IN THE ALPS.

CHILLON AND THE DENT DU MIDI, CANTON OF VAUD, SWITZERLAND.







Roman and Greek churches contain altars. Pope Sixtus II. erected the first stone altar, and it is thought that Saint Wolstand introduced stone altars in England. The ancient Greeks and Romans had a number of altars in their places of worship, each dedicated to some particular deity, and sacrifices and blood offerings were made on altars in many countries, especially among the heathen. In some nations the altar was looked upon as a refuge in the time of danger. The Jews regard the altar a sanctuary.

**ALTENBURG** (äl'ten-böörg), a city in Germany, capital of Saxe-Altenburg, near the Pleisse River, about 24 miles south of Leipzig. It is the seat of several educational institutions and has a fine art gallery, a museum, and a hospital for the poor. Several railroads and manufactures of woolen goods, toys, cigars, and clothing make it important as a commercial center. Population, 1905, 38,818.

**ALTO** (äl'tö), a term used in designating voice, or pitch of sound. The term is applied to the lowest female voice, having a compass of about an octave and a half, and the term contralto signifies a tone quite similar, being the voice between the tenor and soprano. The term alto was formerly applied to the highest male voice.

**ALTON** (äl'tun), a city of Illinois, in Madison county, on the Mississippi River, twenty-one miles above Saint Louis. The city occupies a fine site about 200 feet above the river, and is on the Chicago and Alton, the Chicago, Burlington and Quincy, and other railways. It is a port city of entry, has extensive steamboat connections, and is an important trade center. Among the manufactures are quarry products, machinery, furniture, tobacco products, clothing, and earthenware. The streets are substantially paved with brick and asphalt. It has systems of electric lights and waterworks, a park, several libraries, and an extensive system of street railways. The city has excellent schools and churches, and is connected by electric railroad with Upper Alton, the seat of Shurtleff College, a Baptist institution founded in 1827. The census of 1910 accords Upper Alton a population of 2,918, while Alton has a population of 17,528.

**ALTONA** (äl'tö-nä), an important city of Germany, in the province of Schleswig-Holstein, on the Elbe River, and connected by railroads and electric car lines with Hamburg. It has excellent public schools, an observatory, an infirmary, a mint, several colleges, and many libraries. Among the chief buildings are the palace of justice, the city theater, the customhouse, and several cathedrals and other churches. The

manufactures include tobacco, sugar, soap, cordage, silk and cotton textiles, chemicals, and leather. It has an excellent harbor, modern municipal improvements, and a large domestic and foreign trade. The city was founded by the Danes as a rival to Hamburg, but in 1867 came into possession of Prussia. Population, 1905, 168,320.

**ALTOONA** (äl-töo'na), a flourishing city of Pennsylvania, in Blair county, near the Alleghany Mountains, on the Pennsylvania Railroad. It is an extensive commercial and manufacturing center, and produces locomotives, railroad cars, ironware, boilers, tobacco products, furniture, and machinery. About 7,500 persons are employed in the factories. The city has a fine public library, municipal waterworks, electric street railways, and pavements of stone and macadam. Lakemont Park is a fine public resort, and near the city is the famous Horseshoe Bend. The Pennsylvania Railroad Company founded Altoona in 1850. Population, 1900, 38,973; in 1910, 52,127.

**ALTORF** (ält'ôrf), or **Altdorf**, a city in Switzerland, capital of the canton of Uri, near the southern extremity of Lake Lucerne. It is nicely located at the foot of the Grünberg. The surrounding country is beautified with gardens and orchards. It is the seat of a monastery and has several modern school buildings. A fine bronze statue of William Tell ornaments the place where he is said to have shot the apple placed on the head of his son. Altorf is located on the railroad that passes through Saint Gotthard Tunnel, about 20 miles south. Population, 1908, 2,980.

**ALTRUISM** (äl'tröö-izm), a word coined by M. Comte and adopted with decided approval by Herbert Spencer. It is used to express that theoretical condition of human principle which the benevolent aim to attain in relation with their fellows. In popular use the term implies the finding of one's own highest welfare in seeking the welfare of others.

**ALUM** (äl'üm), a whitish astringent saline substance used in the arts and in medicine. Its constituents are alumina, alkali, sulphuric acid, and water. There are three general classes of alum, these depending on whether the alkali contained is potash, ammonia, or soda. Though found in a natural state, the alum of commerce is manufactured. In a natural state it is obtained from alum ore, which occurs in the lower coal measures. It was known and manufactured fully six centuries ago in Syria and other parts of Eurasia. Burnt alum is what remains after the water is taken out by heat, and in this form is used as a caustic.



**ALUMINIUM** (äl-û-mîn'ĩ-ŭm), or **Aluminum**, a ductile, malleable, sonorous metal of a whitish color. Though the most abundant of all the metals, it was not discovered until in 1827. It is found in slate, clay, mica, spar, and many other mineral substances, and until recently was not extensively manufactured owing to a lack of machinery with which to make its production sufficiently inexpensive. Electricity is employed largely in its manufacture from clay, since the process requires a very fierce heat, and the currents generated in some factories attain as high as 15,000 amperes and 30,000 volts. It can be drawn easily into fine wire, and may be converted into very thin foil by a process of rolling. In manufacture it is used with other metals for ornaments, scientific instruments, bells, and guns, and is mixed with different metals, such as copper, to serve very useful and ornamental purposes. Within recent years it has gone largely into the construction of bicycles, scientific instruments, chains used in mining, bath tubs, and automobiles. In large factories it has been successfully alloyed with steel in manufacturing war vessels, and a class of torpedo boats are constructed largely of it. Since it is the lightest in weight of all metals and yet exceedingly durable, it can be seen why its use is constantly increasing.

**ALUMNUS** (â-lŭm'nŭs), plural **Alumni**, a term used to designate a person educated at a school, university, or other place of learning. Thus, an alumnus of a particular school implies one whose education was obtained there by graduation.

**ALUM SHALE** (äl'ŭm shāle), or **Alum Stone**, a mineral consisting of clay combined with iron pyrites and mixed slightly with carbon or bitumin. This mineral is weathered by exposure to the air and rain, causing a dissolution of the pyrites and a union of the alumina with the sulphur, yielding a compound from which limonite and alum are obtained. In practice the shale is crushed before being exposed to the weather, or by burning slowly and leaching it.

**AMALGAM** (â-mäl'gam), a term applied to a class of alloys in which one of the combining metals is mercury. Though mercury readily unites with gold and silver, it does not combine with iron even when heated, and, for this reason, is used to separate gold and silver from the ores, the process being called amalgamation. When properly applied, mercury dissolves and combines with the precious metals and separates them from the waste matter, and afterward is itself driven off by heat. Numerous forms of amalgams are employed in the

arts. In this way zinc and tin are prepared for the rubbers of electrical machines, copper and cadmium for uses in dentistry, silver and gold for plating and resilvering, and tin for preparing mirrors. The process of effecting amalgamation differs widely, some forms being produced by rubbing together the two metals, while others are the result of applying electricity. Amalgamations are effected both in solids and liquids.

**AMANA COMMUNITY** (äm'a-na kôm-mŭ'nĭ-tŷ), a German-American society whose origin dates back to the 18th century. The most successful community now known is located in the northeastern part of Iowa County, in the State of Iowa. The members own in common a tract of about 26,500 acres of land, though less than two thousand persons belong to the society. They engage in farming, stock raising, and manufacturing on a large scale, and share the profits in common. They maintain well established schools and churches, and have a number of charitable institutions. The society has attained a reputation for excellence in the manufacture of woolen goods and other articles of commerce.

**AMARANTH** (äm'a-rānth), an order of plants containing nearly 200 known species, native to tropical and temperate countries, but most common in the tropics. The flowers are composed of separate sepals opposite the stamens, usually one-celled anthers, and a single ovary with one or more seeds, and are surrounded by dry, membranous bracts. The cockscomb, love-lies-bleeding, prince's feather, and globe amaranth are common kinds. The name *amaranth* is frequently applied in poetry to an imaginary flower supposed never to fade, and which serves as an emblem of immortality.

**AMASIA** (â-mä'sĕ-â), a city of Asiatic Turkey, on the Irmak River, 200 miles southwest of Trebizond. The surrounding country is fertile and well adapted to silk culture and fruit growing. It has several bazaars, numerous mosques, and a Mohammedan university. In the vicinity are ruins of an old castle and archaic remains. Strabo, the geographer, was born here. Population, 30,000.

**AMATITLAN** (ä-mä-tĕ-tlän'), a town in Guatemala, Central America, 15 miles south of the city of Guatemala. It is located on the transcontinental railroad passing from the Caribbean Sea to the Pacific Ocean, hence has a growing trade in produce, especially in salt, cochineal, fruit, and raw silk. Near it is Lake Amatitlan, which is three miles wide and nine miles long. The town was founded by Jesuits, who promoted agriculture and stock raising. The surround-



ing country produces large quantities of sugar cane. Population, 8,970.

**AMAZON** (ăm'a-zôn), the largest but not the longest river in the world, extending nearly across the northern part of South America. It is formed by a large number of head streams in the Andes, drains an area of about 2,500,000 square miles, and has an estimated length of 3,500 miles. It flows into the Atlantic at the equator, where it is 200 miles wide; 1,000 miles from the ocean it is four miles wide, and 2,000 miles from the ocean its width is about one mile. Among the chief tributaries are the Napo, Rio Negro, Jurua, Madeira, Japura, Tapajos, Xingu, and other streams. The Amazon and its tributaries afford about 30,000 miles of water surface suitable for navigation. In its valley is some of the most luxuriant vegetation on earth, being rivaled only in the equatorial region of Africa, and within its forests dwell many kinds of wild animals. The waters of the river system contain an abundance of fish. In the rainy season its banks and the lower courses of its larger tributaries are overflowed, and a large extent of country takes on the appearance of a vast inland sea. Large tracts of country traversed by the Amazon and its tributaries have not been carefully explored, but its basin is known to contain valuable natural resources, such as minerals, timber suitable for construction, and large tracts of fertile land. It is certain that the Amazon basin contains all the natural resources requisite to support vast populations. It is connected with the Orinoco by the Negro and Cassiquiare rivers. Yanez Pinçon discovered the Amazon in 1500, but Francis Orellana, one of Pizarro's officers, first navigated it in 1541. In his report is a description of a nation of female warriors, or Amazons, with whom he engaged in several wars, and from whom the river received its name.

**AMAZONAS** (ä-mä-zō'näs), the largest province of Brazil, situated in the northwestern part of that country. It is traversed by the Amazon, has an area of 733,000 square miles, and a population of 162,000. The name is also applied to a department in the northern part of Peru, of which Chachapoyas is the capital.

**AMAZONS** (ăm'a-zōnz), the mythical name of a warlike race of women who lived in Asia Minor, near the Black Sea. They were governed by a queen, and, to facilitate the use of the bow, burned their right breast. In Greek mythology it is related that Hercules defeated them, and that Theseus took captive their princess, Antiope. The Amazons fought on the side of Troy in the Trojan War, and

their queen, Penthesilea, was killed in a combat with Achilles. Among the many sculptures of the Amazons is that of August Kiss (1802-65), en-



AMAZON, BERLIN.

titled "Mounted Amazon Attacked by a Tiger," now in the Museum of Berlin, Germany.

**AMBALA** (üm-bä'lä), or **Umballa**, a city in India, in the Punjab, 150 miles northwest of Delhi. It has convenient railroad facilities and an extensive trade, and is surrounded by a fertile country. Its chief buildings are a hospital, a Presbyterian church, a dispensary, and the government house. Ambala was founded in the 14th century. Population, 79,300.

**AMBASSADOR** (ăm-bäs'sä-dēr), a minister of the highest rank sent by a nation to the capital of another to represent there the interests of his country. • Ambassadors are termed extraordinary when they are sent on a special mission, and ordinary when sent permanently to the seat of a foreign country. The United States did not appoint ambassadors until within recent years, but there was representation at foreign courts by officers termed ministers plenipotentiary, who were appointed by the President with the approval of the Senate. In 1893 the Diplomatic and Consular Appropriation Bill empowered the President to raise to the rank of ambassador extraordinary the American ministers accredited to any country which should previously confer a similar promotion upon its representative at Washington. Accordingly, Great Britain, Germany, Italy, and France raised their ambassadors at Washington to ambassadorial rank, and the representatives at the courts of Saint James,



Berlin, Paris, and Rome were similarly promoted. Japan and several other countries have since named ambassadorships.

**AMBATO** (ăm-bă'tô), a town of Ecuador, in the province of Leon, 75 miles south of Quito. It is located on the northeastern slope of Mount Chimborazo. It has a growing trade in cochineal and grain, and mining is carried on in the surrounding country. In 1698 it was destroyed by an eruption of Cotopaxi. Population, 14,000.

**AMBER** (ăm'bēr), a hard substance, usually yellow, but sometimes clouded with red or brown. It is brittle, yields easily to the knife, and is translucent and sometimes transparent. Amber is highly electrical, on account of which the Greeks called it *elektron*, and later the word *electricity* originated from it. It is obtained in oceanic and tributary waters, from which it is taken by divers, but also occurs in bituminous beds of wood. The origin of amber is assigned to the remains of timber and other plants that grew in remote ages, perhaps in the Pliocene. Many plant and animal remains have been found in it, about 163 of the former and over 800 of the latter; fully two-thirds of the organisms represented are now extinct. Amber is sold at from \$2 to \$75 per pound, depending upon its quality. It is used for making ornaments, tobacco pipes, beads, and other articles. An imitation of amber called amberine is a valuable product, and is harder and tougher than the genuine.

**AMBERG** (ăm'bērg), a city of Germany, in Bavaria, 32 miles north of Ratisbon. Through it flows the Vils River, and a railroad line connects it with Nuremburg and other important commercial centers. Earthenware, woolen cloths, and machinery are its chief manufactures, and the government maintains here a manufactory of arms. It has a library of 35,000 volumes, an industrial school, and several fine churches. Population, 1905, 24,303.

**AMBERGRIS** (ăm'bēr-grēs), a solid, fatty, inflammable substance derived from the intestines of the sperm whale. It has a gray or blackish color, the shades being variegated like marble, and possesses a peculiar earthy odor. The product is met with near the sea-shore and in the abdomen of the whales. It is an important article of commerce, and is used largely in the manufacture of perfumes. Genuine ambergris emits a fragrant smell and commands a high price.

**AMBOYNA** (ăm-boi'na), or **Amboina**, an island in the Indian Archipelago, classed with the Molucca group. The chief products include fruits, cloves, nutmegs, indigo, sago,

cocoanuts, and sea-shells. It is inhabited by natives of the Malayan race and a number of Chinese and Europeans, and is a possession of Holland. The city of Amboyna, on the Bay of Amboyna, is the capital. The island has an area of 280 square miles; population about 50,000.

**AMBROSIA** (ăm-brō'zhà), in mythology, the food and drink of the gods, and supposed to confer immortal youth. It was not only used for food and drink, but was employed to anoint the gods, and in it they bathed themselves. It was sometimes served to the mortals who were favorites of the gods to give them strength, and with it the hair of Venus and Jupiter was anointed. Later writers say that nectar was the drink and ambrosia the food of the gods.

**AMBULANCE** (ăm'bũ-lans), a covered wagon used in large cities for the conveyance of sick or wounded persons to the hospital. In times of war the name is applied to moving field hospitals, especially such as are constructed by the Red Cross and other societies. These are stationed at the rear of troops that engage in battle. Persons wounded in action are carried hastily to ambulance wagons and conveyed to the field hospital, where they are out of range of artillery fire and are treated by army surgeons. Ambulance wagons were first used in the French army in 1792. They are now in universal use in times of war, and all large cities employ ambulance wagons for the police department to convey both persons and animals that have been injured or wounded.

**AMENDMENT** (ă-mënd'ment), in judicial proceedings, a term applied to the correction of errors or the addition offered in the pleadings of a cause. It is also used to designate additions to the constitution of a society, State, or nation. In the Constitution of the United States the following conditions govern the addition of amendments to that document: "The Congress, whenever two-thirds of both houses shall deem it necessary, shall propose amendments to this Constitution, or, on the application of the legislatures of two-thirds of the several states, shall call a convention for proposing amendments, which, in either case, shall be valid to all intents and purposes as part of this Constitution, when ratified by the legislatures of three-fourths of the several states, or by conventions in three-fourths thereof, as the one or the other mode of ratification may be proposed by the Congress; provided, no amendment which may be made prior to the year one thousand eight hundred and eight shall in any manner affect the first and fourth clauses in the ninth section of the first article;



and that no State, without its consent, shall be deprived of its equal suffrage in the Senate."

**AMERICA** (ă-mĕr'ĭ-kă), the name applied to the land masses of the western hemisphere, which extend from an unknown region in the Arctic Circle to about 55° south lat. The Isthmus of Panama, a neck of land about twenty-eight miles wide at its narrowest point, separates the continent into two grand divisions, known as North and South America. America is bounded on the north by the Arctic Ocean, east by the Atlantic, which separates it from Europe and Africa, south by the Antarctic, and west by the Pacific, which separates it from Asia. The extent from north to south, from the ice fields of the Arctic regions to the southern extremity of Patagonia, aggregates 10,500 miles, and the greatest width is about 3,250 miles. There is a total land surface of 16,237,535 square miles. See **North America**, **South America**, **Central America**.

**AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE**, a scientific society organized and maintained in the United States. The forerunner of this organization was the association of American Geologists, which was organized in Philadelphia in 1840, and at a meeting held in Boston two years later its scope was enlarged and it became the Association of American Geologists and Naturalists. In 1847 the name was changed to American Association for the Advancement of Science, and to encourage and promote scientific work was declared to be its purpose. While there is no bar which would prevent any person becoming a member, the membership is limited in practice to citizens of the United States and Canada. The nine sections into which the association is divided are mathematics and astronomy, physics, chemistry, mechanical science, geology and geography, zoölogy, botany, anthropology, and economic science and statistics. The chief executive officer is the president, assisted by nine vice presidents, each of whom presides over one of the departments. The society meets annually in the summer in some city of North America, the sections holding separate sessions, and each year the proceedings are published. The reports contain information of great scientific value.

**AMERICAN BEAUTY.** See **Rose**.

**AMERICAN FEDERATION OF CATHOLIC SOCIETIES**, an organization promoted by the Roman Catholic Church, and whose headquarters are at Cincinnati, Ohio. The purpose of this organization is declared to be "the cementing of the bonds of Federal union among the Catholic laity and the Catholic societies of

the United States; the fostering and protecting of Catholic interests and works of religion, piety, education, and charity; the study of social conditions; and the encouragement of the spread of Catholic literature and of the circulation of the Catholic press."

**AMERICAN FEDERATION OF LABOR**, an organization of trade unions, whose object is to improve the condition of wage workers. It may be considered the successor of the Knights of Labor, a similar industrial organization. The first convention recognized as official was held in Pittsburg, Penn., in 1881, at which it was declared to be the Federation of Organized Trade and Labor Unions of the United States and Canada, and the present name was adopted at a trade-union meeting at Columbus, Ohio, Dec. 8, 1896.

On Jan. 1, 1908, the American Federation of Labor included 825 local unions, 473 city centrals, 26 State federations, and 101 national and international unions. The United Mine Workers of America continues to be the largest affiliated union, and others of great numerical strength are the Cigar Makers' International Union, the Brotherhood of Carpenters and Joiners, the Granite Cutters' National Union, and the International Typographical Union. In January, 1908, the membership, excluding all duplicates, was placed at 1,850,000. Samuel Gompers is president, with headquarters at Washington, D. C., and his publication, *The American Federationist*, is the official organ.

The primary object is to improve the condition and wages of laborers in all industrial pursuits, for which purpose unions of all classes of wage workers are to be organized and maintained. It is sought to form favorable public opinion through the press, platform, and legislatures, and to secure a reduction in the hours of labor to the toilers, the avowed purpose being to extend industrial progress and improve the status of civilization. It is sought to organize women wage workers, exclude Chinese immigration, establish shorter hours and better remuneration, and protect children under fourteen years of age from labor in factories and mines. To obtain the ends for which organization is maintained, funds are raised by assessment of its members. While it is recommended that all unions seek to prevent strikes and boycotts, they are permitted under extenuating circumstances, and assistance is given to affiliated organizations when necessarily engaged in protracted struggles to secure relief. The union labels being looked upon as important designations, efforts have been made by the executive committee to protect and legalize them.



**AMERICAN FORESTRY ASSOCIATION**, a society in the United States whose purpose is to promote interest in the forest resources of that country and its territories. It was organized in 1882 and incorporated in 1897, and has a membership of about 2,000. Annual meetings are held, and at these important topics relating to forestry are discussed. The aim is to influence public sentiment in favor of planting trees, preserving forests, and promoting legislation to accomplish these ends. This organization has accomplished much for the welfare of the country by arousing interest to the extent that Congress has been induced to increase the timber reservations, both in number and extent, and the nation and many states have enacted laws to encourage the planting of trees and the protection of forests. *Forestry and Irrigation* is the official organ of this society.

**AMERICAN INDIANS.** See **Indians.**

**AMERICAN INSTITUTE**, a society organized in New York City to promote domestic industries. It was founded in 1828 with the purpose of aiding in the development of the State, but ultimately the aim became broader and encouragement was given to agriculture, arts, manufacturing, and commerce in the entire country. Interest is promoted by fairs and exhibitions. This organization early recognized the value of the McCormick reaper and other useful inventions, such as the stocking loom, the telephone, the metallic lifeboat, the telegraph, and the milk separator, and by its recommendations and public reports stimulated interest in the use of these and others valuable in the productive industries.

**AMERICANISMS** (ă-mēr'ī-kān-iz'm), a term applied to certain expressions in the English language used extensively in the United States. They consist chiefly of words coined in America, or of words and terms obsolete in Great Britain, or which have been modified in meaning by usage. Some words and idioms are local, while others have come into general use. The following embraces a representative list, though it does not include all the Americanisms:

Advantage, as a verb instead of profit.  
 Backwoods, a partially cleared forest region.  
 Baggage car, instead of luggage van.  
 Blizzard, a storm of snow or sleet.  
 Bogus, meaning false, counterfeit, fraudulent.  
 Boss, an employer of laborers, a leader.  
 Broncho, a western horse of small size.  
 Bug, a beetle.  
 Buggy, a vehicle with four wheels.  
 Bulldoze, meaning to intimidate.  
 Buncombe, used in the phrase to "speak for Buncombe," a common quotation, meaning to speak only to catch applause or favor.  
 Bureau, a dressing table with drawers.  
 Calculate, to think, to suppose, to believe.  
 Calico, meaning prints, printed muslin goods.

Canebrake, a thicket of canes.  
 Canyon, a deep depression or gorge.  
 Caucus, a preliminary meeting of politicians, held either by the members of a party in a voting precinct, or by members of a convention or legislative body.  
 Chunk, a part or piece of any material.  
 Clever, meaning obliging or good-natured.  
 Cowboy, a western drover or cattle herder.  
 Creek, a small stream or river.  
 Cracker, a bake or biscuit.  
 Creole, in the Gulf States, a person of French or Spanish descent.  
 Cunning, sly or crafty, pretty or pleasing.  
 Deadhead, to make free use of public conveyances, or to have free entrance to places where admission is charged.  
 Depot, a tramway or railway station.  
 Down East, the New England States.  
 Drummer, a solicitor, a commercial traveler.  
 Dry goods, the articles sold by drapers, mercers, and haberdashers.  
 Dress, the gown worn by a woman.  
 Dude, a dandy, a man dressed in the height of fashion.  
 Endorse, to approve, confirm, sanction.  
 Fall, meaning autumn.  
 Fancy, the opposite of plain or common, as fancy horses, fancy silks, fancy store, fancy dress.  
 Fish dealer, a fishmonger.  
 Fix, to adjust, to put in order.  
 Gerrymander, a word derived from the name of Elbridge Gerry, a signer of the Declaration of Independence, who devised a scheme to divide Massachusetts into districts in such a manner that the political party to which he belonged could elect a majority of the General Assembly. The term is now applied to the arrangement of political divisions in the interest of one party over its opponent, and in such instances it is said that the district so organized has been gerrymandered.  
 Given name, the first or Christian name.  
 Hang around, to be near to or loiter about a place.  
 Hardware merchant, an ironmonger.  
 Help, a servant, servants, or service.  
 Homely, plain, simple, unadorned.  
 Hustle, to hasten, to hurry.  
 Improve, to ameliorate real estate by care or cultivation.  
 Jew, to haggle with the view of getting a better bargain.  
 Johnnycake, bread or cake made of Indian cornmeal.  
 Lasso, the art of catching horses or cattle with a rope.  
 Loafer, a vagrant, a lounge.  
 Lobby, to attempt to influence legislation by the personal solicitation of the members of a legislature. *To lobby through* is to get a bill adopted by such influence.  
 Logrolling, a system of management by which a member of a political party or a legislative body attempts to secure advantage for or the adoption of a favorite measure.  
 Lot, an allotment, a small piece of land.  
 Lynch law, capital punishment executed without legal authority or without a trial, either by a mob or by the populace.  
 Mail, used instead of post.  
 Moccasins, a shoe of soft leather, either made to button or to lace, and sometimes provided with a sole.  
 Notions, small wares.  
 One-horse, anything of little importance.  
 Pantaloon, meaning trousers.  
 Pickaninny, a small Negro child.  
 Platform, a declaration of the principles upon which a person, a sect, or a party proposes to stand, each division of which is called a *plank*.  
 Posted-up, to be well informed.  
 Rooster, the domestic cock.  
 Saloon, a taproom.  
 Sleigh, a sledge; sleigh riding instead of sledge driving.  
 Smart, meaning considerable or important.  
 Span, from the German, *gespann*, meaning a pair of horses or mules.  
 Stampede, to flee suddenly.  
 Store, a shop, as a drug store, a book store.  
 Suspenders, used instead of braces.  
 Succotash, maize and beans boiled together.  
 Tenderfoot, a western term, meaning a newcomer.



Transient, a stranger, a traveler.

Truck, small produce grown in gardens.

Typist, one who can operate a typewriter.

Wilt, to droop, to wither, to decay.

Woods, meaning a wood.

**AMERICAN LITERATURE**, the written and printed productions of American writers. The term is popularly applied in the United States to the productions of writers confined within the area or under the jurisdiction of that country, but in a broader sense it applies to the collective writings of all Americans. In the latter sense it embraces the literature of Canada, Mexico, Brazil, and the other American countries. The literature of Canada is more nearly associated with that of England than that of the United States, a condition arising from its colonial dependence, but, like the latter, is largely in the English language. The writings of the other American countries, except Brazil, are practically all in the Spanish, while those of Brazil are in the Portuguese. In the scope of this article it is possible only to give an outline of the literature of the United States. For Canadian literature, see Canada, subhead LITERATURE.

It may be said that the advantage of studying the literature of a nation consists in becoming acquainted with the best thoughts of its best minds. Such writings reveal to us the highest ideals and the noblest motives that prevailed while the nation passed through successive periods of growth and development. Thus, the reader becomes influenced by such thoughts and motives as actuated the writers of literature, and the best that is in him is called into action. In the literature of America we find much to commend, especially because it presents to us a remarkable transition from the literature of Europe to the writings that are purely American in thought and sentiment. Though principally in the English, there are a large number of American writings in the German, French, and Swedish. The German writers are particularly numerous, and include such eminent men as John Winebrenner, W. A. Muhlenberg, Carl F. W. Walther, Louis J. R. Agassiz, Henry T. Tuckermann, and Carl Schurz, all of whom are treated in special articles.

American literature may be divided into two general periods: from its beginning to 1840, and from 1840 to the present time. However, the former may for convenience be subdivided into the Colonial, the Revolutionary, and the Transcendental periods. If we speak of literature in the stricter sense, which embraces the writings characterized by beauty of form and artistic style, it may be said that American literature begins properly with Washington Irving. How-

ever, in the Colonial period we have writings closely associated with history, and, for that matter, there is a close relationship between all literature and history.

**COLONIAL PERIOD.** The early settlers were men of action, using the ax and the musket more than the pen, but we have a number of excellent works dating from the Colonial period, which embraces the epoch included in 1620-1775. Captain John Smith produced the first three books written in America. The first of these, "General History of Virginia," contains an account of the early colonists in America, and was printed in London shortly after the settlement at Jamestown. Smith's second book is a reply to complaints made by the London stockholders of the Virginia Company, and his third, published in 1612, is entitled "Map of Virginia." The writings of Smith consist rather of history than literature, but contain the first Virginian romance in the story of Pocahontas. George Sandys (1577-1644), in Virginia, made a version of Ovid's "Metamorphoses" in 1620, which was really the first purely literary production completed in America.

The establishment of Harvard College in 1636 gave an impetus to educational effort, and the desire for intellectual advancement was further extended by the founding of William and Mary College in 1693 and Yale University in 1701. In 1639 the first printing press was set up at Cambridge, Mass., and the first book printed in America appeared in 1640, entitled "Bay Psalm Book." It was not strictly original, and was edited by a number of eminent colonists, among them John Eliot, who also translated the Bible into the Algonquin language, but it proved very popular and went through many editions. Anne Bradstreet, of Massachusetts, issued a volume of poems in 1650, entitled "Tenth Muse," which was published in an enlarged form at Boston in 1678. William Bradford (1589-1657), Governor of Plymouth, published the first annals of New England, entitled "History of Plymouth Plantation," and John Winthrop wrote "History of New England." Both these works are of immeasurable value in describing the life and times of the colonists, and from them many subsequent writers have drawn inspiration for a number of valuable works, including Whittier's "John Underhill," Longfellow's "New England Tragedies," and Hawthorne's "Scarlet Letter." Samuel Sewall (1652-1730) was the first to denounce the crime of slavery in his tract, entitled "Selling of Joseph."

Many of the colonial writings were by Puritan pastors, and are devoted to a discussion



of the doctrines and history of the colonial church. These include Cotton Mather's "Magnalia Christi Americana," and other works from the same author, all of which are written more or less in the style of Milton. His "Wonders of the Invisible World" was a leading factor in the Salem witchcraft trials, while his "Essays to Do Good" was praised by Franklin, who declared it a potent factor in influencing his life for good. The writings of Cotton Mather embrace 382 publications, but most of them have not been preserved. Roger Williams was the foremost advocate of religious tolerance and a strong sympathizer with those who advocated kind treatment of the Indians, and criticized the intolerance of the Puritans in several excellent writings.

Jonathan Edwards, a student of Yale, minister, and president of Princeton College, attained the foremost place among the early preachers of America. He published "Freedom of the Will," a profound discussion of Calvinism, and "Treatise Concerning Religious Affections," a masterly analysis of the movements of the mind under religious influences. To this period also belongs Benjamin Franklin, who was presented by France with a medal bearing the inscription, "He seized lightning from heaven and the scepter from tyrants." He first attained fame by publishing "Poor Richard's Almanac," which he issued annually for twenty-five years, beginning in 1732. This publication was immensely popular on account of its concise calendars, and in the spaces between the notable days were pungent sayings containing excellent morals, such as, "It is hard for an empty sack to stand upright," "The cat in gloves catches no mice," "One to-day is worth two to-morrows," "Little boats should keep near the shore," "God helps them who help themselves," "He that goes a-borrowing goes a-sorrowing," "Little strokes fell great large oaks," "Dost thou love life, then do not squander time, for that is the stuff that life is made of," and "Who dainties love shall beggars prove." The longest and most interesting of his works is his "Autobiography," but his shorter writings are also of interest, particularly "Dialogue Between Franklin and the Gout," "Story of the Whistle," and his works on scientific subjects, entitled "Papers."

REVOLUTIONARY PERIOD. The literature of the Revolutionary period embraces many excellent works devoted to the discussion of political rights, much of which appeared in the form of speeches by eminent champions of liberty. These include Samuel Adams, Josiah Quincy, Patrick Henry, Thomas Jefferson, Alexander

Hamilton, James Madison, George Washington, and Thomas Paine. The most noted of these writings embrace the works of Thomas Jefferson, who wrote "Notes on Virginia," the "Declaration of Independence," and many able state papers. Alexander Hamilton, of whom Webster said, "He smote the rock of national resources and abundant streams of revenue burst forth," contributed many papers as treatises on government in the *Federalist*, and may be regarded the father of the American financial system. The *Federalist* published at various times a number of contributions from John Jay and James Madison. The latter made the first draft of the national Constitution and published the "Madison Papers," embracing the debates and speeches of the constitutional convention. Madison's "Notes on Virginia" and his first "Inaugural Address" take high rank in the literature of this period. The writings and state papers of George Washington fill twelve volumes, but his "Farewell Address," which was prepared and published in 1796, is the most celebrated. Fisher Ames produced many excellent orations during the administration of John Adams. The best of these were delivered in 1796 and relate to the treaty with Great Britain. Thomas Paine exerted a strong influence on the colonists by publishing his "Common Sense," which was issued immediately preceding the Revolution, and afterward went to France and published "Rights of Man" in reply to Burke's "Reflections," the latter relating to a justification of the French Revolution. Subsequently he forfeited his great popularity in America by publishing "Age of Reason," in which he attacked the Christian religion.

Little poetry of note was produced in the period of the Revolution, and the valor of its heroes remained unsung for more than a generation after independence was secured. The most noted poem of this period is "McFingal," by John Trumbull, which appeared in part in 1775 and in a complete form in 1782, and went through thirty editions in America. Though a fine American political satire, it is rather droll, but has touches of real humor, and was intended as a satire on the Tories of America. Some parts of it have come to us as proverbs, for instance:

"No man e'er felt the halter draw  
With good opinion of the law."

The "Columbiad," an epic in ten books, was published by Joel Barlow (1755-1812), who is also author of the humorous poem, "Hasty Pudding." Timothy Dwight (1752-1817), president of Yale for twenty-one years, is the au-



thor of an epic in eleven books, the "Conquest of Canaan," but is better known by his many church hymns, such as, "I Love Thy Kingdom, Lord." "Yankee Doodle" sprang up in the Revolutionary period, and was first played and sung by the British in derision of the New Englanders, who afterward adopted it as a military air. Francis Hopkinson (1737-1791), a signer of the Declaration of Independence, wrote the humorous ballad, "Battle of the Kegs," and his son, Joseph Hopkinson (1770-1842), wrote the popular song "Hail Columbia." The "Star Spangled Banner," another famous national song, was written by Francis Scott Key at the time the British invaded the United States, in 1814. Philip Freneau (1752-1832) attained fame by his "Wild Honey-suckle," "Indian Burying Ground," and other graceful poems regarded as forerunners of the lyrics of Bryant and Longfellow. The first American man of letters to maintain himself altogether by his writings was Charles Brockden Brown (1771-1810), a Quaker of Philadelphia, who may be regarded a forerunner of Poe and Hawthorne. His best-known writings include "Wieland," a heroic romance, and "Arthur Mervyn," a description of the plague which ravished Philadelphia in 1793.

TRANSCENDENTAL PERIOD. The American writings up to the close of the 18th century were largely imitations of the English models, and the *Edinburgh Review* sneeringly asked, "Who reads an American book?" Though there was no immediate reply that seemed to satisfy, a new era in American literature dawned when Washington Irving published his "Knickerbocker's History of New York." This work appeared in 1809, and not only stood on its own merits, but at once sprang into great popularity. From that time until 1826 Irving busied himself largely with the "Sketch-book," which includes the famous short stories of "Rip Van Winkle" and "Legend of Sleepy Hollow." Other writings by this famous author embrace "Tales of a Traveler," "The Alhambra," "Astoria," "Life of Washington," and "Life of Oliver Goldsmith." James K. Paulding (1779-1860) published "Life of Washington" and a number of novels; Gulian C. Verplanck (1786-1870) published an edition of the "Plays of Shakespeare;" Fitz-Greene Halleck (1790-1867) is the author of "Marco Bozzaris;" Joseph Rodman Drake gave us his poems "Culprit Fay" and "The American Flag;" and Nathaniel Parker Willis (1806-1867) founded the *Youth's Companion*, a publication famous for its literature suitable for youth. To this period of literature belong the

writings of James Fenimore Cooper, who may be regarded the earliest eminent novelist whose style is distinctively American. In 1820 he published "The Spy," the first American historical novel, in which he gave the American public an interesting story of the Revolution. He published "The Pioneers" in 1823, and soon after followed the first of the series of five "Leather Stocking Tales." Cooper himself invented "Leather-Stocking," *Natty Bumppo*, who is represented as a back-woods philosopher and is the most original invention of character added to the world's literature by an American. Subsequently he published a series of sea tales, including "The Pilot," "The Red Rover," and "Wing and Wing." Cooper could not easily endure adverse criticism, and as a defense wrote several tracts against his opponents and brought a number of suits for damages. The romances of the sea and of the forest are his invention, in which he excelled, but in humorous efforts he was not successful. Several poets of this period succeeded in writing single poems that became great favorites, among them "Home, Sweet Home," by John Howard Payne; "I Would Not Live Alway," by William Muhlenberg; "The Old Oaken Bucket," by Samuel Woodworth; and "My Life is Like a Summer Rose," by R. H. Wilde.

William Cullen Bryant may be classed in this period. A poet at the age of nine years, he published a volume of verse at fifteen, entitled "Embargo." His "Thanatopsis," written at eighteen, shows mature thought and stately expression, and its gravity and dignity in blank verse is unexcelled by any recent writer. No one knew better than Bryant how to give interest to the solemnity of the forest and mountain, and to paint the impersonal beauty of nature. His individual poems include "Death of the Flowers," "Forest Hymn," "To a Water-Fowl," and "Fringed Gentian;" while among his stories of interest are "Letters of a Traveler" and "Tales of the Glauber Spa." He made a translation of Homer, spending four years on the "Iliad" and two years on the "Odyssey." Edgar Allen Poe is best known as author of the "Haunted Palace" and of "The Raven," and his best work in prose is his "Tales of the Grotesque and the Arabesque." He is well known as a critic and classed Hawthorne as a great novelist and Longfellow as a worthy poet before either was known to the world. Nathaniel Hawthorne may be regarded the greatest American novelist. His first production to attract attention appeared in 1837 as a part of the series



known as "Twice-Told Tales." At Concord he published "Mosses from an Old Manse" and another installment of "Twice-Told Tales." The "Snow Image," the most beautiful of his tales, appeared some time later. In 1850 he published "The Scarlet Letter," which may be regarded the most artistic product in American literature. The scenes of his writings are laid within the limits of Massachusetts; "Marble Faun" is the only exception. Other well known writings from the pen of Hawthorne include "Great Stone Face," "Grandfather's Chair," "Tanglewood Tales," "House of Seven Gables," "Blithedale Romance," and "Legends of the Province House."

This period of American literature is famous as an epoch of orators, including such eminent statesmen as Daniel Webster, Henry Clay, John C. Calhoun, and Edward Everett. Daniel Webster may be regarded the greatest American orator, and his speeches rank in literature with those of Demosthenes, Cicero, and Burke. His membership in Congress covered a period that called for men of strong intellectual and oratorical powers, and the events connected with his life were such as to bring out to the best advantages his great fertility of mind. The most famous of his orations include the one delivered at the laying of the cornerstone of Bunker Hill monument in 1825; the one at the completion of the monument in 1843; eulogies of Presidents Adams and Jefferson in Faneuil Hall, Boston, in 1826; his reply to Hayne in 1830; and his oration on Washington in 1832. These orations embody the finest sentiments of Americanism, and convey as a central thought that the Union should be preserved at whatever cost. Henry Clay, the *Great Reconciler*, is the author of the Missouri Compromise; of the Act of 1833 settling Nullification, and of the compromise measures of 1850. Calhoun ranks rather as a debater than as an orator, but his sympathies extended more closely to his own section, the South, than to the whole country. A champion of state rights, he contributed the most able arguments in favor of that view in government. Everett belonged to the illustrious orators of Boston, but he did not possess the massive strength of Webster. None of his contemporaries had so complete an education, and his speeches are among the most polished contributed to American literature. Other eminent orators of this period include Rufus Choate, an orator of much intellectual strength, and William Ellery Channing, famous as a leader in the Unitarian movement. The latter is the author of two very able

works: "Life of Napoleon Bonaparte" and "Essays on John Milton."

Ralph Waldo Emerson, the friend of Carlyle, ranks as an eminent writer of this period, and is particularly famous as a factor in the Carlyle-Emerson correspondence. His prose works were mostly delivered as lectures, and include "Society and Solitude," "Representative Men," and "Letters and Social Aims." Many passages in his writings are majestic in thought and rhythm, but his style is the condensed epigrammatic. His oration on the "American Scholar," delivered in 1837, is an epoch-making production, and his chief poems are "Snow Storm," "Concord Hymn," and "Bumble Bee." The transcendentalists, who supported a form of idealism, include Emerson, who may be regarded the greatest of this class of writers. They represent the idealistic in poetry and prose, thus favoring the German philosophy rather than the English materialistic writings. *The Dial*, a periodical published at Concord, was the chief organ of the transcendentalists, and in it were published the chief poems and prose writings of this school. Louise M. Alcott, author of "Little Women," "The Old-Fashioned Girl," and "The Spinning-Wheel Stories," belonged to this class of writers. Other writers include Henry David Thoreau, who found intense enjoyment in simple life and spent two years in a cabin on the shores of Walden Pond, Concord, where he lived as a means of closely observing nature. The best known of his works embrace "A Yankee in Canada," "The Maine Woods," and "Cape Cod." Margaret Fuller (1810-1850) was prominent in this class of writers, and is well remembered by her plea for equality before the law, and by her "Woman in the Nineteenth Century," "A Summer on the Lakes," and "Papers on Literature and Art."

RECENT PERIOD. The second period of American literature, that from 1840 to the present time, begins with the so-called Cambridge poets, whose center was at Harvard College. These writers embrace four of the most famous Americans: Longfellow, Holmes, Lowell, and Whittier. Henry W. Longfellow, though influenced by the literature and historic associations of Europe, is eminently American in the treatment of his subjects. Endowed with an appreciative nature and enriched by college life, select reading, and foreign travel, he has never been surpassed in American literature. In 1841 he published such favorite poems as "The Village Blacksmith," "The Skeleton in Armor," and "The Wreck of the Hesperus," and soon after gave us "The Old Clock on the



Stairs." His greatest poem, "Evangeline," appeared in 1846, and is the story of an Acadian peasant girl. In 1855 he published "Hiawatha," an interesting poem, treating of the legends and traditions of the American Indians, whose plan was suggested by the German translation of the Finnish epic, "The Kalevala." Other writings of Longfellow include "Miles Standish," "Building of the Ship," and "Belfry of Bruges." Oliver Wendell Holmes is particularly famous for his "Autocrat of the Breakfast Table," which appeared in the *Atlantic Monthly* in 1857, and afterward followed "The Professor," "The Poet," and "Over the Tea-Cups." His three novels include "Mortal Antipathy," "Elsie Venner," and "Guardian Angel." "Chambered Nautilus," "Old Ironsides," "The Last Leaf," and "Height of the Ridiculous" are among his excellent poems. James Russell Lowell inherited culture, if that is possible, and acquired an excellent education at Cambridge. He published three books in the autumn of 1848: "Sir Launfal," "Bigelow Papers," and "Fable of Critics." He is not a mountain poet like Bryant, or an ocean poet like Whittier, but touches with great beauty the birds, trees, and flowers. In his poems are included "The Courtin'" and "Indian Summer Reverie." "Among My Books" and "My Study Windows" are excellent critical works. John Greenleaf Whittier, frequently called the poet of anti-slavery, is the favorite American poet of many students. His writings show that he lived a dual life, one in the world of fancy and one in the world of fact, as is shown in his "Bare-Foot Boy" and "In School Days." The first half of his literary career was marked by earnest opposition to slavery, the writings of this period embracing productions both in verse and prose. His "Laus Deo," written when the bells pealed for the abolition of slavery, is the last lyric of this period. "Snow Bound" is a winter idyl, "Maud Müller" and "Among the Hills" are exceedingly graceful, and "Telling the Bees" is the most pathetic of his productions. Whittier ranks with Bryant as a nature poet, but he reflects the calm and beauty of scenic nature, while Bryant relies upon placing strength in the objects of his descriptions.

Harriet Beecher Stowe is famous in the anti-slavery group of writers, and is best remembered by her "Uncle Tom's Cabin," "Dred: A Tale of the Dismal Swamp," and "The Minister's Wooing." Wendell Phillips was the orator of anti-slavery, and devoted his education, wealth, legal abilities, and oratorical powers to the cause he espoused. He was recognized

as the representative of the movement in Faneuil Hall in 1837, which continued active until the Emancipation Proclamation was issued in 1863. William Lloyd Garrison's writings are important in the history of the antislavery movement rather than in literature, but they contain many lofty and inspiring thoughts. The speeches of Charles Sumner, published complete in twelve volumes, are scholarly and powerful arguments and supply almost a complete history of the contest.

William Hickling Prescott takes high rank among the distinguished American historians, and his first famous work is "The Reign of Ferdinand and Isabella." He published "The Conquest of Mexico" in 1843, "The Conquest of Peru" in 1847, and "The History of Philip II." in 1855. No one has surpassed Prescott in his treatment of these themes, but his work was done under great difficulties, owing to the fact that he was partly blind during a large part of his life. George Bancroft is famous among the historians who wrote of the Colonial and Revolutionary periods, and published the first volume of his "History of the United States" in 1834, and finally completed it in 1885. In this work he spent over half a century, consulting the archives of America and Europe for that purpose, and his writings are remarkably accurate in descriptive details. John Lothrop Motley stands preëminent as a historian, and in 1856 published "The Rise of the Dutch Republic," a historical work of vast value. Other writings from his pen include "The United Netherlands" and "Life of John of Barneveld." Francis Parkman is another famous historian. The difficulty under which he labored resembled that of Prescott, and he was confined in a dark room and unable to read for three years. His writings include "The Oregon Trail" and "The Conspiracy of Pontiac." Other famous historians include Jared Sparks, author of "Library of American Biography;" George Ticknor, writer of "History of Spanish Literature;" Horace Greeley, author of "Prayer of Twenty Millions;" and Alexander H. Stephens, writer of "Corner-Stone of the Confederacy." Other names that belong to the group of historians include Benson J. Lossing, Jefferson Davis, John Fiske, John Clark Ridpath, Justin Winsor, Carl Schurz, John Bach McMaster, and Herman Eduard von Holst.

The famous pulpit orators include Henry Ward Beecher, author of "Lectures to Young Men," "Aids to Prayer," and "State Papers." James Freeman Clarke, a Harvard man, published "Ten Great Religions," and Thomas Starr King, the famous Unitarian pastor of Boston,



wrote on religious and patriotic subjects and published "White Hills." David Swing is the author of "Life Immortal" and "Truths for To-day;" DeWitt Talmage published many sermons and religious writings. Chas. M. Sheldon is the author of "In His Steps," "For Christ and the Church," and many other writings.

The recent writers are very numerous. Bayard Taylor, author of "Views Afoot" and "Songs of Summer," and translator of Goethe's "Faust," takes high rank. Walt Whitman won extensive notice by his "Leaves of Grass," which appeared in 1855, and afterward published "Drum Taps" and "Memoranda" during the war. Will Carleton is eminently popular as the author of "Poems of Farm Life" and as a lecturer, while James Whitcomb Riley has attained much popularity. His best-known writings include "Afterwhiles," "Knee Deep in June," and many popular poetical and prose writings in the hoosier dialect. Eugene Field is famous as a writer of poems for children, such as "Little Boy Blue" and "Wynken and Blynken and Nod," but we are also indebted to him for many humorous and satirical writings. Bret Harte is remembered for his "Luck of Roaring Camp" and "Outcasts of Poker Flat;" Joaquin Miller for his "Songs of the Sierras;" and E. E. Hale for his "Man Without a Country." A. E. Sweet, Josh Billings, Artemus Ward, Robert J. Burdette, E. W. Nye, Samuel L. Clemens, and Francis R. Stockton are among the well-known humorists.

The recent essayists include Josiah G. Holland, Charles D. Warner, John Burroughs, and Donald G. Mitchell. Edmund C. Stedman, Edwin P. Whipple, George W. Curtis, and Richard G. White are among the critics. The recent women verse writers embrace Alice and Phoebe Cary, Helen H. Jackson, and Lucy Larcom. Henry James, W. D. Howells, George W. Cable, Thomas W. Higginson, Edward Eggleston, Elizabeth Stuart Phelps, Edward P. Roe, and Henry James Howells are among the recent novelists. The miscellaneous writers embrace Maurice Thompson, Ella Wheeler Wilcox, George Ade, R. H. Stoddard, George Edward Woodberry, Richard Hovey, Thomas Bailey Aldrich, Theodore Roosevelt, Edward S. Ellis, Henry Harland, J. K. Bangs, and Marietta Holly.

**AMERICAN PARTY.** See **Know Nothings.**

**AMERICAN UNIVERSITY,** an educational institution situated in Washington, D. C., which is designed for post-graduate students. It was chartered in 1891, when the citizens of

Washington donated ninety acres of land for that purpose. The institution is under the patronage of the Methodist Episcopal Church. It is governed by a board of trustees of fifty members, among whom are included as ex-officio members the President, Vice-President, Chief Justice of the Supreme Court, and the speaker of the House of Representatives of the United States. The courses of study are designed especially for college graduates, and the bachelor's degree or its equivalent is necessary for entrance.

**AMERICUS** (ă-mēr'ī-cūs), a city in Georgia, county seat of Sumter County, 70 miles southwest of Macon, on the Georgia and Alabama and the Central of Georgia railroads. It has a considerable trade and is surrounded by a fertile country. There are excellent schools and churches, good municipal facilities, and a female college. The manufactures embrace machinery, tobacco products, utensils, earthenware, and clothing. The first settlement in its vicinity was made in 1832 and it was incorporated in 1855. Population, 1900, 7,674.

**AMESBURY** (āmz'bēr-ī), a town in Essex county, Mass., forty-two miles north of Boston, on the Boston and Maine Railroad. It has electric street railway facilities, waterworks, several libraries, and excellent school and church buildings. The manufactures include carriages, boots and shoes, woolen goods, and machinery. It was the home of the poet, John G. Whittier, who removed here in 1836 and made it his residence until his death. Amesbury was incorporated in 1666. Population, 1905, 8,840.

**AMETHYST** (ăm'ē-thīst), the name of a crystallized quartz or rock, usually purple or bluish violet in color. Varieties that are characterized by beauty and hardness command a high price. The color is not always uniformly diffused, and by candlelight it appears less brilliant than in sunlight. The best specimens are brought from Ceylon, Armenia, Arabia, and India. Amethyst is regarded a precious stone, and is used largely in making rings, seals, and other articles of jewelry. The Greeks supposed that it was a protection against drunkenness and recommended that it be worn by those addicted to that habit.

**AMHERST** (ăm'ērst), a town of Massachusetts, in Hampshire County, 23 miles north of Springfield, on the Vermont Central and the Boston and Maine railroads. It is beautifully situated in the valley of the Connecticut River, within sight of Mount Holyoke, and is the seat of Amherst College. It has manufactures of straw hats and a considerable trade in prod-



uce and merchandise. The first settlement was made in its vicinity in 1703. Population, 1905, 5,313.

**AMHERST**, a town of Nova Scotia, capital of Cumberland County, nine miles east of Sackville. It is located on the Intercolonial Railroad and on an arm of Cumberland Bay. Shipbuilding is the chief industry, and coal is mined in its vicinity. Population, 1901, 4,964.

**AMHERST COLLEGE**, an educational institution at Amherst, Mass., founded as the Collegiate Institute of Amherst in 1821, but changed to Amherst College in 1825. The property and endowments are valued at \$2,500,000. It has a faculty of thirty-eight instructors, 420 students, and a library of 78,000 volumes. The institution carries advanced courses of study, and numbers among its alumni some of the most prominent educators of America. It is maintained in the interest of Christian education, having been founded by an association of Congregational and Presbyterian ministers, and about one-fourth of the graduates enter the clergy.

**AMIENS** (ä-mĭ-än'), a city of France, capital of the department of Somme, seventy miles north of Paris. It is finely located on the Somme River, which is navigable for small craft, and has excellent railroad and electrical car line advantages. The streets are regularly platted and paved, and it is the seat of a Gothic cathedral, one of the finest in Europe. It has a fine public library of 100,000 volumes, several parks, and a statue of Peter the Hermit. Amiens is noted for its extensive manufactures of velvet and cotton goods. Other manufactures include silk, linen and woolen textiles, machinery, pottery, and clothing. The Treaty of Amiens, which restored peace between France, Holland, England, and Spain, was concluded in 1802. In 1870 it was taken by the German army, after a decisive victory over the French. Population, 1901, 90,758.

**AMMON** (äm'mŭn), an ancient diety worshiped in many countries of Africa and Europe. The Egyptians celebrated him in temples at Thebes and in the Libyan oasis of Ammonium, and dedicated many statues to his honor. He was worshiped by the Greeks as identified with Zeus, while the Romans associated him with Jupiter. In statuary he is represented as a man with a ram's head.

**AMMONIA** (äm-mō'nĭ-ä), a volatile alkali. It is a colorless gas, having a penetrating, pungent odor and a burning taste. Though combustible, it will not burn in air. It was first made in the Libyan Desert, in Africa, from

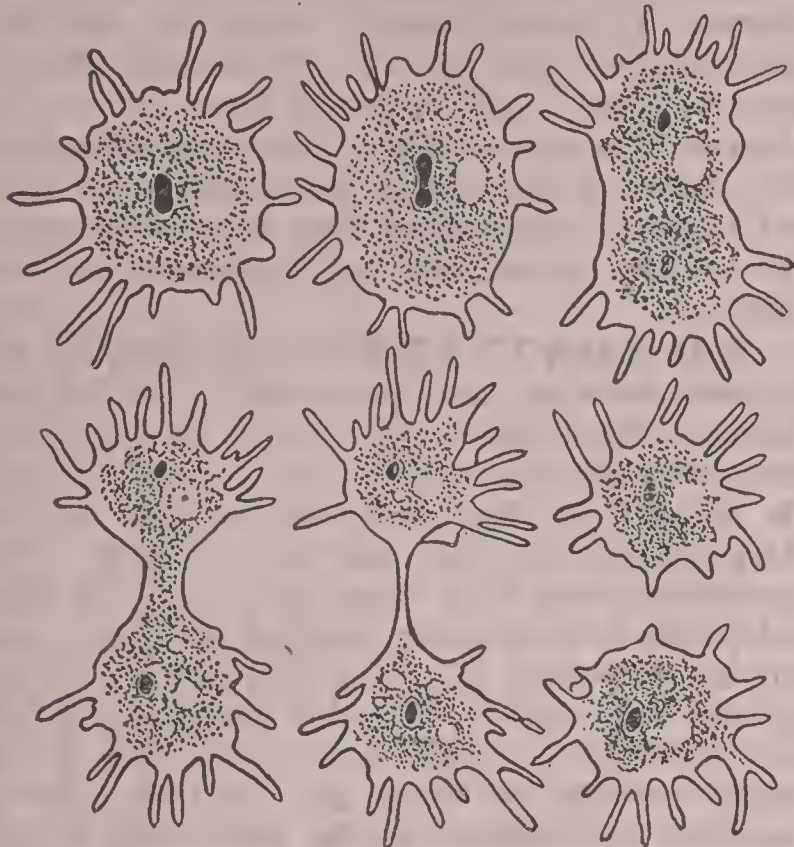
decaying animal matter gathered by the Arabs at the temple of Ammon, hence the name ammonia. The name *hartshorn* is frequently applied to this substance from the circumstance that it may be prepared by making shavings of horns. It is now derived chiefly by distilling coal and refuse animal substances gathered promiscuously, such as hoofs, horns, bones, etc. Ammonia is also obtained from vegetable matters, when it contains a considerable per cent. of nitrogen. The chief uses are for medicine, for motive power, and in the manufacture of ice.

**AMMUNITION** (äm-mŭ-nĭsh'ŭn), the primer, powder, and projectiles used in firearms. These articles are made up ready for use in small arms and small cannon, when it is known as *fixed ammunition*, and in the larger guns they are put in separately. The projectile used in a large gun is put in first, after which the powder, handled in a brass case or in cloth bags, is placed, and the primer explodes the charge. Fixed ammunition is put up in cases of brass and pasteboard, or in cases entirely of brass, and in this form is sold on the market, or the cases may be obtained separately and afterward loaded to meet the requirements. The government of most countries supervises and controls the manufacture of ammunition for the army, or it is manufactured to order under careful inspection. Formerly field artillery carried between 150 and 200 rounds per gun with the battery and a reserve of as much more, but at present the quantity kept ready for use is larger, since the rapid-fire and automatic guns make it necessary to have a large supply available. The ammunition in the caissons is used first, and further supplies are drawn from the ammunition columns, the rule being to use the ammunition in the limber only when no other is available.

**AMOEBA** (ä-mĕ'bä), a genus of microscopic animals, belonging to the lowest class of Protozoa. Several species have been described, all of which are viscid like glue, and the specific gravity is little greater than water. An amoeba is an irregular mass of protoplasm, semi-transparent, and has the power of locomotion by means of a streaming movement of the protoplasm. A small portion within the mass, called the *nucleus*, is somewhat darker than the general brown color, and small projections, known as *pseudopodia*, are thrust out at certain points of the body while others behind them are retracted, and it is by these processes that locomotion is possible. The same motion is essential in taking in food, which



is done by the pseudopodia flowing around digestible objects and extracting from them nutritious substances. In this animal the processes of nutrition, sensation, motion, and repro-



AMOEBEA.

Showing how an amoeba is divided in the process of growth.

duction are all performed by a single cell. Its power of sensation is such that it keeps in water of a medium temperature, and moves from the source of light and objects that endanger it. These characteristics have caused it to be selected as the subject of treatises on biological subjects. It is found in pools of water and swamps, and usually clings to some object, such as dead leaves and weeds.

**AMNESTY** (ăm'nēs-tỹ), an act of pardon, the effect of which is that persons guilty of political offenses will not be called upon to answer for them. The amnesty may be either *absolute* or *qualified*. An instance of the latter may be found in the proclamation issued by Napoleon on his return from Elba in 1815, in which amnesty was declared for the benefit of all except thirteen persons, whom he named. Only five amnesties have been issued in the United States. These were all relative to the Civil War, the first by Lincoln and the remaining four by Johnson.

**AMORITES** (ăm'ō-rīts), a powerful nation of ancient Canaan, whose possessions extended on both sides of the Jordan River. The Amorites occupied the whole of Gilead and Bashan, and formed two kingdoms—the northern governed by King Og, and the southern by King Sihon. The former is spoken of as King of

Bashan, and the latter as King of the Amorites. They were conquered by the Israelites, after the death of Moses, under the leadership of Joshua.

**AMOY** (à-moi'), a city in China, on an island of the same name, in the province of Fukien. It is located on the strait of Formosa, near the mouth of the Pei-chi or Dragon River, and ranks as one of the chief seaports on the Pacific, having long been an open port. The harbor is large and deep. It has a growing trade in tea, opium, paper, cotton, and earthenware. Deposits of coal abound in the vicinity. Population, 96,800.

**AMPHIBIA** (ăm-fīb'ĩ-à), the term used to designate a class of vertebrate animals which can live for a considerable time either on land or in water, and which for one part of their existence live in water and at another on land. They include the frog, tortoise, lizard, crocodile, snake, salamander, and many others. In the larval stage they possess gills, and some species, when fully developed, are able to breathe either by the gills or the lungs, and many retain the gills throughout life.

**AMPHITHEATER** (ăm-fĩ-thē'à-tēr), or **Colosseum**, a spacious building, usually oval shaped, used by the Romans for gladiatorial contests, wild beast fights, and other spectacles. The largest of these structures was the Flavian, known as the Colosseum, which was begun by Vespasian and finished by Titus in the year 80 A. D., ten years after the destruction of Jerusalem. This structure is now in a better state of preservation than any other. It covers five acres of ground, and had a capacity sufficient to seat 87,000 persons. The length is 612 feet and the breadth is 515 feet. Titus dedicated it by a celebration lasting a hundred days, during which time 5,000 wild beasts were slain. Many of the amphitheaters were used as castles and for fortifications in the Middle Ages. In modern times the name came to be applied to any oval or circular building with tiers of seats overlooking an arena or a central space.

**AMPUTATION** (ăm-pũ-tā'shũn), in surgery, the removal of any part of the body or limbs on account of disease or injury. An operation of this kind is advisable in cases of serious accidents and diseases, in which life would be endangered if the part were allowed to remain, especially in such diseases as gangrene and malignant growths. Amputations are either *flap* or *circular* with reference to the manner in which the flesh is cut. In the former the flesh is cut in a slanting direction to the bone so as to leave one or more flaps to cover amply the end of the stump, and in the



latter the skin and superficial fascia are divided by the knife around the limb, loosening the skin about three inches, then dividing the muscles and using sufficient to cover the bone. The flesh is removed before the saw is applied. Most surgeons consider an amputation at the joints more serious than in the continuity of the limbs, while an operation at the hip joint and near the vital organs of the trunk need a skillful operator and are attended with considerable danger. Amputations were practiced by the ancient, but a great many deaths resulted because practitioners did not understand the methods of preventing infection, severe bleeding, and blood poisoning.

**AMRITSAR** (üm-rit'sür), a city of India, in the Punjab, 40 miles east of Lahore. It is the capital of a district of the same name and the center of the Sikh religion and learning. An extensive commercial trade is carried on with Central Asia. The chief manufactures are shawls and silks. It is at the junction of several railroads and the seat of a number of schools, a dispensary, and the marble Darbar Sahib, the chief temple of the Sikh faith. Population, 1901, 162,548.

**AMSTERDAM** (äm'stēr-däm), a city of New York, in Montgomery County, on the Mohawk River, thirty-two miles northwest of Albany. It is on the Erie Canal and on the West Shore and the New York Central railroads. It is surrounded by a fertile region, and has an extensive trade in general merchandise. The chief manufactures are carpets, paper, brooms, hardware, vehicles, cigars, and clothing. The streets are substantially paved with stone and macadam. It has electric street railways, waterworks, sewerage, a public library, and other facilities. It is the seat of a fine public school system, several private educational institutions, and a number of excellent church buildings. The first settlement in its vicinity was made in 1778, when it became known as Veedersburg, and it was incorporated under its present name in 1830. Population, 1905, 23,943; in 1910, 31,267.

**AMSTERDAM**, one of the chief commercial cities of Europe, capital of Holland and of the province of North Holland, and the metropolis of the Netherlands. It is situated on an inlet of the Zuyder Zee, ten miles east of Haarlem, and is the converging center of many important railroads. Owing to the low and marshy condition of the site, the greater part of the city is built on piles driven deep into the ground. It is protected by dikes against the tides that rise higher than the level of the city. A system of canals divides it into about

ninety islands, which are connected by nearly 300 bridges.

The city has many excellent and substantial structures, among them the government palace building, erected in 1648. It contains many fine churches, a majority belonging to the Dutch Reformed Church, but the inhabitants include a considerable number of Lutherans, Catholics, and Jews. It is a noted educational center, being the seat of a thoroughly organized public school system, numerous colleges and academies, hospitals, and other public institutions. The chief manufactures are clothing, pottery, lumber products, sailing vessels, glassware, books and printed matter, engines, and machinery. A large majority of the inhabitants engage in manufacturing and commercial enterprises, and the domestic and foreign commerce has long taken high rank. Indeed, it ranks among the leading commercial centers of Europe.

In the 13th century Amsterdam was a small village with a few hundred fishermen, but it rose rapidly with the extension of the Dutch colonial interests. Owing to wars and other causes it declined somewhat in the 18th century, but in the last century it again rose to importance, and now surpasses its former high mark of prosperity. All the modern conveniences, such as telephones, electric lights, waterworks, libraries, and boulevards, have been provided for the convenience and enjoyment of its citizens. Intercommunication is facilitated by electric surface lines, by canals, and by a suburban system of steam railways. Population, 1906, 564,186.

**AMU**, or **Amu-Darya**, See **Oxus**.

**AMUCK** (ä-mük'), or **Amok**, a custom practiced in Java and other islands of the Malay Archipelago by natives who have become ferocious through the excessive use of opium. Maddened by the effect of the poison, the crazed victim of the opium habit rushes to the street with a dirk knife and seeks to stab those who may come in his way. On being seen in this condition, the population are aroused by the cry of *amuck* and the madman is captured and put to death.

**AMUR** (ä-mōor'), or **Amoor**, an important river of Asia, one of the great streams of the world, formed by the junction of the Shilka and Argun rivers. It has a basin covering an area of 796,000 square miles, and its estimated length is 2,739 miles. The Amur forms a part of the boundary between Siberia and China, penetrates the Khyngan Mountains, and flows into the Sea of Okhotsk, through the Gulf of Amur. Among its chief tributaries



are the Sungari, the Ussuri, the Seya, and the Bureya.

**ANABAPTISTS** (än-ä-băp'tists), a name sometimes applied to the denominations of Christians that deny the validity of infant baptism, but more properly used to designate a peculiar sect that laid claim to supernatural power. This sect was founded in 1517, under the leadership of Thomas Munzer, at Zwickau, Germany. They took part in the Peasants' War but were defeated near Muhlhausen in 1525. Munster, in Westphalia, became their center of influence in 1533, where they were defeated by a military force sent against them on a charge alleging that they practiced gross immoralities. This sect differed in many points of doctrine from the Baptists, but, like the latter, protested against infant baptism.

**ANABASIS** (ä-năb'ä-sis), the title of two Greek historical works. The "Anabasis of Cyrus" was written by Xenophon in the 4th century B. C., and in it is an account of the expedition of the younger Cyrus against his brother, King Artaxerxes of Persia, and of the retreat of the 10,000 Greeks. The other, known as the "Anabasis of Alexander," is the account of the campaigns of Alexander the Great, written by Arrian in 168 A. D.

**ANACONDA** (än-a-kön'da), a large serpent of the boa family, native to tropical America, but found chiefly in Brazil and Guiana. There are different well-known species, the typical form attaining a length of about thirty feet, but those usually seen in museums are not over twenty feet long. The eyes are small, the mouth is perfectly straight, the teeth are strong, and the color is blackish green above and yellowish below. These serpents feed on fish, small rodents, monkeys, and other animals, which they crush in their strong folds and usually swallow whole or only partly masticated. They are found mostly along the shores of lakes and streams. Their skins are used for making bags and shoes by the natives, who utilize their flesh as food.

**ANACONDA**, a city of Montana, in Deer Lodge county, about sixty miles southwest of Helena, on the Great Northern, the Northern Pacific, and other railways. It has a free library of 8,500 volumes, several fine school buildings, and good municipal improvements. The surrounding country contains valuable deposits of gold and silver, a circumstance that occasioned the rapid growth of the city. The manufactures are machinery, earthenware, clothing, brick, and smelter and machine shop products. It has a growing trade in merchandise, produce, and minerals. Anaconda has had a

rapid growth since 1884, when the copper reduction works were established. Population, 1900, 9,453.

**ANAEMIA** (ä-nē'mi-ä), the name applied to a morbid condition of the system produced by various causes, especially by a loss of blood and a deprivation of light and air in mines. A person afflicted with anaemia is characterized by great paleness and usually the blood vessels are easily traceable. The patient should have fresh air and good nourishment, especially such materials as tend to restore the vigor of the blood, including iron and arsenic treatment.

**ANAESTHETICS** (än-ës-thët'iks), a class of medicines used as drugs or inhaled in the form of vapor, which destroy consciousness for a time and with it the sense of pain. The value of such agencies was known to the ancients, but the scientific application dates from 1800, when Sir Humphry Davy recommended them for use in surgery. Homer and Herodotus mentioned the effects of nepenthe when used in surgery, and it is spoken of in that respect by Pliny, while various Chinese manuscripts allude to the use of a preparation of hemp for the same purpose. Faraday established the use of sulphuric acid in 1818, and Simpson in 1847 announced the value of chloroform, which has since been used as the chief anaesthetic agent. A solution of cocaine is injected by some practitioners to secure anaesthesia in certain parts of the body, a practice originated by August Bier, of Kiel, Germany. By this method the patient may witness in a conscious state the operation performed, as the amputation of a leg or arm, but this is not possible when the operation is in the trunk. A new anaesthetic known as *stovaine* was discovered by M. Fourneau, a French surgeon, in 1907, which is used in a similar way to produce paralysis of the body below the point of injection and removes all sensation from the limbs. With it properly administered it was found possible to amputate a limb while the patient retained consciousness, and, had he been allowed to do so, could have even witnessed the operation. Stovaine is a compound in the nature of cocaine.

**ANAGRAM** (än'ä-gräm), the transposition of the letters forming a word or sentence into a new word or sentence. The ancients constructed anagrams of divers words, often applying to the newly formed words a prophetic meaning. A true anagram is formed by transposing every letter in the original word and adding no new or different letter. For instance, the letters of Des Moines (Iowa) have been



transposed and the name *Seni Om Sed* originated, which is applied to an autumnal festival given in that city.

**ANAKIM** (än'ä-kim), a race of giants who lived in the southern part of Palestine at the time of the exodus of the Israelites. They are referred to as "the children of Anak," and settlements were made by them in the mountains of Judah and Israel. Joshua conquered them and destroyed many of their cities, but a remnant of them survived in Gath, Gaza, and Ashdod.

**ANALOGY** (ä-näl'ö-jī), a word used to express relation or close resemblance. It is used in grammar to express conformity with the structure of a language; in biology, to denote parts which agree in functions; and in mathematics, to designate similitudes of ratio.

**ANALYSIS** (ä-näl'i-sis), the process of resolving a whole into its parts, and opposed to synthesis, by which parts are combined to form wholes. The term *analysis* is applied in many branches of study, especially in chemistry, mathematics, and physics.

**ANALYTICAL GEOMETRY.** See **Geometry.**

**ANAM** (ä-näm'), or **Annam**, a country of Asia, situated south of China, east of Siam, and west of the South China Sea. Southwest of it is the Gulf of Siam. The drainage is chiefly by the Mekong River, which forms a part of the boundary between it and Siam, and flows through the southern portion. It embraces the once separated states of Tonquin and Cochin-China, and includes the ancient kingdom of Cambodia. At present it is divided into three parts: Tonquin in the north, the country of the Laos southwest of Tonquin, and nearly the whole of Cochin-China; a portion of the latter has belonged to France since 1867. The area comprises 170,100 square miles. In the north and south are rich alluvial plains, while the interior is more or less diversified by mountain ranges, and the coastal regions are generally fertile. There are extensive deposits of iron, copper, silver, gold, manganese, and coal. The commercial products take rank among the best of Southern Asia, and include cereals, live stock, fruits, tobacco, and fish. Anam is governed as an absolute monarchy, though it is largely dependent on France. In 1872 it was recognized as independent of China by the French, on condition that the king allow the free exercise of religion, open divers ports to foreign vessels, and grant special commercial advantage to France. The French claimed a violation of the treaty of 1872 and occupied Tonquin by a military force in 1883, which resulted in placing

the country practically under a French protectorate. Buddhism and Confucianism are the chief religions, but a number of the inhabitants profess Christianity. Hue and Saigon are the chief seaport cities. The population of Anam aggregates 18,125,000.

**ANARCHY** (än'är-chÿ), a theory of political science, which is based upon the principle that each individual is entitled to freedom from civil authority, and that he of right possesses liberty of action in social and economic matters. The theory of anarchism developed in the 19th century, having its most eminent advocate in Jean Proudhon, a distinguished French jurist. It seeks to abolish all systems of law and government, and gives to the individual the largest freedom in society. While it may be considered as an ethical ideal of social relations, the application of its principles, though only individual or local, have resulted in harm and disaster. If the tendencies of men were pure and unselfish, and there were a standard of right both correct in itself and accepted and practiced by all individuals, it might be possible to successfully build a state or nation upon its tenets, but in practice it has led to revolution and terrorism. Many adherents, though at first pure and sincere in the belief, became contaminated with thoughts of destruction and assassination that have placed anarchy in the category of lawlessness.

No doubt the aristocratic and absolute governments of Europe have tended to increase the adherents of this political and social dogma, and as a natural result a large number of anarchists have emigrated to America. Paterson, N. J., has long been noted for the number of anarchists who settled in that city, and there are also many adherents in Chicago and New York. From these cities as centers of influence, literature in the form of circulars and periodicals has been sent broadcast, and efforts to secure adherents have been made through personal solicitations and public meetings. In 1896 disturbances occurred in Chicago in which a number of anarchists took part, and three assassinations in this country are charged to perpetrators who were supporters of anarchism—the assassination of Lincoln in 1865, Garfield in 1881, and McKinley in 1901.

The most prominent agitators and advocates of anarchism in the United States were Johann Most and Emma Goldman, both of whom were convicted under the laws of New York for directly inciting crime. The assassinations of M. von Plehve of Finland and Grand Duke Sergius in Moscow, in 1905, are chargeable more or less directly to anarchists stimu-



lated by the feeling of unrest and revolution in Russia. No doubt the evil results incident to a general spread of its supporters can be lessened by federal legislation, which would operate to limit writing and speechmaking designed to extend its influence. An anti-anarchist conference was held in Austria in 1898, owing to the assassination of the empress, and at this time there is a movement in the leading nations to curtail, if not eradicate, the spread of anarchistic influences.

**ANATOMY** (ă-năt'ō-mŷ), the science that treats of the form and structure of organic bodies, and shows their distinct formation, and the relation of each part to the other parts of such bodies. It implies the cutting up or dissecting, and is generally understood to apply to the human body, while the anatomy of animals is known as zoötomy, and that of plants as phytotomy. Hippocrates is held to be the father of medicine, but, since his views of the structure of the human body were superficial, he is not regarded the father of anatomy. Aristotle based his views on the dissection of animals, and is regarded the founder of the science. Human bodies were not dissected until 250 B. C., when it became common to dissect the bodies of criminals. Celsus wrote much on anatomy, and after his time many discoveries were made by the dissecting of apes and the bodies of other animals. For centuries a popular prejudice existed against allowing the body of a relative or a corpse of any kind to be dissected, which long retarded the progress of this highly important and useful department of knowledge. Many investigators were obliged to limit their dissections to the dead bodies of the lower animals, drawing analogies thence to the human frame, instead of directly studying the corpses of mankind.

Superstition retarded progress in the study of anatomy for many centuries, and scientists who announced new and valuable discoveries were either ruined in their attempts to develop useful results from them, or were burned at the stake. The circulation of the blood was not known to the ancients and was discovered by Harvey in 1619, who for years hesitated to announce this valuable addition to human knowledge, but when he made his discovery known popular disapproval ruined his medical practice. Discoveries made in the 18th and 19th centuries are numerous, and have greatly extended knowledge in the practice of surgery and medicine. The adoption of improved methods of practice so revolutionized the external and internal treatment of the human body that the average of

human life has been prolonged at least several years.

Anatomy as a science has become so systematized that it has been divided into several departments, which are studied with the view of fitting practitioners for special lines of practice. The surgeon is required to understand the relation of the different organs to each other that he may know how and where to apply his instrument in operating on the living body, while the physician must necessarily understand the structure of all parts that he may successfully administer medicines to affect the different organisms in the most beneficial way. The study of the bones of the skeleton, muscles, nerves, skin, digestive system, and other systems of the body is called descriptive anatomy. Investigations of the special organs, as the coats of the stomach and the cells of the lungs, is termed general anatomy. Study relating to the tissue cells and atoms by the use of the microscope is known as microscopical anatomy.

For convenience in the study of anatomy, the body is considered from the standpoint of its principal parts. These include the skeleton, constituted of the bones, joints, and cartilaginous formations; the muscular system; the skin; the nervous system, including the ganglia, nerves, spinal cord, and brain; the throat and mouth; the vocal organs; and the organs constituting the seat of the senses—the ear, the eye, the nose, the mouth, and the papillae. To the digestive system, which includes the alimentary canal, the muscular membranous tube into which food is taken to be digested while undergoing its more or less complicated course through the body, and which is constituted of the mouth, oesophagus, stomach, and intestines, belong the accessory organs, including the salivary glands, the pancreas, and the liver. The organs of circulation include the capillaries, the arteries, the veins, and the heart, while to the organs of respiration belong the throat, the windpipe, and the lungs. Other principal parts include the kidneys, the organs of reproduction, and the lymphatic system, with its vesicles and glands. See **Heart, Ear, Eye, Skin**, etc.

**ANCHOR** (ăn'kēr), in navigation, an implement for retaining a ship at a particular place by temporarily chaining it to the bed of the sea or river, which is called an anchorage. In early times bags of sand, large stones or wooden anchors weighted with lead were commonly employed for this purpose. Iron anchors were first used by the Greeks, and their manufacture was one of the most laborious industries, this being due to the fact that very



large hammers are required to weld and shape the materials. In modern times the steam hammer came into almost exclusive use for this purpose. It is a powerful implement, having an enormous force, and is easily applied in comparison to the sledge hammers wielded by



ANCHOR.

men. Anchor-making is now conducted on a large scale, and the occupation of an anchor-smith is considered an important one. Ships that have a tonnage of 1,000 tons usually require anchors weighing thirty cwt.; those having a tonnage of 3,000 require an anchor weighing thirty-five cwt., and others in like proportion. Most ves-

sels carry from two to ten anchors, this depending on the size of the ships and the routes to be sailed.

**ANCHOVY** (än-chō'vŷ), a small fish common in the Mediterranean Sea and the Atlantic shores of Europe. It belongs to the herring family, but is somewhat thicker, has a pointed head, a projecting upper jaw, and is esteemed for its fine flavor. It is caught in seines and used extensively for sauces and pastes. Several species of anchovy are found off the coasts of Canada and the United States, both in the Atlantic and the Pacific.

**ANCIENT ORDER OF UNITED WORKMEN**, a fraternal, mutual benefit association organized in 1868 by John J. Upchurch at Meadville, Penn. There are limited restrictions of occupation and its aims and purposes are purely benevolent. Three degrees are recognized in the order, each having its appropriate grips, signs, and symbols. The association has forty grand or State lodges, about 5,000 subordinate lodges, and a membership of 360,000 in the United States. Since its organization it has paid annually an average of about \$2,000,000 as benefits to members, but the disbursements at present aggregate \$7,500,000 per year. The supreme officers are elected annually in the supreme lodge, which is constituted of delegates sent by grand lodges, and the latter in turn are made up of delegates from subordinate lodges.

**ANCONA** (än-kō'nà), an important seaport city in Italy, capital of a province of the same name, about 130 miles northeast of Rome. It is built in the form of an amphitheater on the slope of two hills rising from the shores of the

Adriatic, has railroad facilities, and carries considerable export and import trade. The manufactures are paper, woolen and cotton textiles, musical instruments, silk hats, and machinery. The city abounds with fine statuary, among which is a colossal statue of Count Cavour. In the harbor is a mole 200 feet long built by Emperor Trajan, on which is the famous triumphal Arch of Trajan. Ancona was founded in the 4th century B. C., by refugees from Syracuse, but became a Roman colony in the 3d century B. C. It has belonged to Italy since 1860. Population, 1906, 57,310.

**ANDALUSIA** (än-dà-lōō'shĭ-à), a region in the southern part of Spain. It was part of the Roman province of Baetica, is a fertile district, and comprises an area of 33,663 square miles. Along the northern border extend the Sierra Morina Mountains, and the southern part is traversed by the Sierra Nevada. The Guadalquivir is the largest river and has a southwesterly course to the Atlantic. Fruit, grain, wool, cotton, and wine are the chief products. Copper and iron mining is carried on extensively. The Andalusian breed of horses has long been famous. For the purpose of government it is divided into the eight provinces of Almería, Cadiz, Cordova, Granada, Huelva, Jaen, Málaga, and Sevilla. The language spoken is Spanish with a slight mixture of Arabic. Population, 1900, 3,562,650.

**ANDAMANS** (än-dà-mänz'), a group of small islands in the Bay of Bengal, politically attached to British India. These islands have an area of 2,508 square miles, are well timbered, and by the Duncan Passage are divided into the Great and Little Andamans. The natives are of small stature and engage chiefly in fishing and the manufacture of clothing and utensils. Since 1858 the islands have been used as a penal settlement of India. The government is under a commissioner resident at Port Blair. Population, 1901, 18,190.

**ANDERSON** (än'der-son), a city of Indiana, county seat of Madison County, thirty-five miles northeast of Indianapolis, on the Cleveland, Cincinnati, Chicago and Saint Louis and other railways. It occupies a fine site on the west fork of the White River. The surrounding country is rich in farm produce and deposits of coal and natural gas. It has electric street railways, pavements, waterworks, electric lights, and several libraries. Among its chief buildings are a number of excellent schools, the county courthouse, numerous churches, and many excellent business blocks. The manufactures include machinery, clothing, cigars, earthenware, and



farming implements. The first settlement at Anderson was made in 1823 and it was incorporated in 1865. Population, 1900, 20,176.

**ANDERSON**, a city of South Carolina, county seat of Anderson County, 125 miles northwest of Columbia, on the Southern, and other railroads. The surrounding country is fertile. It has manufactures of tobacco products, machinery, and implements. The city has several fine public buildings and modern municipal facilities. Electric power it obtained from a station on the Senaca River, about ten miles distant. In 1827 the first settlement was made in the vicinity. Population, 1900, 5,498.

**ANDERSONVILLE**, a village in Sumter County, Georgia, sixty-two miles southwest of Macon. It is famous as the site of a Confederate prison from 1864 to the close of the war. The total number of prisoners received at the place aggregated 49,485, of whom 12,926 died from lack of food and sanitation. The superintendent, Henry Wirtz, was tried on a charge of mismanagement, found guilty, and hanged on Nov. 10, 1865. A national cemetery now occupies the site of the prison. In 1900 the village had a population of 245.

**ANDES** (än'dêz), the predominating mountain system of South America, extending from near the island of Trinidad across the northern part of the grand division, thence in a direction nearly parallel to the Pacific, and continuing almost to the Strait of Magellan. It is composed of two approximately parallel chains, between which are located wide and comparatively fertile valleys. On the north they are separated into three chains, in the center mainly into two, and in the south they unite into one. The chains are connected by transverse ridges, forming numerous mountain knots. The system forms a continuation of the Cordilleras of North America, from which it is separated by wide depressions at the Isthmus of Panama. From this point the elevations increase in height toward the south, reaching their highest point in Chile, where they culminate in the volcanic peak of Aconcagua, 23,910 feet, which is the highest elevation. The average height of the Andes is about 12,000 feet, and the system is from forty to 350 miles wide. The total area covered by the base of the system is more than a million square miles.

The Andean mountain system includes numerous tablelands, the most important being the plateau of Quito, 9,543 feet; the plateau of Casco, in North Peru, 11,000 feet; and the plateau of Bolivia, 13,000 feet. From most of these higher plateaus rise volcanic peaks,

which, together with the volcanoes located in the mountain ranges, include from forty to sixty still active the greater part of the year. The system is the most compact of the great mountain systems of the world, and hundreds of the peaks tower to immense heights; at least ten of them exceed a height of 20,000 feet. The system contains the source of all the great rivers of South America, except the main source of the La Plata, the Tocantins, and the São Francisco, which rise in the highlands of Brazil. In the northern portion the Orinoco dashes its waters toward the island of Trinidad, from the center flow a large number of the sources of the Amazon, which discharges great volumes of water into the Atlantic Ocean under the equator, while farther south some of the sources of the La Plata and the Colorado carry their waters toward the south and east. In the center of the system, on the high elevation between Peru and Bolivia, is located the wonderful inland lake Titicaca, 12,847 feet above the level of the sea, which has no outlet to the ocean, and is perhaps the only inland fresh-water lake. Its surface area is 3,800 square miles. The countries that include parts of the Andean mountain system are Venezuela, Colombia, Ecuador, Peru, Bolivia, Chile, and Argentina. Between their elevations are many fertile valleys and plains, notably among them the plain of Cuzco, which, under the burning sun of the tropics, has the climate and productions of the temperate zone. In the territory occupied largely by Peru reigned the ancient Incas, who attained a high state of semicivilization and whose works are still attested by gigantic ruins and wonderful cemeteries. Here were constructed great highways for travel, which crossed summits of the lofty peaks or passed through them by tunnels and in their course they extended over cañons and rivers by works of solid masonry. Peru and Chile still retain the highest conditions of civilization that have developed in South America.

The plant and animal life of the Andean system differs widely from that of the eastern portions of South America. Among the wild animal forms are the alpaca, llama, jaguar, puma, and the fleet deer. Bird life is especially rich with song and plumage, and includes the great condor, besides hundreds of varieties of smaller birds peculiar to the different altitudes. This highland region has extremely rich deposits of minerals, such as iron, lead, platinum, copper, coal, petroleum, silver, and gold. These yield large profits where the apparently indifferent inhabitants of the south-



ern continent have put forth an effort to develop mining. Many cities located in the Andes are at a great elevation, and consequently enjoy a perpetual season of cool and bracing atmosphere. Chief among these are Cerre de Pasco, Potosi, and Quito, the historic capital of Ecuador.

**ANDORRA** (än-dör'rá), a republic of Europe, Eastern Pyrenees, between the Spanish province of Lérida and the French department of Ariège. The area is 175 square miles, divided for the purpose of government into six parishes. It is surrounded by high mountains, is rich in iron and lead deposits, has some forests, and agriculture and manufacturing are the chief enterprises. Dairying and fruit culture receive careful attention. Charlemagne made Andorra an independent state because its inhabitants had rendered services to him while he was conducting an expedition against the Moors, and its autonomy has been preserved until the present. It is governed by a council of twenty-four, elected for four years, and the laws are administered by two judges, one chosen by the Bishop of Urgel in Spain and the other by France. Andorra, the capital, has a population of 1,000 and is the chief town. The population of the republic is 5,231.

**ANDOVER** (än'dō-ver), a town of Essex County, Mass., on the Merrimac River, twenty miles north of Boston, on the Boston and Maine Railroad. It is the seat of the Andover Theological Seminary, which was founded in 1808. This institution has a library of about 60,000 volumes, is under the direction of the Congregational Church, and has sent forth fully 3,250 ministers. Andover has excellent public schools, is connected with other towns by electric car lines, and is substantially improved by modern facilities. The manufactures include clothing, textiles, earthenware, and machinery. Andover was first settled in 1643 and was incorporated three years later. Population, 1905, 6,632.

**ANDRIA** (än'drê-ä), a city of Italy, in the province of Bari, thirty-two miles northwest of Bari. It is situated on a fertile plain, has railroad facilities, and is the center of large commercial interests. The city is the seat of several noted educational institutions, a Gothic palace, and a fine cathedral. Andria was founded by the Normans. Frederick II. built the noted Castello del Monte, located nine miles south of the city. Population, 1901, 49,569.

**ANDROS** (än'drös), an island in the Grecian Archipelago, the most northerly of the Cyclades. It is about twenty-five miles long,

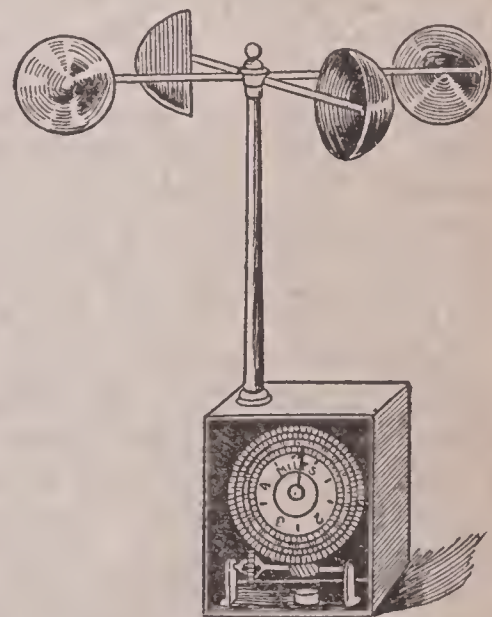
ten miles wide, and has a fertile though mountainous surface. Most of the inhabitants belong to the Greek Church. Andros, the capital, has a population of 2,160. It has a large trade in wine, fruits, and merchandise. The island has a population of 19,025.

**ANDROSCOGGIN** (än-drös-kög'gin), a river of New Hampshire and Maine, rises in Lake Umbagog, which is situated on the border between the two states. It flows through a portion of Maine, and discharges into the Kennebec River near Bath. The total length is 156 miles.

**ANEMOGRAPH** (ä-nēm'ō-gráf), a device attached to an anemometer to make it self-recording. Most forms of this instrument have a cylinder covered by paper, which moves uniformly by clockwork, and an indicator registers at the proper time both the changes in the velocity and the direction of the wind. The paper is ruled properly before being adjusted on the cylinder. The anemograph is frequently called a wind register.

**ANEMOMETER** (än-ē-möm'ē-tēr), an instrument for measuring the force and velocity of the wind. As ordinarily constructed, it consists of four hemispheres or cups mounted on the ends of crossed rods, on a horizontal plane, in such a manner that it may be rotated by the force of the wind. In a box below is a mechanism which records the revolutions made by a perpendicular shaft, and the indication is given by a hand moving round the dial. It has been found that the center of each cup moves with a velocity almost exactly one-third of that of the wind. Besides this contrivance, there are other instruments which serve the same purpose.

**ANEMONE** (ä-nēm'ō-nē), a genus of flowering plants having truncate leaf stems, calyx corollalike, and colored petals longer than the stamens. About sixty species are cultivated on account of their profuse and beautiful flowers. The flowers are either double or single and variously colored, usually white, red, blue, yellow, or creamy violet. These flowers thrive

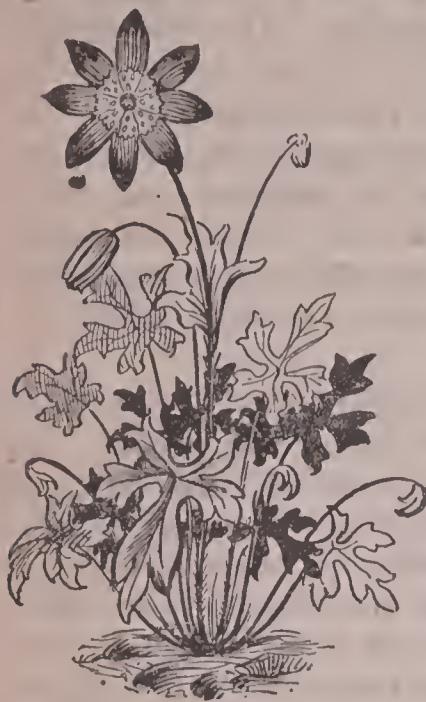


ANEMOMETER.



best in a light, loamy soil. The plants are propagated by offsets, seeds, and cuttings.

**ANGEL** (än'jĕl), a ministering spirit employed by God to administer comfort to men.



ANEMONE.

While angels are mentioned frequently in the Bible, only two are designated by name, these being Michael and Gabriel. Tobit, a book of the Apocrypha, mentions Raphael. We have scriptural evidence that angels became visible to men (Gen. xviii. and xxxii.), and that there were several orders of these beings, among them the seraphim, the cherubim, and the archangels. The popular belief that angels have wings is not a revealed truth, rather a poetical invention.

**ANGELUS** (än'jĕ-lŭs), a short Roman Catholic prayer, beginning with the words, "Angelus Domini nuntiavit Mariae," and recited at the ringing of the Angelus bell. It is offered in devotion to the memory of the Annunciation, at six o'clock in the morning and evening and at noon. J. F. Millet made the sound of the Angelus bell reaching the ears of a man and woman working in a field the subject of his celebrated painting, which was purchased by M. Chauchard in 1890 for \$150,000.

**ANGERS** (än-zhā'), a city in France, capital of the department of Maine-et-Loire, sixty miles southwest of Le Mans. It has a college, a cathedral, and a library of 40,000 volumes. In the vicinity are slate quarries. Leather, silks, chemicals, clothing, and machinery are among the manufactures. Statues of J. Bodin and René of Anjou, who were born here, are in the Place du Lorraine. Population, 1906, 82,935.

**ANGINA PECTORIS** (än-jĭ'na pĕk'tō-rĭs), or **Heart Stroke**, an intense pain which occurs in paroxysms in the region of the heart, or extends from the lower end of the chest-bone to the left arm. It is accompanied by faintness and suffocation, and successive attacks weaken and ultimately cause death. Men are more susceptible to it than women, especially after the age of fifty years. The disease is due to a cramp of the heart muscle, or a neuralgia of the cardiac nerves.

**ANGLE** (än'g'l), a term ordinarily used to designate a figure of two straight lines emanat-

ing from one point, the vertex, as a corner of a room. In general the term is used to express the inclination of two lines to one another. Four kinds of angles are distinguished in geometry, the plane, spherical, dihedral, and polyhedral.

**ANGLER** (än'glĕr), a fish common to the coasts of North America and Europe, and known by the different names of monkfish, fishing frog, and gooselike. It is classed with the family of spiny-ray fishes, has a length of from three to five feet, and its mouth is very large and fringed with barbels. On the top of the head are spines which it throws out as bait to its prey, attracting the smaller fishes, on which it feeds. Several species abound on the American coast from Nova Scotia to Florida, most of which attain a length of three feet, and all have a large mouth and are very voracious.

**ANGLES** (än'gl'z), or **Angli**, an ancient German tribe that occupied the country lying northeast of the Elbe, and subsequently settled in Schleswig, between the Saxons and Jutes. In the 5th century many Angles emigrated, and with large number of Saxons and Jutes colonized portions of England and Scotland. The Germanic portion of these immigrants founded the three kingdoms of Mercia, Northumbria, and East Anglia.

**ANGLESEY** (än'g'l-sĕ), or **Anglesea**, an island and county in the Irish Sea, belonging to Wales, from which it is separated by the Menai Strait. It is seventeen miles wide and twenty miles long, and is connected by railway with the mainland, which crosses the strait by the Britannia tubular bridge. The surface is quite level and the soil productive, and much of the land is in pasture. Copper is mined quite extensively, though agriculture and stock raising are the chief enterprises. Wheat, oats, barley, and potatoes are grown. Anciently the island was inhabited by Druids, and at present the Welch language is spoken largely by the peasants. Holyhead, Beaumaris, and Amlwch are the chief towns. Population, 1901, 50,590.

**ANGLICAN CHURCH** (än'glĭ-kan), the name applied generally to the Church of England, and sometimes used in reference to all the societies embraced in the Protestant Episcopal Church. In its strict application it refers only to the Church of England and the Protestant Episcopal Church in Scotland, Ireland, and the British Colonies. The ritual is contained in the "Book of Common Prayer," and in the Thirty-Nine Articles are laid down the doctrines of the church. As a body it is represented by its bishops from all parts of the world in the Lambeth Conference, which is



held at Lambeth Palace, under the presidency of the Archbishop of Canterbury. This assembly meets at irregular intervals when called by the archbishop, usually about every ten years, and its value consists chiefly in the interchange of counsel. Its most important session was held in 1888, when it promulgated a basis for the establishment of Christian unity.

**ANGLING** (än'gling), the art of alluring and catching fish by means of a rod, line, and hook. The hook is furnished with a bait or lure, which is an object of prey, or the imitation of such an object. Usually the rod is about twelve to twenty feet long, the line being attached to the small end, and containing one or more hooks baited with the lure. The line is thrown into the water, in which it floats from a cork, the cork serving as an indicator of the nibbling or bite of the game. When the fish has been caught, it is drawn from the water and the line is thrown out for more game. The practice of catching fish by angling is of great antiquity. Mention is made of it by the prophet Isaiah, in Chap. xix, 8, in these words: "The fishers also shall mourn, and all those that cast angle into the brooks." The practice has prevailed throughout all ages and in all countries, and is still a favorite means for pastime and profit. Juliana Berners, the prioress of Sopwell Nunnery, is the authoress of the oldest English work on angling. It was published by Wynkyn de Worde in 1496 under the title "A Treatyse of Fysshynge wyth an Angle."

**ANGLO-SAXONS** (än'glō-säks'ŭns), the name commonly applied to the people formed by an amalgamation of the Angles, Saxons, and other Germanic tribes, and who constitute the English, the Lowland Scotch, and a large portion of the present population of the United States and Canada. By far the greater number of tribes from whom the English-speaking people descended had their seat in the northern part of Germany. The first of these came to Britain about the year 449. From a preponderance of the Angles the country came to be called England, and the language the Angles or English. From Anglo-Saxon institutions have come many modern terms, such as earl, alderman, sheriff, and town. The language spoken by them was largely the language of North Germany, called Plattdeutsch, or Low German. Later it was modified by the Danes, during the Danish supremacy from 1017 to 1042. Still later the Normans, a people of French-Germanic origin, conquered England and introduced a new element into the language, thus giving rise to a number of dialects. These mix-

tures of tongues were modified largely by the writings of Chaucer in the 14th century, and by successive modifications the spoken tongue eventually developed into the modern English language.

**ANGOLA** (än-gō'lä), or **Portuguese West Africa**, a Portuguese colony in Western Africa, in Lower Guinea, situated south of the Congo Free State, and north of German Southwest Africa. It includes an area of 490,000 square miles and has a population of 4,500,000. Along the Atlantic is a coast plain about fifty miles wide, and beyond that the surface rises rapidly and culminates in elevations about 7,000 feet high. The Coanza is the great water course of Angola. It rises in Lake Mossamba, is about 700 miles long, and flows into the Atlantic Ocean. This stream is scenic and, besides other natural attractions, contains several gorges and a falls with a drop of seventy feet. The inhabitants include every shade of transition from the Negro to the Hamitic type, and every degree of culture from the absolute savage state to the almost semi-civilized condition common to Southwestern Africa. The products and exports consist largely of coffee, gum, wax, ivory, hides, tobacco, palm oil, and cereals. Saint Paul de Loanda is the principal city. It is a thriving seaport and the seat of the government of the colony. Near it is the oldest Portuguese settlement south of the Equator. The city has a large export and import trade, and is provided with railway and other facilities. In 1908 the colony had about 1,200 miles of railways in operation, including a line that penetrates to the interior of Central Africa.

**ANGORA** (än-gō'rä), a species of goat native to Angora, a division of the Turkish Empire, situated in the mountainous interior of



ANGORA GOAT.

Asia Minor. The goat is celebrated for its beautiful silky hair, which attains a length of about eight inches. This goat hair is used in the manufacture of yarn, known in the market



as Turkish yarn or camel yarn. The skin of this animal is used in manufacturing oriental morocco leather. The climate seems to favor the growth of hair on dogs, rabbits, and other animals as well as on the goat. When these animals are transported, the vigorous growth of the hair soon disappears, or it loses much of its fineness. Angora goats are reared quite extensively in some parts of Canada and the United States. The town of Angora, situated about 220 miles southeast of Constantinople, is the capital of a vilayet of the same name. It has a large caravan trade and a population of 35,500.

**ANGOULÊME** (än-gōō-lām'), a city in France, capital of the department of Charente, about sixty miles south of Poitiers. It is an ancient city, and in the old part the streets are crooked, but the newer section is platted regularly and has substantial buildings. It is the seat of a naval academy, a college, and a library of 25,000 volumes. The cathedral of Saint Peter dates from 1101. Among the industries are potteries, paper mills, machine shops, and woolen mills. Its location on several railroad lines gives it commercial advantage. Population, 1906, 37,507.

**ANGRA** (än'grà), a seaport on the island of Terceira, one of the Azores, and capital of the Azore Islands, a colony of Portugal. It has a good harbor and is a station for ships between Portugal and the ports of South America. The place is strongly fortified, has a military college and arsenal, and is the seat of a Roman Catholic bishop. The trade is chiefly in honey, wine, flax, and fruit. Population, 11,500.

**ANGUILLA** (än-gwīl'là), or **Snake Island**, an island of the Leeward group, in the British West Indies. The area is 34 square miles. It is low and has considerable forest, but some sections are well grassed and furnish good pasture for stock raising. Salt is obtained from a lake in the center of the island. Maize, tobacco, sugar cane, and cotton are grown profitably. The inhabitants are mostly Negroes. Population, 3,950.

**ANHALT** (än'hält), a duchy in the central part of Germany, surrounded by the provinces of Saxony and Brandenburg, with an area of 906 square miles. About 48 per cent. of the people engage in mining and manufacturing. The minerals include coal, granite, iron, and clays. Among the chief manufactures are sugar, soap, cement, leather, clothing, and chemicals. A large majority of the inhabitants belong to the Protestant Church. Agriculture is the principal occupation, in which

industry a large diversity of products are obtained. The duchy has a network of railroads and is in a prosperous condition. The capital, Dessau, has a population of 55,134. Anhalt has been governed by the reigning family for several centuries, but its present autonomy dates from 1863. Population, 1905, 328,029.

**ANHYDRITE** (än'hī'drīte), a mineral composed of anhydrous sulphate of lime. It is harder and heavier than gypsum, takes a fine polish, and is used for sculpture. Large deposits are found in Nova Scotia, at Lockport, N. Y., and in Lombardy, Italy. The Italian product is considered of the best grade.

**ANILINE** (än'ī-līn), one of the numerous products secured by the distillation of coal tar, but first obtained by distilling indigo with caustic potash. The article of commerce is secured largely from benzene. It is a colorless, oily liquid, but when exposed to air absorbs oxygen and turns to a deep brown color. It has a vinous odor and a burning taste, and ignites readily. It is used to produce every shade and all tints of colors, and is employed in the industrial arts for numerous other purposes, besides its extensive use for dyeing materials. Large quantities are employed in the manufacture of inks, for tinting pulps, and for the superficial staining of finished paper. Aniline is also used for a large variety of purposes in manufacturing lithographic inks, perfumery, and fancy soaps. The discovery of aniline dates from 1826, but its larger manufacture for commercial purposes was introduced in 1856 by Perkins of London, who discovered mauve aniline.

**ANIMAL** (än'ī-mal), an organic being rising above the vegetable life, especially in possessing will, sensibility, and the power to move from place to place, although there are some animals that have not the power to move from the place occupied. While in general there is no difficulty in distinguishing an animal from a vegetable, yet some forms so closely resemble each other that it is difficult to say whether certain peculiar organisms belong to the vegetable or animal kingdom. All vegetable and animal life consists of various groupings of cells, in the form of jellylike matter called protoplasm. At its beginning all life consists of a minute cell, filled with more or less protoplasm, in which is contained a darker opaque spot called the *nucleus*. Living bodies contain organs, and living matter is therefore called *organic matter* to distinguish it from nonliving or inorganic matter. Every kind of animal has peculiarities that adapt it to live best in some particular place and under partic-



ular conditions. Those belonging to any one country are called its *fauna*. The faunae of regions having warm and moist climates are much more extensive than those common to the cold and arid zones, while the sea has a much greater diversity of animal life than the land. Most animals live in the light, but there are some forms that live in dark caves, and whose organs of sight are not fully developed.

For convenience in study, Cuvier divided the animal kingdom into four great subdivisions; but others, among them Huxley, classified animal life into a greater number of groups. The subdivisions made by Cuvier will answer the purpose of this article, and are the following: vertebrates, articulates, mollusks, and radiates; the last three are usually called invertebrates. Each of these divisions is again subdivided into classes; the classes are divided into orders, and the orders into families. Vertebrates are those animals that have an inside skeleton, the backbone of which is called the vertebral or spinal column. To this subdivision belongs man, and it also includes the four-footed animals, birds, reptiles, amphibians, and fishes. Though the skeletons of these animal forms differ in many essentials, they are alike in having a backbone made up of numerous bones fitted together, each one of which is called a vertebra. Articulates include all animals whose bodies are made up of rings joined together. They have no inside skeleton, but their outside shell answers a similar purpose, all the muscles being fastened to it. Mollusks are soft-bodied animals, most of which have shells that serve as a protection for the body. Radiates have a radiated or starlike formed body; they have no head, and many of them have not the power to move from the place where they grow, being fixed like plants to a common trunk. In former times many animals of this class were supposed to be plants on account of their resemblance to vegetables in some particulars, such as corals and sponges.

Animals depend upon organic matter for food, which they derive from plants or from other animals. On the other hand, plants feed upon inorganic matter, and the food, with only a few exceptions, is in the gaseous or liquid state. Carbonic acid, which is generally poisonous to animals, is an essential constituent of the food of plants, while animals require free access to oxygen to sustain life. The food of animals is taken into the body to be digested and the nutritious parts are assimilated, but plants take food through their external surfaces and assimilation is effected by the aid of sunlight.

**ANIMAL HEAT**, in physiology, a term used to designate the heat produced in the interior of animal bodies, due to the nutritive changes taking place in the blood and the tissues. Living protoplasm being constantly at work disintegrating, the changes produced by it are accompanied by the evolution of heat. The temperature is dependent largely upon the degree of activity and the nature of living organisms. In general it varies from 96° to 100° Fahr., but sometimes falls as low as 90° and rises to 108°, though these extremes are due to a diseased condition of the body. Cold-blooded animals and even plants evolve some heat, and thereby are rendered slightly warmer than the surrounding atmosphere. Cold-blooded and warm-blooded animals agree in the development of heat, but differ in that the former possess greater means of losing heat by the skin and otherwise. In that class of animals the means of losing heat are considerable as compared to the amount of heat produced, while in the warm-blooded animals the production and loss of heat are about equal. Some writers apply the term *animal magnetism* to certain phenomena connected with animal organisms, especially in relation to man, and attribute to persons an influence similar to that exercised by a magnet on iron. This property is generally known as mesmerism, hypnotism, and clairvoyance. See **Mesmerism**.

**ANIMAL INTELLIGENCE**, the capacity which some animals have to know or understand, which in many respects resembles some of the intellectual characteristics of man. Many animals possess in a more or less highly developed form the senses of hearing, feeling, sight, smell, and touch, but in the lower forms some of these are not highly developed or are entirely wanting. Whether they possess the power to reason has been a subject for extended discussion, and scientists have generally decided the proposition in the negative. Like John Burroughs, they assign the traits in animals that seem to indicate reasoning to animal instinct, or class it as simply physical.

Insects and fishes possess a keen sense of smell, and it is thought that they depend to a large extent upon this sense in selecting their food. On the other hand, in birds and reptiles the sense of smell is not highly developed, though it is thought that the crow and other scavenger birds are attracted by carrion at a long distance. Birds are able to hear with remarkable accuracy, which is evident from the peculiar exactness with which some birds of song are able to reproduce notes uttered by other birds. Fishes are dull in respect to hear-



ing, but the dog is keen both in hearing and smelling, as is seen from the ability with which pointers are able to locate game and bloodhounds trace footsteps. The sense of taste is not well developed in most animals, and they seem to prefer certain classes of food from the odor rather than from the taste, though there are notable exceptions. Birds possess a singular keenness of vision, which is evident from the fact that an eagle is able to distinguish a prey beyond the range of the human eye. The cat, the owl, and some other animals are peculiar for their ability to see more or less in the dark, while the frogs and toads are able to distinguish objects only at short range in daylight. Some peculiarities are found in the sense of touch among animals, especially in the location of the seat of greatest sensitiveness, which in the bat is in the wing and in the cat it is reached through the whiskers. The elephant and the alligator have a skin so thick that the sense of feeling is not easily excited through many portions of the surface.

Some writers refer many acts of animals to their power to *imitate* human acts. This has reference to the tendency of a horse to turn into gates along the highway, which is especially noticeable in an old animal that has been driven until it has become tired. Cats and dogs wait outside during cold weather for the door of the house to open and in summer-time seek the cool shade, but they do so from habit and memory rather than the faculty of reasoning. The so-called educated hog and the trained horse frequently seen at exhibitions do not reason, but learn to act in conformity with the questions of the trainer. It is no more difficult for the horse to select a particular color or object when requested to do so, than it is to follow the directions of gee and haw. *Trixie*, the famous trained horse that has been exhibited in Europe and America, is a marvel in this respect. Modern writers incline to the view that animals possess a high degree of affection and tenderness for their kind, especially the young, as is seen in the care given by some birds and the lion to their offspring. Ernest Thompson Seton, in his "Wild Animals I Have Known," brings this trait out with unusual interest.

**ANISE** (ăn'is), an annual plant native to Egypt and the Levant, and now cultivated in various parts of America and Europe. About seventy-five species have been described. The common anise is about two feet high, and the *star anise*, a native of China, is a small tree. The fruit is known as aniseed, which yields a volatile oil known as oil of anise. It is used

in the manufacture of liquors, as an aromatic in medicine, and for carminative and flavoring purposes.

**ANNAM.** See Anam.

**ANNAPOLIS** (ăn-năp'ô-lis), the capital of Maryland, county seat of Anne Arundel County, twenty-eight miles southeast of Baltimore. It occupies a fine site on the Severn River, has a good harbor, and is on the Annapolis, Washington and Baltimore and the Annapolis and Baltimore Short Line railroads. It has electric street railways and numerous public improvements, including waterworks, a sewerage system; and stone and brick pavements. Among the noteworthy buildings are the State capitol, the Governor's mansion, the county courthouse, and several fine schools and churches. It is the seat of Saint John's College and of the United States Naval Academy (q. v.). The manufactures include machinery, clothing, tobacco products, and utensils. It has a considerable trade, is a port of entry, and has an important market for fruits and oysters. The city was founded in 1649 and received a charter in 1708. Congress held a session at Annapolis in 1783, at which Washington resigned as commander-in-chief. Population, 1900, 8,402.

**ANNAPOLIS**, a seaport of Nova Scotia, 100 miles west of Halifax. It is conveniently situated on the Annapolis River, near its entrance into an inlet from the Bay of Fundy. The harbor is well protected, which, together with railway facilities, make it a convenient market for fish, fruit, and cereals. Formerly it was called Port Royal. It is the oldest European settlement in British America, and in 1604 it was made the capital of Arcadia. The English captured it in 1710, and soon after the name was changed to Annapolis in honor of Queen Anne. The seat of government was removed to Halifax in 1750. Population, 1901, 1,019.

**ANN ARBOR** (ăn är'bor), a city of Michigan, county seat of Washtenaw County, on the Huron River, forty miles west of Detroit. It is on the Ann Arbor and the Michigan Central railroads, has substantially paved streets, electric street railways, waterworks, and a number of parks and libraries. The leading manufactures are lumber products, musical instruments, ironware, tobacco products, clothing, and machinery. It has a fine county courthouse and numerous public schools and churches, and is the seat of the University of Michigan. This institution was founded in 1837, and is one of the most liberally endowed and successful educational institutions of the United States. The first settlement was made at Ann Arbor in



1824 and it was incorporated in 1851. Population, 1904, 14,599; in 1910, 14,817.

**ANNEALING** (än-nēl'ing), the process by which glass, steel, iron, and other substances are heated and then cooled slowly to render them less brittle, or to increase their degree of ductility and malleability. When metals are given form in the process of manufacture, as in rolling them into plates or drawing them into wire, they become somewhat brittle and are made more serviceable by annealing. By this process also is diminished the elasticity of metals, as to impart to springs the precise measure of elasticity deemed the most suitable.

**ANNIHILATIONIST** (än-nī-hī-lā'shūn-ist), the term applied to one who believes in the doctrine of man's annihilation at death. This doctrine had its origin in England in the 18th century, when several prominent writers, including Archbishop Whately, wrote on subjects relating to *eternal death*, and from these writings originated a widespread belief in literal destruction. As now understood, annihilationism is a belief in the bodily and spiritual extinction of man's being.

**ANNISTON** (än'is-ton), a manufacturing city of Alabama, county seat of Calhoun County, eighty-seven miles northeast of Birmingham. It is on the Louisville and Nashville, the Southern, and other railroads, and in the vicinity are extensive iron mines. The manufactures include ironware, machinery, cotton goods, clothing, and tobacco products. The city has electric lights, pavements, waterworks, and other municipal improvements. It has a number of fine public school buildings, about twenty-five churches, and several well-selected libraries. It is the seat of the Noble Institute, the Anniston College for Young Ladies, and the Barber Memorial Seminary (for colored students). The city was founded in 1873 by the Woolstock Iron Company, under the management of Samuel Noble. Population, 1910, 12,792.

**ANNUAL** (än'ū-äl), in botany, a plant whose whole course of development is completed in one season, during which it germinates, flowers, perfects its seeds, and perishes, never again to grow from the same roots. Some grains are the products of annuals, such as oats and corn. The cockscomb, phlox, and marigold are examples of garden flowers belonging to the annuals. Some hardy annuals, like the morning-glory, may be sown in autumn to germinate in the spring.

**ANNUITY** (än-nū'ī-tŷ), a fixed sum of money paid annually, or at intervals, either for a definite term of years or the continuation of a given life, or a combination of lives. The

term is used largely by insurance companies, who stipulate the payment of definite amounts. The theory is an application of algebra to the fundamental idea of compound interest. According to this idea, any sum of money invested at interest is increased at the end of interest-payment periods by the addition of accrued interest. The first addition is at the end of the first payment period. At the end of the second payment period a second addition of interest is added to the sum, and thus additions are made in the same way by interest accruing from time to time until a definite amount has been reached. Life annuities are based on a knowledge of the rate of mortality among mankind, or among the particular class of persons upon whose life the annuity depends. Annuities are the reverse of life insurance. An annuitant is paid to live, while an insured, through his representative, is paid to die.

**ANODE** (än'ōd), in electricity, the positive pole of an electric current, or that surface by which the current enters the body (electrolyte), undergoing decomposition. The negative pole, by which the current leaves the electrolyte, is called the cathode.

**ANSONIA** (än-sō'nĭ-ä), a city of Connecticut, in New Haven County, on the Naugatuck River. It is on the New York, New Haven and Hartford Railroad, has a considerable trade in merchandise, and is important as a manufacturing center. The products include carriages, clocks, iron and brass wares, machinery, electrical appliances, and textiles. It has a fine system of public schools, numerous churches, and a public library. Among the chief buildings are the opera house and the Y. M. C. A. building. The municipal improvements include electric street railways, waterworks, electric lights, and a sewer system. The first settlement was made on the site of Ansonia in 1840 and it was chartered in 1893. Population, 1910, 15,152.

**ANT** (änt), an insect belonging to the order of membranous-winged insects, of which there are several hundred species in different regions of the earth. They live in colonies or families,



sometimes many thousands in number, and are divided into three classes, females, males, and workers. The females and males have wings, but the workers, or neuters, are wingless. As to size, the females are the largest, the males



are slightly smaller than the females, and the workers are the smallest. The ordinary work is done by the workers and the principal part in warfare, both defensive and offensive, is taken by the soldiers, which are made up of the workers. The males and females constitute but a small portion of each community. After the pairing season, the males wander away and soon die. The females lay little eggs, so small that they can hardly be seen by the naked eye, and the eggs are scattered about in the nest wherever the females happen to be at the time the eggs are deposited. They are taken by the workers and put in the sun in the morning, and at night are stored in the nest until they are hatched. The larvae or grubs, hatched from the eggs, are small, white worms, and are carried back and forth in the same way as the eggs by the workers, who nourish them with a liquid from the stomach until they reach the proper age to spin their own webs around themselves, which cover them like the cocoon of a silkworm. The cocoons are carried into the sunlight the same as the eggs and grubs were, and, when ripe, for their second birth, the workers cut them out of their inclosed cells and they soon become perfect ants.

The workers are the most intelligent and interesting of the three classes of ants. They not only take care of the eggs, grubs, and cocoons, but do the work of the society, which includes the building of houses and streets and keeping them in repair. In their work they show wonderful ingenuity in carpentry, masonry and mining. Most ants build their houses or nests in the ground, and many construct cones or hills over them, which are known as ant-hills. In them are many rooms, with galleries connecting the different apartments. Others construct large pillars, from which arches are extended, and are covered with loose straw and sticks. In tropical regions the ant-hills are frequently from twelve to eighteen feet high. A class of ants, known as mining ants, construct long galleries in clay, in which pillars support the roof and many rooms and stories are provided. Carpenter ants build their houses in growing trees by boring deep cells into the wood and constructing rooms and galleries by unique partitions. In Australasia several species of ants are found that build their houses of leaves fastened together with a kind of glue. Oftentimes several ants unite to carry particles for the construction of their houses, and in this way they are able to move material much larger and heavier than the aggregate of the ants employed in construction work.

The chief substance used by ants for food is sugar taken from vegetables. Their sense of smell seems to be so acute that they can easily locate sugar substances in plants. Honeydew is a sugar fluid found in the aphid, a small insect, and is a favorite food of many kinds of ants. To obtain it they are often seen to touch the aphid with their antennae, and, after a drop has been obtained, they pass on to another aphid. The process has been likened to the milking of a cow or camel. Ants that feed upon animal food render important service in that they clear away carrion. The flesh of a small animal buried for a short time in an ant-hill will be entirely consumed, only the skeleton remaining. In tropical countries ants prey upon living animals and sometimes kill birds, reptiles, and small quadrupeds by attacking them in vast swarms. In some regions ants are so numerous that communities of them have been known to attack domestic animals when sick, and there are a number of instances in which man himself dreaded their ravages. On the island of Grenada, about one hundred years ago, vast numbers of a particular kind of ants appeared. They descended from the hills like torrents and filled every path and road for miles, preying upon rats, mice, and reptiles, and were stopped in their onward progress only by streams of water. Every means to destroy them was unsuccessful until in 1780, when a hurricane exposed them to a deluge of rain and freed the island of them.

Some ants carry on war against other species and take their young into slavery. The fighting ants are red, and are generally regarded too stupid to take care of themselves, and would die



ANT-HILL.

from starvation if they did not have in captivity others to provide for them. However, ants have many enemies, being consumed in large numbers as food by birds, while some quadrupeds, as the aard-vark and the ant-eater, dig



into their habitations and consume great numbers of them. *Termites*, or white ants, belong to a different order from the common ants, but are like them in their habits. They live in the tropics, in vast communities, and are regarded a very dangerous pest. In Africa they are found extensively, where several species burrow in wood or excavate dwellings underground, and some build mounds above the surface of the plain. These are very productive, a single female often laying over 80,000 eggs. They live mainly on dry and decaying woods. The natives use them as an article of food, for which purpose they are pressed or pounded into a jam, which they regard a delicacy.

The intelligence of ants is recognized as a remarkable circumstance of nature. They are sensitive to changes in temperature and moisture, and exceed the human range of ability to observe sound waves. They remove the dead promptly, care for the injured, and observe cleanliness in caring for the young. Naturalists assert that ants communicate with each other and are able to recognize each individual of a community.

**ANTANANARIVO** (än-tä-nä-nä-rē'vō), or **Tananarivo**, the capital and chief city of Madagascar, situated near the center of the island, 165 miles southwest of Tamatave. It is in a mountainous region with an elevation of 4,500 feet above the sea. The streets are irregular and crooked, most of the buildings are of wood, and the inhabitants are chiefly natives, including only about 200 French. Its commerce is not important, but it has manufactures of jewelry, silk stuff, clothing, and utensils. An improved highway extends to Tamatave, but the transportation facilities are inadequate. Population, 1906, 65,840.

**ANTARCTIC** (änt-ärk'tik), meaning opposite to the Arctic, and relating to the region surrounding the South Pole. The Antarctic Circle, a circle imagined drawn parallel to the equator, forms a small circle around the earth at a distance of 23° 28' from the South Pole. The Antarctic Ocean is that portion of the sea which surrounds the South Pole, and lies immediately south of the Atlantic, Pacific, and Indian oceans. It has been explored by navigators, and is known more or less satisfactorily as far as 75° south latitude. The highest southern latitude ever attained, that of 78° 50', was reached in 1900 by an expedition which sailed from Tasmania in 1898. Owing to great dangers and difficulties in southern navigation, only a small portion of the Antarctic region is definitely known. The land masses of this region of the earth include Graham's Land, En-

derby Land, and Victoria Land. A part of these land areas are accessible, and the sea in their proximity has yielded valuable returns through the seal and whale fisheries. However, they contain cliffs of perpetual ice and their valleys are covered with everlasting snow. A large part of the Antarctic Ocean is clouded with constant fogs. Baffling currents and numerous icebergs, together with extreme cold, make navigation difficult. The Antarctic Ocean is richer in life, especially deep-sea fauna, than the other oceans. On the coast of Victoria Land is Mount Erebus, a volcano 12,400 feet above the level of the sea.

**ANT-EATER** (änt ēt'ēr), the popular name of a quadruped mammal native to South Amer-



GREAT ANT-EATER.

ica, and belonging to the order *Edentata*. The mouth is perfectly toothless, and the food consists of insects, chiefly ants. It has small eyes, short and rounded ears, and powerful claws. The tongue is long and wormlike and coated with a sticky saliva, and is thrust out to catch the food. Though large and powerful, the ant-eaters are very stupid and inoffensive, and are an easy prey to animals weaker than themselves. The average length of the body is about four feet, not including the bushy tail, which is nearly as long as the body. The aard-vark, a species of ant-eater, is native to South Africa. It lives chiefly on the termites, whose nests it tears down in search of food. Other animals classed with this group include the manid, or scaly ant-eater, and the echidna, or porcupine ant-eater, of Australia.

**ANTECEDENT** (än-tê-sēd'ēt), a term used to express precedent in point of time. The term *antecedent* is applied in grammar to a word going before a relative pronoun, or a word to which the relative relates. In logic the antecedent is that part of a constitutional proposition upon which the other depends, and in mathematics it implies that quantity which is considered first in making comparison with another number.



**ANTELOPE** (ăn'tě-lōp), a genus of ruminating mammals quite similar to the deer. The horns are hollow and encircled by rings at the base, but are not renewed annually. They are swift of foot, have large lustrous eyes, and when fleeing before a foe take enormous leaps.



ANTELOPE.

The smallest species are found in South Africa, such as the guevi, or bluebuck, which is about thirteen inches in height, while the largest species are from five to seven feet. Two representatives of the antelope family are native to North America, and allied species are found in Eurasia, particularly in India. The American antelopes include the prongbuck and the mountain goat. The latter possesses a coat of long woolly hair, and in form is closely allied to the chamois of Europe. The eland and gazelle are species native to Africa, the latter being confined largely to the northern part of that grand division. A species of Northeastern Africa, the addax, has spirally twisted horns about four feet long. Most species are so fleet of foot that greyhounds cannot catch them, and are capable of leaping a height of from eight to twelve feet, while the length of their bounds is fully as great. The flesh is highly prized as food, for which they are hunted, and the skin is valuable in making gloves and other wearing apparel.

**ANTENNAE** (ăn-těn'nē), the organs of insects located nearly in the same position as horns in some of the animals, and composed chiefly of minute articulate rings. They are two in number and are found in nearly all in-

sects, only a very few excepted. In moths the antennae look like feathers, and those of butterflies have little knobs at the tip. Similar appendages are common to the lobster and other crustaceous animals. They serve the purpose of organs of touch and probably of hearing. With them the animal is enabled to feel its way and test surrounding objects. In some animals the antennae possess organs of taste, sound, and smell, and it is known that at least several species of the lobster are capable of hearing by organs located at the extreme end. Deprived of this organ, this class of animals becomes largely inactive, while the ant becomes helpless.

**ANTHER** (ăn'thēr), a part of the stamen of a flower, and generally attached to the apex of the filament. It is the male organ of the flower, and usually contains two cells, which are filled with the pollen. At shedding time the pollen escapes through a longitudinal fissure, which generally extends from the base to the apex. In some flowers the anther is a direct continuation of the filament, when it is said to be innate; in others it grows to the side or face of the filament, when it is designated adnate; and it is versatile when it is attached to the middle of the anther.

**ANTHRACITE** (ăn'thrā-sīt), a variety of coal differing from the common, or bituminous, in that it contains a larger proportion of carbon. It is distinguished by its compactness, bright luster, and high specific gravity. Though difficult to ignite, it is smokeless and gives an intense heat. The bituminous coal contains about eighty per cent. of carbon, while the anthracite possesses from ninety to ninety-five per cent. It is most abundant in the Alleghany Mountains and in the province of Shansi, China, but is found in considerable quantities in Wyoming, New Mexico, British Columbia, France, and Russia. Anthracite coal, next to diamond, is the purest form of carbon.

**ANTHROPOLOGY** (ăn-thrō-pōl'ō-gy), the science devoted to the study of man and mankind. It is the newest of the sciences and may be said to embrace the three departments of somapology, psychology, and ethnology. Somapology, or the biology of man, places mankind in the zoölogical system and treats man as an animal, while psychology is the science of the human soul and embraces comparative psychology, which investigates the mind of the lower animals. Biology is a study of man in relation to the arts of life. See **Biology**, **Ethnology**, etc.

**ANTHROPOMETRY** (ăn-thrō-pōm'ē-try), the measurement of the height and other di-



mensions of the human body, especially at different ages and under the influence of various habits and occupations, to aid in classification as to physical and mental characteristics. This subject has received growing attention in recent years, especially from the standpoint of education, medical treatment, physical culture, and in criminology. Since no two individuals are alike in all dimensions and are influenced variously by their environments, it has been found profitable to employ measurements when considering the treatment of individuals at different ages and for a variety of causes. Craniometry is a system of measurements of the skull, and some schools regard it the most important part of anthropology, while others do not look upon it as being of over-shadowing importance and think it expresses only trifling variations in individuals. The measurements regarded of primary importance in anthropometry are those taken while the body is at rest. They include facial angle (q. v.), position and size of ears, shape of head, position and attitude of eyes, size and form of nose, length of fingers, size of feet, length of thigh and forearm, circumference of waist and shoulders, length of limbs, sitting height, expansion and circumference of chest, stature, weight, age, etc. Considerable importance is attached to the color of the eyes and hair, beard and body hair, form and color of the mucous membrane and nails, and the peculiarities of features and movement of the visible organs. The habits of individuals are studied, especially in regard to the food eaten, clothing worn, and the character and amount of work done and rest taken. Some attach considerable prominence to the dynamic aspect of anthropology, and in consequence substitute largely the measurement of functions, such as the rate of pulsation and respiration.

**ANTICHRIST** (ăn'tī-chrīst), a name employed by Christian writers to designate a supposed powerful institution destined to stand in opposition to Christianity. It is referred to in I. John ii, 18-22; iv, 1-3, but the idea seems to have originated before the Christian era, at least some writers quote in favor of this view the prophecy of Ezekiel concerning Gog and Magog. A number of Protestant writers, both before and since the Protestant Reformation, have referred to the pope or the papacy as the antichrist, while both Protestant and Catholic writers have referred to Nero, Diocletian, and other emperors who persecuted Christians as the antichrist.

**ANTICOSTI** (ăn-tī-cōs'tī), an island in the Gulf of Saint Lawrence, belonging to the

Province of Quebec, near the mouth of the Saint Lawrence River. It is 40 miles wide and 135 miles long, and has an area of 2,500 square miles. Fox Bay, in the northwest, and Ellis Bay, to the west, are the larger indentations and have good harbors. Much of the interior is wooded, though a considerable part furnishes pasture. In the northern section are mountains, and numerous swamps and rocky districts prevail. Cōd, trout, salmon, and her-ring fisheries abound near the coast. Few settlements have been made, owing to the severe climate, and the population at present does not exceed 250.

**ANTIDOTE** (ăn'tī-dōte), a medicine employed to neutralize the effect of a poison. The antidotes are classed as chemical and physiological. The chemical antidotes neutralize the poison by converting it into an insoluble or harmless substance, while the physiological antidotes produce action within the body, by which it is enabled to resist the injurious effects of the poison. Acids and alkalis act upon each other as chemical antidotes, while morphine and atropine have opposite actions upon the body. Both opium and belladonna are poisonous, but act as antidotes to each other. Ammonia and alcohol are given in certain snake poisons, acting as physiological antidotes. See **Poison**.

**ANTIETAM** (ăn-tē'tam), a small stream of the United States, rises in Pennsylvania, thence flows into Maryland, and joins the Potomac about fifty miles from Washington. It is noted as the scene of an indecisive battle fought Sept. 17, 1862, between the Union army numbering 57,640 men under General McClellan, and the Confederates with 38,000 men under General Lee. The battle continued with great slaughter the entire day. The Union loss aggregated over 11,000 and the Confederates lost 10,000 men. Lee's army retreated on the 18th, recrossing the Potomac soon after. While the result was indecisive, it tended to give great encouragement to the Union cause, and, on the strength of this battle, President Lincoln issued the Emancipation Proclamation abolishing slavery.

**ANTI-FEDERALISTS** (ăn'tī-fēd'ēr-al-īst), a political party in the United States, organized in opposition to the Federal party. Thomas Jefferson was the principal leader, and it stood in favor of strict construction of the Constitution as against the centralizing tendencies in the administration of government. However, the ground originally occupied was at least in part abandoned after the election of Jefferson in 1800, since he favored the purchase of



Louisiana and other measures possible only under a liberal construction. The name was changed to Republican in 1793, and soon after the organization became known as the Democrat party.

**ANTIGO** (än'ti-gō), a city of Wisconsin, county seat of Langlade County, about seventy-five miles west of Menominee, on the Chicago and Northwestern Railroad. It has a fine public school system, and is provided with modern municipal facilities, such as waterworks and electric lights. The manufactures include furniture, flour, lumber products, broom handles, clothing, and machinery. It has a large trade in cereals, merchandise, and live stock. The first settlement was made in 1878 and it was incorporated in 1884. Population, 1905, 6,663.

**ANTIGUA** (än-tē'gwà), one of the Leeward Islands, twenty-two miles south of Barbuda. It belongs to the British West Indian Islands and has an area of 108 square miles. The coast is indented with small inlets, the surface is rugged, the soil fertile, and the climate favorable to the cultivation of sugar cane and fruit. Barbuda and Redonda are dependencies of Antigua and for government purposes are united to form one of the five presidencies of the Leeward Islands. Columbus discovered Antigua in 1493 and it was settled by the English in 1632. Saint John, the capital, has a population of 10,000. English Harbor is the best port. Population, 1901, 34,970.

**ANTILLES** (än-til'lēz), the name applied to the whole of the West Indies, except the Bahamas. They stretch eastward from the Gulf of Mexico and form a half circle. They are divided naturally into two sections: the Greater Antilles, lying to the north and west, and the Lesser, to the east and south. The Antilles include about 360 islands, all of which are more or less fertile, have a tropical climate, and are frequently visited by hurricanes. The chief products are rice, tobacco, corn, cotton, sugar, rum, coffee, vegetables, and tropical fruits. The Greater Antilles include Cuba, Jamaica, Porto Rico, and Hayti, and the Lesser Antilles embrace nearly all the remainder of the islands. The area of the entire islands aggregates about 94,398 square miles. See **Cuba, Porto Rico, Jamaica**, etc.

**ANTIMONY** (än'ti-mō-nŷ), a metal of a bluish-white or silver color, and commonly found in nature alloyed with other metals. Large veins producing antimony occur in California, Sweden, Chile, Mexico, Australia, Borneo, and many other countries. It is brittle and is easily reduced to a powder. It is hard-

ened by alloying with other metals. On account of not tarnishing or rusting, it is valuable as an alloy in making type metal. It is used extensively as a medicine and in the arts, especially for coloring and in the manufacture of lead pencils. A variety known as *yellow antimony* is well suited for painting porcelain and for enameling.

**ANTIOCH** (än'ti-ōk), an ancient city of Syria, on the Orontes River, founded by Seleucus Nicator in 300 B. C., and long celebrated as one of the finest cities of the East. It was one of sixteen cities of this name built in memory of Antiochus, father of the founder, who was one of the generals of Philip of Macedon. The people were noted for intelligence, wealth, and luxury, and it had a large commercial trade by caravans. In this city the name *Christian* was first applied to the disciples of Christ. Much human life and many of the chief buildings were destroyed by earthquakes in 526 and 587 A. D. In the ruins were found the remains of 250,000 people who had been killed by the great upheavals. It was conquered alternately by the Saracens and the Crusaders, and was razed to the ground by the Mamalukes in 1269. Since 1516 it has been a possession of the Turks. The ancients spoke of it as "Antioch the Beautiful." Its site is now occupied by Antakieh, or Antakiyeh, a market and residence town. Population, 27,500.

**ANTIOQUIA** (än-tē-ō'kē-à), a city of Colombia, in the state of Antioquia, on the Cauca River. It is situated on an elevation 1,890 feet above the sea. The surrounding country contains productive mining and lumbering interests. It has considerable trade in maize, sugar, and tobacco. Population, 9,150.

**ANTIPODES** (än-tip'ō-dēz), a word of Greek derivation, used to denote peoples or places on opposite sides of the earth, so situated that a line drawn from one to the other would pass through the center of the earth and form a true diameter. Thus the south pole is exactly antipodal to the north pole, noon at one place is midnight at the other, the longest day corresponds to the shortest, and the midsummer to midwinter. A voyager sailing east anticipates the sun and his dating at the opposite side will be twelve hours in advance, while one sailing westward will fall as much in arrear. At the point of meeting there will be a whole day, twenty-four hours, difference between them. This has been at least twice exemplified; the Russians sailing from the west to the northwest coast of North America were a day in advance of



the British who sailed from the east; while the Spaniards coming from the east of the Philippines were a day behind the Portuguese in Macao, who came from the west.

**ANTIPODES ISLAND**, a small island southeast of New Zealand. It has an area of eleven square miles and is uninhabited. It was so named because it is nearly the antipode of Greenwich.

**ANTIPOPE** (än'ti-pōp), a term applied to those persons who claimed an election to the Papacy by the suffrage of the cardinals, or otherwise, but whose claims were for some reasons not deemed valid by the church. Novatian, the first antipope and founder of the sect of Novatians, procured his election in 252 in opposition to Cornelius. According to some writers there were fourteen antipopes, but the number usually given is thirty-one, the apparent difference being due to the fact that a number of writers do not recognize the claims of all who are usually credited with some degree of right to recognition. The antipopes were elected by religious factions or set up by political parties. Felix V., the last antipope, was a Duke of Savoy and made claim to the See in 1431. See **Pope**.

**ANTIQUARIES** (än'ti-kwâ-rēs), **Society of**, the name of an association established by learned men of America and Europe, whose object is the study of antiquity. Beginning with the Revival of Learning, much interest was aroused in a study of classical productions of Greece and Rome. Accordingly every obtainable relic was secured and preserved. Organizations for the study of this branch of learning were not generally established in Western Europe until about 1572. The present Antiquarian Society of London consists of a council of twenty-one and one hundred fellows. This society and several others of Europe and America have published some valuable works and have added largely to the literature treating of antiquities.

**ANTISEPTICS** (än-ti-sēp'tiks), the substances that prevent or retard putrefaction of animal and vegetable matter. It has been demonstrated that putrefaction in fermentation generally depends upon the presence of microscopic vegetable organisms. Hence, to prevent it, an agent is necessary that will destroy these microorganisms, or exclude them entirely. Among the substances used are salt, alcohol, creosote, tannic acid, arsenic, aloes, camphor, benzene, chloroform, and many others. Salting is a common way of preserving herring, fish, and meats, or perishable commodities of this kind may be packed in ice

as a means of keeping the temperature too low to permit decay. Besides their use in the preservation of foods, many forms of antiseptics are used in the treatment of wounds and in the prevention of infectious diseases, as carbolic acid and formaldehyde. The properties of infectious matter commonly found in contagious diseases appear closely analogous to organisms that lead to putrefaction in fermentation. These can be rendered inert by exposure to a high temperature, or by the use of antiseptics, such as an application of chloride of zinc, carbolic acid, or other equally efficient agents. By a liberal application of these substances to the bedroom or house containing germs of contagious diseases, the infection may be destroyed and prevented from spreading. Besides, antiseptics are used in surgery for the treatment of wounds, with the view of preventing harmful organisms from developing. This is done largely by allowing air to reach the wounds only through substances capable of destroying the germs in the atmosphere, upon whose presence the generation of suppuration depends. The general term *disinfectant* is applied to any agent that destroys microorganisms, and at the same time removes the harmful products of fermentation and putrefaction.

**ANTITOXIN** (än-ti-tōks'in), the name of a preparation of value in treating diphtheria, cholera, bubonic plague, and other diseases due to the development of bacteria in the blood. Diphtheria antitoxin is prepared by injecting diphtheria poison under the skin of some animal, usually a horse, the quantity being sufficient to give rise to a slight illness in a few days. The injection is repeated as soon as the animal regains its health, but the quantity of the poison is increased after repeated recovery. In the course of several months a condition is developed in the animal under which it can bear the injection of several hundred times as much poison as the minimum quantity that at first would have resulted in death. When in a proper state of development, several gallons of blood are withdrawn from the horse, the serum or watery part constituting the antitoxin. Persons afflicted with diphtheria are relieved by injecting it under the skin, and such treatment also gives immunity to persons exposed to but not affected by the disease. Other antitoxins have been prepared and used successfully.

**ANT-LION** (änt lī'un), the larva of several species of insects, which, when fully developed, are similar in appearance to the dragon fly. These insects are common to the sandy regions



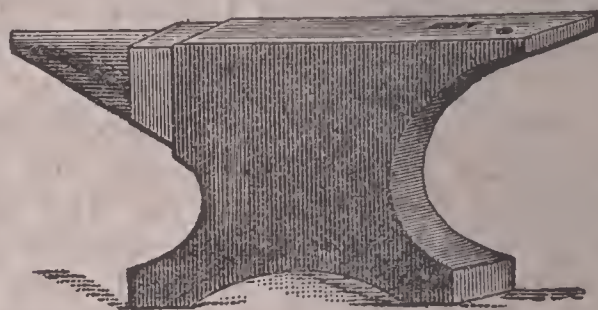
of many countries, and about fifty species of North America have been described. They are most numerous in semiarid districts, such as Mexico and the part of the United States lying north of the Rio Grande. The ant-lion is remarkable for the curious and ingenious method by which it catches the ants and other insects on which it feeds. A cavity in the form of a funnel is excavated in the sandy soil, the sides being smooth and sloping uniformly, and at the bottom the ant-lion waits until an insect comes so near to the edge that it falls into the pit, where the juices are sucked out of its body. When ready for another prey, the skeleton of the dead insect is removed and the ant-lion awaits another insect.

**ANTOFAGASTA** (än-tō-fā-gās'tà), a city of Chile, capital of a province of the same name, situated on the Pacific coast. In its vicinity are extensive deposits of saltpeter and some distance inland are the rich silver mines of Caracoles. A railroad extends inland, making it an important market for domestic and foreign trade. Formerly both the city and province belonged to Bolivia, but in 1882 they were ceded as the result of a war between the two countries. Population, 1906, 26,445.

**ANTWERP** (änt'werp), the principal seaport of Belgium, capital of the province of Antwerp, on the Scheldt River, about fifty miles from the sea. It is strongly fortified, being encircled by outer fortifications and inner lines of defenses, and is the converging center of many important railroad lines that connect it with commercial cities of Belgium, Holland, France, and Germany. The surrounding country is a fertile and well cultivated region. It has extensive manufactures of machinery, cotton and woolen textiles, silks, chemicals, leather, pottery, furniture, and canned and cured meats and fish. The city has important commercial relations with the leading ports of Europe, and is a point of departure for emigrants to Africa and America. Few cities of Europe rival it in the point of architectural beauty. Among its public buildings is a fine Gothic cathedral with a spire 400 feet high. This building contains the famous paintings of Rubens, entitled "The Descent from the Cross," "The Elevation of the Cross," and "The Assumption." The city has many hospitals, educational institutions, and public buildings, and supports a well-organized public school system. Gas and electric lights, numerous libraries, several fine parks and boulevards, and an extensive system of electric street railways are among the many improvements. Antwerp was a place of importance as

early as the 11th century, and in the 16th century attained to large commercial trade relations, when it had a population of 200,000. Its commerce was greatly injured by wars between Spain and the Netherlands. In the last century it made wonderful growth, and is now a center of wealth, intelligence, and industrial activity. German with the Flemish dialect is spoken generally, and most of the daily newspapers are in that language. Population, 1906, 304,032.

**ANVIL** (än'vil), an iron block with a steel surface on which metals are hammered and shaped. The common blacksmith's anvil is



ANVIL.

usually built of six pieces, which are welded to a central *core* or *body*, and has four corner pieces, a projecting end, and a conical end, or *beak*, for hammering curved pieces of metal. The projecting end has a square hole for the reception of a chisel, thus serving to facilitate punching holes in iron plates. The anvil is usually placed on a large wooden block. Heavy anvils for forging shafting and large portions of implements are placed on piles of masonry.

**AORTA** (ä-ôr'tà), in anatomy, the great arterial trunk from which branches proceed to penetrate the whole system. It rises from the left ventricle of the heart, where it is called the *ascending aorta*, then makes a curve called the *arch of the aorta*, from which branches pass to the head and other upper extremities. It then passes toward the lower extremities, where it is called the *descending aorta*. From this part and farther down innumerable branches proceed to the trunk and lower extremities, where, as elsewhere, minute branchlets ramify the different parts of the body.

**APACHES** (ä-pä'châz), a warlike tribe of North American Indians now principally resident in Arizona, New Mexico, and parts of Mexico, where they settled many years ago, after emigrating from the vicinity of Great Slave Lake in Canada. They harassed the pioneer settlers and government troops for many years, but civilization is steadily benefiting them, and large numbers have taken advantage of educational facilities provided by the government. Antonio Apache, a highly



educated Apache Indian, held an official position in the department of anthropology at the World's Columbia Exposition in Chicago in 1893. The total number of Apaches, in 1900, was 5,150.

**APATITE** (ăp'ă-tit), a mineral found in the older crystalline rocks, consisting of phosphate mixed with fluoride and chloride of calcium. Deposits are found in many parts of the world, being abundant in Canada, the United States, and Europe. This mineral is important as a source of fertilizer.

**APE** (ăp), an animal closely allied to the monkey, and in structure nearly approaching the human race. The word *ape* was formerly applied to all monkeys, but is now limited to the species that possess a manlike form and appearance. The principal kinds of apes are the orang-outang, chimpanzee, gorilla, and gibbon. These are classed as *anthropoid apes*, owing to their manlike structure. Their toes and fingers are very similar and much like human hands, by the aid of which they can swing from trees with much ease, but they are quite helpless when on the ground. The brain structure is similar to that of man, but it is only half as large. The food consists chiefly of fruits and the tender part of plants. They are native to Africa, Borneo, and the warmer parts of Asia.

**APENNINES** (ăp'en-ninz), an extensive range of mountains in the Italian peninsula, extending from the Maritime Alps to the Strait of Messina. They form the principle watershed of Italy. The Apennines are considered the southern branch of the great Alpine system of Europe, and are separated from other ranges in the vicinity of Genoa. Their length is about 800 miles, the average height is about 4,000 feet, and the highest peak, Monte Corno, near Aquila, is 9,580 feet above sea level. This range does not reach the limits of perpetual snow, owing to the mild climate of that section of Europe. The geological formations include immense limestone rock, and they are exceeding rich in the finest marbles and metal ores. Several of the mountains are volcanic, including Mount Vesuvius, which is the most active and noted of Europe. The slopes, even to a comparatively high altitude, are covered with abundant vegetation, while the summits are sterile.

**APHIS** (ă'fis), an insect commonly known as the plant louse. Many widely different species have been described. They propagate in large numbers, are soft, round-bodied, and carry a long beak coming from between the fore legs, from under the head, which is used to suck the juice of plants. The aphides are taken as food by the larvae of the ladybird.

Some species are pursued by ants for a saccharine liquid that contains a large portion of sugar, and of which they are very fond. This liquid is called *honeydew* and is secreted at the posterior end of the abdomen, from which it exudes a drop at a time. Its purpose is to supply food for its young. Tobacco is used as a means to protect plants against the ravages of these insects.

**APIA** (ă-pě'ă), a town in the Samoan Islands, on the island of Upolu, which is a possession of Germany. It has a good harbor and is the most important commercial center of the Samoan group.

The chief buildings include several schools, a Roman Catholic church, and the government house. It has a good trade in cotton, copra, tobacco, and fruits. Population, 1901, 3,750.

**APIARY** (ă'pĭ-ă-rĭ), a shed or stand for keeping bees, commonly constructed to protect bees from extremes of weather and temperature. In cold regions the apiaries are built so as to face toward the south or southwest, for the purpose of utilizing to the best advantage the warmth of the sun during the winter season. In the summer months the hives are set out in the open air near good feeding ground, as clover fields, gardens, or flowering heaths. Apiaries are not generally maintained in regions having a warm climate, but they are quite necessary to bee-keeping in the colder sections. See **Bee**.

**APIS** (ă'pĭs), the bull regarded sacred by the ancient Egyptians, and long worshiped as a symbol of Osiris, the husband of Isis. The day of his birth was kept as an annual festival, and his death was a season of public mourning. This animal was not allowed to live to exceed twenty-five years, and on attaining that age was killed and embalmed. The type by which Apis was represented is that of a human mummy containing the head of an ape. Figures



ANT AND APHIDES.



in bronze, stone, and porcelain were common in all cities, and many made of the first two mentioned materials are still abundant.

**APOCALYPSE** (à-pŏc'a-lĭps), a name applied frequently to the last book of the New Testament. In the English and most languages it is called the "Revelations of Saint John the Divine," and it is supposed to have been written by John the Apostle, but its authorship is much disputed. Those who assign it to the Apostle John think it was written while he was on the Isle of Patmos, about 95-97. A large part of it is devoted to predictions respecting the future of Christianity.

**APOCALYPTIC NUMBER** (à-pŏk-à-lĭp'-tĭk), the number 666, based on Rev. xiii, 18: "Let him that hath understanding count the number of the beast: for it is the number of a man; and his number is Six hundred threescore and six." In the 2d century it was discovered that the name *antichrist* was contained in the Greek characters expressive of this number, while it was held by some to express a date. The Roman nation was the most powerful pagan government, was the most mighty representative of antichrist, and its name is spelled in Greek by characters in which the number 666 appears. Some Protestants apply the prophecy to papal Rome, while it is applied by others to reformers of other denominations for, perhaps, no better reasons.

**APOCRYPHA** (à-pŏk'rĭ-fà), the term applied to professedly inspired writings, and sometimes to those whose public use was not thought advisable. It is used especially to designate books written in the two centuries preceding the birth of Christ, and which are omitted from the majority of Bibles now in use. These books include a total of fourteen, and, when published at all, usually appear in the Bible in the following order: I Esdras; II Esdras; Tobit; Judith; the Additions to the Book of Esther; the Wisdom of Solomon; the Wisdom of Jesus, the son of Sirach, or Ecclesiasticus; Baruch; the Song of the Three Holy Children; the History of Susanna; the History of Bel and the Dragon; the Prayer of Manasses, king of Judah; the First Book of the Maccabees; and the Second Book of the Maccabees.

**APOGEE** (ăp'ŏ-jē), a term used in astronomy to denote the point occupied by the moon at which, in its course of revolution, it is at the greatest distance from the earth. The ancients regarded the earth as the center of the solar system, and used the term apogee to designate the point most remote from the sun. When the sun became recog-

nized as the center, the expression for this relation was changed, and the term *aphelion* is used instead. Apogee is now used to express the greatest distance of the moon and the planets from the earth, and *perigee* the nearest. Aphelion expresses the greatest distance of any heavenly body from the sun, and *perihelion* the nearest.

**APOPLEXY** (ăp'ŏ-plĕks-ÿ), a serious malady that comes on suddenly, causing a loss of sensation and voluntary motion. A stroke of apoplexy suspends the functions of the cerebrum by a pressure on the brain, caused by a rupture of blood vessels or a congestion of the blood. It is accompanied by loss of the intellect or thought, while respiration and the action of the heart and of the general vascular system continues. In a severe stroke the person falls suddenly and gives no proof of consciousness. Persons at the age of from fifty to sixty are the most subject to it. Among the causes leading to apoplexy are continued anxiety, frequent indulgence of temper and passion, intoxication, luxurious living, and intense thought. Out of a large number of patients, carefully examined, only six per cent. were corpulent, thirty per cent. were thin, and the others were of ordinary form. Recovery after one or two attacks is quite common, but persons afflicted more than twice are almost certain to fail of recovery.

**APOSTLES** (à-pŏs's'lz), meaning a person sent, a term applied to the twelve men whom Jesus selected to aid Him during His ministry and to preach the gospel. They were chosen by Him promiscuously from among fishermen and others engaged in the more common occupations. The twelve were as follows: Simon Peter; James; John; Andrew; Philip; Thomas; Bartholomew; Matthew; James, the son of Alpheus; Lebbeus, or Thaddeus; Simon; and Judas Iscariot. On account of Judas Iscariot's betraying Christ, Matthias was chosen in his place, and later Paul and Barnabas are spoken of as apostles of Jesus. These apostles were commended by Jesus to preach the gospel, at first to the Jews, but a short time before his ascension they were instructed to preach to all nations. The day of Pentecost was the occasion when they received miraculous gifts for the public ministry. The chief events in the lives of the apostles are recorded in the Epistles and Acts of the Apostles. In a wider sense, the early Christian preachers sent to heathen countries are termed *apostles*, but usually, when speaking of the apostles, those named above are implied.

**APOSTLES' ISLANDS**, a number of small



islands in Lake Superior, near the western end, first settled by the French in 1680. They consist of twenty-seven islets and islands, and have an area of 200 square miles. Mandeline Island is the largest of the group and on it is the town of La Ponte. The islands have deposits of a fine quality of brownstone, which is quarried and shipped. For governmental purposes they belong to the State of Wisconsin.

**APOSTOLIC FATHERS** (ăp-ōs-tōl'ic), the name given to the disciples and fellow-laborers of the apostles, especially those who are supposed to have left writings. These writings are looked upon as a continuation of the epistles written by the apostles, but in form and contents are quite inferior to their predecessors. The essence and main purpose is to exhort to faith and holiness. The list of apostolic fathers include Barnabas; Clement of Rome; the Shepherd of Hermas; Ignatius, Bishop of Antioch; Papias of Hierapolis; and Polycarp, Bishop of Smyrna. Diognetus is sometimes included with the above list.

**APOSTOLIC SUCCESSION**, the uninterrupted succession of bishops, priests, and deacons from the time of Christ to the present day. It is considered essential and is observed strictly by the Anglican, Greek Catholic, and Roman Catholic churches, who do not consider the ordination of ministers or priests legitimate unless it is by a bishop.

**APOTHECARIES' WEIGHT** (ă-pōth'ē-kā-rīz), the system of measurement used in dispensing drugs. The pound contains twelve ounces, the ounce eight drams, the dram three scruples, and the scruple twenty grains. The grain is equivalent to that used in avoirdupois weight.—Apothecary, one who keeps a store or laboratory for preparing, compounding, and selling medicines, and for compounding prescriptions. In early times, even as late as the 17th century, apothecaries ranked with the grocers, but in the 18th century they were placed on a higher standard. In most countries laws have been enacted for the purpose of regulating the practice of compounding medicines. A person who engages in this line is called a *pharmacist*. He is usually required to hold a certificate showing that he is duly authorized by law to make up prescriptions and is qualified for such duties. The name *druggist* is usually applied to one who keeps a drug store.

**APPALACHIAN MOUNTAINS** (ăp-pā-lā'chī-an), a vast system of elevations in the eastern part of North America, located partly in Canada, but mostly in the United States. The system consists of a number of nearly parallel

chains extending from the Saint Lawrence River to Alabama and Georgia. It is highest in the north and south and slopes gradually toward the middle. Its length is about 1,300 miles and its breadth varies greatly in the different portions. Between the mountain system and the Atlantic Ocean stretches a fertile slope, known as the Atlantic Coast Plain, which is from fifty miles in breadth in New England to two hundred miles in the South. In the North are the Adirondacks, the Green Mountains, the White Mountains, and others; in the central portion, the ranges of the Blue Ridge, and the Alleghanies; in the southern, the ranges of the Blue Ridge, Black Mountains, Smoky Mountains, and others. The elevation of the system is from a few hundred to 6,500 feet above the level of the sea, though none of the higher peaks reaches the snow line, and the average height is about 2,500 feet.

The Appalachians are the source of a large number of rivers, and form the divide between those that discharge into the Atlantic Ocean and the eastern tributaries of the Mississippi River system. These highlands contain but one large body of water, Lake Champlain, which is located between the northern part of New York and Vermont, and has its outlet into the Saint Lawrence River. The mountains are covered entirely with vegetable growth and contain many fertile valleys. Near them have developed many of the large manufacturing cities and commercial centers of North America, due partly to their closeness to the sea coast, and partly to the large variety of rich minerals which these mountains contain. They yield, perhaps, the best anthracite coal in the world, and supply vast quantities of petroleum, gas, and iron. Besides, there are extensive deposits of other minerals, including lead, copper, marble, gypsum, salt, gold, silver, and bituminous coal. The forests yield many varieties and large quantities of valuable timber, consisting chiefly of white birch, beech, ash, sugar maple, walnut, cherry, and yellow pine. The timber product, of course, depends upon the altitude and latitude. In the northern part are the hardy varieties common to colder regions, while in the South abound magnificent forests of trees common to a southern climate, both sections yielding enormous quantities for manufacturing purposes. The wild animals have been largely extinguished, but in some localities the bear, panther, wild cat, and wolf still haunt the forests.

**APPALACHICOLA** (ăp-ă-lăch-ī-cō'là), or *Apalachicola*, a river in the United States formed in Georgia by the junction of the Flint



and Chattahoochie rivers. It flows southward through Florida and discharges into Appalachicola Bay, an inlet from the Gulf of Mexico. The entire course of ninety miles is navigable for steamboats. Near the mouth is the city of Appalachicola, the county seat of Franklin County.

**APPALACHICOLA**, a city in Florida, county seat of Franklin County, 85 miles southwest of Tallahassee. It is located near the mouth of the Appalachicola, on Saint George Sound, and is important as a port of entry. The chief exports are lumber, fruit, and naval stores. Population, 1900, 3,097.

**APPEAL** (ăp-pēl'), in law, the removal of a cause from an inferior court for the purpose of obtaining a review of the suit or a reversal of the decision. A writ of error and a certiorari differ from an appeal in that they merely bring up for review the questions of law involved in the proceedings of the lower court, while both questions of law and fact may be reexamined by an appeal. The rules under which appeals may be granted differ in the system of courts in different countries, but usually require that error be shown in the conduct of the trial, or that additional material evidence be presented.

**APPENDICITIS** (ăp-pënd-ĭ-sī'tis), a term used to denote inflammation of the vermiform appendix, a wormlike pouch or cavity projecting from the first part of the colon. In man it is small. It attains its largest size in such herb-eating animals as the horse, in which it is twice the size of the stomach. In man it has no definite function, and may be removed without any harm to the system. Appendicitis frequently results from cherry stones and round objects stopping in it, often causing death, if the patient is not operated upon by a skillful physician.

**APPERCEPTION** (ăp-pēr-sĕp'shŭn), a term employed in the study of mental science, and first used by Herbart, Kant, Liebnitz, and others. It is now a familiar term among teachers, and denotes a perception obtained by reflecting upon new elements of knowledge and comparing them with others previously obtained. In other words, the action of the mind upon a new idea is influenced by the masses of ideas the mind already has, and from this spring new ideas. Such action has come to be called *apperception*.

**APPETITE** (ăp'pĕ-tit), a term used to denote the natural desire for something, mainly the desire for eating and drinking. It is stimulated by exercise, work, cheerfulness, and plain living. A defective appetite is due generally to vicious habits, diseased action of the stom-

ach, impaired nervous system or circulation, and general debility. A depraved appetite results from unnatural food, excessive eating, and other causes. The technical meaning of appetite is, *I desire*. It is attended by two conditions: a desire of the stomach relieved by taking food, and state of the body changed as soon as the blood begins to take up the products of digestion. These are not yet accurately understood.

**APPIAN WAY** (ăp'pĭ-an), a famous road that connects Rome with the southern part of Italy. It was constructed mainly during the censorship of Appius Claudius Caecus, between the years 312 and 307 B. C. The course from Rome to Terracina is nearly straight, although the Pontine Marshes and the Alban Mountains made construction difficult. It was paved with large square stone and adorned with numerous magnificent sepulchers, the most noted of which were those of the Scipios and of Caecilia Metella. Pius IV. partially restored it, and in 1852 it was excavated as far as the eleventh milestone from Rome by Pius IX., near which it is now crossed by a railroad.

**APPLE** (ăp'p'l), a tree of the rose family of plants, native to the temperate region of Asia and Europe. It has been grown for its fruit since prehistoric times, and brought to America by settlers from England in the early history of this country. The tree has spreading branches, and attains a moderate height, seldom exceeding thirty feet. The wild crab apple of Europe



APPLE.

is the parent of all the varieties now grown. These have been largely improved by ingrafting and naturalization. There are three general classes, summer, autumn, and winter apples, and in each class are many varieties, perhaps 200. Many of the best known varieties are designated by names, as winesaps, Danvers winter-sweet, pippins, Ben Davis, willow twigs, Duchess of Oldenburg, etc. Apples are cultivated



extensively in Southern Canada and in nearly every section of the United States. They are especially productive in the middle Atlantic section, though fine orchards are common to the Mississippi Valley and the Pacific Coast.

The wood of the apple tree is hard, durable, and fine-grained. Some varieties of crabs are planted both for ornamental purposes and for the production of fruit. Besides being a wholesome food when ripe, the apple is used for many purposes in cooking, baking, preserving, and for jelly. From it is made a fermented liquor, called *cider*, and a fine quality of *vinegar*. By distillation a kind of spirits is manufactured. It is used for preparing compounds that have good medicinal qualities. Apples are important articles of commerce, great quantities being produced and exported to domestic and foreign markets in cases and barrels.

The seedless apple was evolved by propagation at Grand Junction, Colo., by John F. Spencer, who conducted experimental researches for several years and succeeded in producing five trees that bore seedless, coreless, and wormless apples, and from this little group there were budded two thousand more trees, which, in 1905, constituted the entire seedless apple stock of the world. This variety of apple trees has many peculiarities. While there is a stamen and a small quantity of pollen, exactly as in the blossom of the ordinary apple tree, yet the flower itself is missing, and several small green leaves grow around the apple to shelter it. The meat of the new apple, like that of the seedless orange, is quite solid, and at the navel end is a slightly hardened substance. In size these apples are of the usual average, of good flavor, and will keep well. The fact that the tree is flowerless renders it more hardy at the time of late frosts, and overcomes, to a large extent, injury by insects, since there is no place for the codling moth to lay its eggs.

**APPLE OF DISCORD**, in Greek mythology, the golden apple thrown by Eris into the midst of an assembly of the gods, at the marriage of Peleus and Thetis. It was intended "For the most beautiful," and was claimed by Juno, Venus, and Minerva, and Paris was chosen to decide the dispute. The award was given to Venus, which caused Juno to become inflamed with jealousy and hatred toward the Trojans.

**APPLETON** (äp'p'l-tun), a city of Wisconsin, county seat of Outagamie County, on the Fox River, about 120 miles northwest of Milwaukee. It is on the Chicago and Northwestern and the Chicago, Milwaukee and Saint Paul railways, has a growing trade in merchandise,

and is surrounded by a fertile farming and dairying region. The manufactures include paper, boots and shoes, furniture, machinery, clothing, tobacco products, and farming implements. Water power for manufacturing purposes is obtained from the Grand Chute Falls of the Fox River. The city has an excellent system of public schools, numerous churches, and is provided with extensive lines of street railways. It has modern conveniences, such as gas and electric lights, pavements, public parks, several libraries, and an extensive system of waterworks. It is the seat of Appleton Collegiate Institute and Lawrence University. The first settlement was made in 1840 and it was incorporated in 1857. Population, 1905, 17,000.

**APPLE-TREE BORER**, an insect native to America, and a common plague to apple and crab apple trees. It also attacks the mountain ash, pear, and quince trees, and does considerable damage to orchards. The larva of the insect is the borer, and when full grown is an inch long. It has a light yellow color and chestnut-brown head, and the jaws are a deep black. The best preventive is an alkaline wash, though soft soap mixed with lye made from wood ashes, applied to the base of the tree, serves practically the same purpose. This pest should be early exterminated from orchards so as to prevent its spread.

**APPOMATTOX COURTHOUSE** (äp-põ-mät'töks), formerly a village of Virginia, in Appomattox County, now called West Appomattox. It is situated twenty-three miles east of Lynchburg, on the Norfolk and Western Railroad, and is the county seat of Appomattox County. At this place was fought the final battle between the Confederates under Lee and the Federals under General Grant. Lee's army was retreating as rapidly as possible, but was met by General Custer, who fought the wearied Confederates till dark. On the following day, April 9, 1865, as Sheridan was preparing for a charge, a white flag was raised, and General Lee surrendered his army, numbering 27,805, to General Grant. This was the close of the Civil War, and the terms of the surrender accepted by General Grant included that Lee's officers and men should be released on parole and retain their horses, for, said he, "They will need them for spring plowing and farm work." The old courthouse building was destroyed by fire in 1892. In 1900 West Appomattox had a population of 267.

**APRICOT** (ä'prü-köt), a fruit of the plum order, though resembling the peach. It was first brought to Greece in the time of Alexander the Great from countries farther east, probably



from Armenia, where it is native. It is now extensively cultivated in the warmer parts of the temperate zone and in subtropical countries. The tree is of low and crooked growth, usually attaining a height of twenty or thirty feet. Its habit of blooming early renders it liable to damage by frosts in the spring, but it is fully as hardy as the peach. It can be propagated by budding and grafting on peach, plum, and wild cherry stocks. The fruit is an important article of commerce. It is preserved in cans or dried and shipped in boxes. The Pacific coastal region supplies a large portion of the markets of America with this fruit, its culture being an extensive industry in that section, both in Canada and the United States.

**APRIL.** See Month.

**APRIL FOOLS' DAY**, the name used to designate the 1st day of April. Custom has established this day as a time to send a person on a bootless errand, such as for horse milk, for the saddle of a nightmare, or to inform him there is a spot of mud on his face. When the person investigates he is laughed at and called an April fool. This practice is known in all civilized countries, but all do not observe the same day. In Hindustan the 31st day of March is set apart for this practice, at which time the Hindus celebrate the Kuli festival.

**APSE** (ăps), a term used by the Greeks and Romans to designate the projecting semicircular part of a building, or to describe a domical chamber and other vaulted structures. The interior was richly decorated and the most sacred subjects were placed on its walls and in the semidome. In temples the apse contained the cult image of the god, and in the basilica was the tribunal of the praetor, who sat in the center and was surrounded by his assessors. In later times the apse entered into the architecture of Byzantium and was adopted as a part of the architectural structure of Christian churches. The exterior of the Byzantium apse was polygonal in form, but the interior remained semicircular. In Christian churches it was modified both in size and structure, and in many cases the central apse was surrounded by smaller ones called *apsidols*, and sometimes the church was provided with a double apse, one at each end of the building.

**APSIDES** (ăp'si-dēz), the ends of the longest diameter of a heavenly body, applied chiefly to a planet, but frequently to a comet or a satellite. The apsides are the two extreme points in the orbit of a planet, one the nearest to and the other the farthest from its primary; a line drawn between the points is the major axis of the orbit, or the *line of apsides*. These points

move slowly forward in the same direction in which the revolving body moves.

**APTERYX** (ăp'tê-rîks), a running bird of New Zealand, belonging to the family which includes the emu, cassowary, and ostrich, but distinguished from the last mentioned by having three toes instead of only two. It is wing-



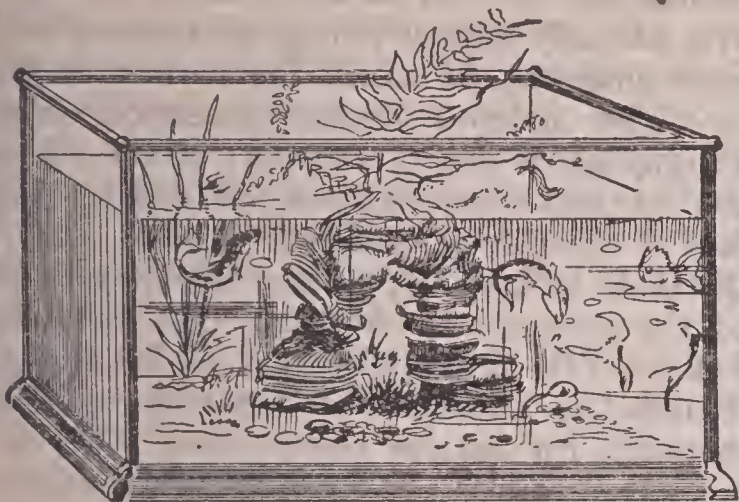
APTERYX.

less and tailless, and possesses a hairlike plumage. The nests are built in a hollow tree, or in deep holes in the ground, and it feeds on worms, insects, and seeds. From its cry, kiwi-kiwi, it is given that name by the natives. It is fast decreasing in number and probably will be extinct ere long.

**AQUARIUM** (ă-kwā'rî-ŭm), a tank or vessel in which marine or fresh-water plants and animals are kept in a living state. The fresh-water aquarium may be provided with a fountain to supply a change of water, or plants and animals may be kept in the proper proportion and the life of both sustained. It was long thought necessary to change the water frequently so as to sustain the life of the fish and other water animals, because when water animals breathe they give out carbonic acid and use up oxygen, just as land animals do, which renders water impure in a short time. But in 1836 M. Charles des Moulins, a Frenchman, discovered that if water plants are put into the same tank with animals they will take up the carbonic acid and give up the oxygen which the animals need. In this way the water may be kept pure and no change is needed. It has been found that salt-water plants can be kept as successfully and in the same way. As a result large aquariums have been established in cities for ornamentation and the study of both plants and animals. Many governments maintain aquariums as a source to study fish and other



animal life, and through these means numerous streams and lakes have been populated with fish and other animals valuable for food and commerce. At the Columbian Exposition at Chi-



FRESH-WATER AQUARIUM.

cago in 1893, the Louisiana Purchase Exposition at Saint Louis in 1904, and other expositions held in the United States, the government made exhibits by demonstrating the practical propagation of many kinds of fishes. At these expositions were eggs of fish in different stages of hatching, and young fish from one day to several months old could be examined and studied by those in attendance.

Aquariums on a large scale are maintained in many public parks for amusement and profit, and the animals treated quite the same as those kept in small tanks for ornament and study in the homes. The Battery, in New York City, formerly known as Castle Garden, has one of the largest aquariums in the world. It contains about 150 tanks, in which are small and large fish, turtles, alligators, and other aquatic animals. Many of the tanks are lighted from above and in the rear by electricity. Brighton, Paris, and Hamburg have large aquariums. In the one at Brighton are 125,000 gallons of water confined in a tank 125 feet long and 100 feet wide, which is covered by a plate glass, through which may be studied the form and habits of very large fish. Other great aquariums are located at Saint Petersburg, and in many natural parks in the United States. The aquarium at Saint Petersburg has been maintained over 150 years.

**AQUARIUS** (à-kwā'ri-ūs), or **Water-Bearer**, the eleventh sign of the zodiac, into which the sun enters about the 20th of January. The same name is applied to a constellation which was in the sign Aquarius at the time when the signs were named, but which, by the precession of the equinoxes, now occupies the sign Pisces.

**AQUATIC ANIMALS** (à-kwät'ic), a term applied to the animals that live in water, or frequent the water in quest of food. This class of animals is very numerous, including the fishes, whales, and dolphins, which live entirely in the water; many birds, reptiles, and mammals, such as the otter and the beaver, which frequent the water for subsistence; most of the mollusca; and many tribes of the articulata and radiata. The animals that live in and habitually frequent water are more numerous than those of the land. The structure and character of animals are influenced by their environments, and in this respect are quite analogous to plants.

**AQUATIC PLANTS**, the plants which live either entirely or partially immersed in water, or which require a preponderating quantity of water as the condition of their existence. Flowerless aquatic plants are more numerous than those that have flowers, and species of the lower types of organism are more abundant than the forms classed with the higher vegetable organisms. Some are entirely in water, as the algae (q. v.), and perform all their functions when submerged, while others are rooted to the ground and have their flowers and part of their foliage above the surface of the water. Some of the seaweeds and plants common to inland waters are provided with air bladders which serve to brace the stem and hold the leaves above the surface, while others, if torn up by the roots, or even if parts of the plant are severed from the main body, continue to grow and multiply. The cat-tail, or bulrush (q. v.), is a notable example of aquatic plants. Others are the water lily, the American lotus, the arrow-head, and the water hyacinth.

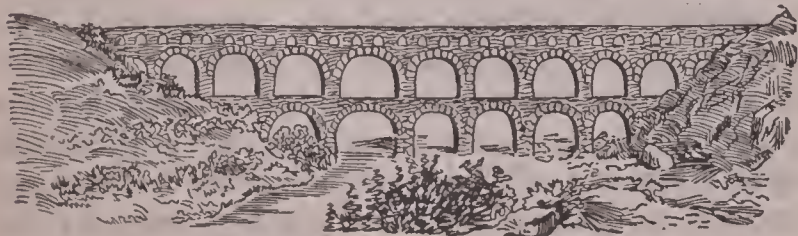
**AQUEDUCT** (äk'wê-dūkt), an artificial course or channel by which water is conveyed from one place to another by the force of gravity. Popular usage has limited the name to conduits built of masonry, such as are used in conveying water to supply large cities, and it does not include the pipes and ditches commonly utilized in mining and in irrigation. The practice of conveying water by aqueducts was in use in times far remote, and was well established in Judaea, Babylon, Persia, and many other countries of Asia. In Peru the Incas constructed aqueducts similar in many respects to those of modern times. In Rome such works were maintained in many parts of the dominion. The city of Rome secured a water supply by means of twenty-four aqueducts, extending many miles, and having a capacity sufficient to supply the entire city. Their construction was usually on a regular descent, winding through hills, crossing valleys by means of great arches,



and in many places even passing by tunnels through mountains.

Modern cities utilize aqueducts, but their construction is changing to a somewhat different plan. Instead of building them on a regular descent so the water may flow entirely by gravity, they are built in part of pipes through which large volumes of water are forced by steam or electric power. In New York City the Croton aqueduct, which supplies the greater part of the city with water, is about forty miles long. The water is conveyed through sixteen tunnels, many of them cut through solid rock. The Harlem River is crossed by a granite arched bridge 1,400 feet long, across which the water is conveyed in three large pipes. The water is carried into reservoirs in Central Park, and is piped from there through many parts of the city. At Boston the Cochituate aqueduct, which is fifteen miles long, supplies a large quantity of water, but the city has additional sources. San Diego, Cal., has an aqueduct or conduit built of redwood, thirty-five miles long, by which the water is conveyed from the mountains.

In recent years the development and application of pipes for conveying water under pressure, buried beneath the soil, have displaced to some extent the building of massive structures of masonry for that purpose. Some very extensive pipe lines, from twenty to fifty miles long, are used in many cities. Rochester, N. Y., is supplied in this way. Saint Louis has conduits that convey water to Bissell's Point, from which the city secures its supply. In many localities conduits of masonry are carried through hills and the valleys are crossed by iron pipe lines. Chicago and many cities secure their supply of water from the Great Lakes by means of tunnels. In most cases a large iron shaft is constructed several miles into the lake, and the water is pumped into a central well, from which it is forced through pipes to all parts of the



AQUEDUCT AT NIMES, FRANCE.

city. Aqueducts are used in hydraulic mining. The water is conveyed from reservoirs far up a river or smaller stream, or from a high point in the mountains, so as to obtain a working head of several hundred feet. The expense of these enterprises is marvelous. The Croton

aqueduct of New York cost over \$20,000,000, and many others cost as much.

**AQUEOUS HUMOR** (ā'kwē-ūs hū'mēr), a waterlike fluid that occupies the space between the cornea and the crystalline lens of the eye. The iris partially divides it into an anterior and posterior chamber, of which the former is the larger. The aqueous humor is almost pure water; only about one-fiftieth part of the whole consists of other constituents, of which fully one-half is chloride of sodium.

**AQUILA** (ä'kwē-lä), a city of Italy, capital of the province of Abruzzo Ulteriore, situated about fifty miles northeast of Rome. It was founded by Emperor Frederick II. in 1240, and is noted for ancient ruins found in its vicinity. It has railroad connections with seaport cities on the Adriatic. The chief manufactures are wine, textiles, and earthenware. A destructive earthquake in 1703 caused the death of about 2,000 persons. Aquila is noted as the birthplace of Sallust, the historian. Population, 1906, 21,188.

**ARABESQUE** (âr-â-běsk'), an Arabian style of architecture employed by the Arabs and by the Moors in Spain. Decorations in this style were used extensively in the Alhambra (q. v.) and by Raphael in the Vatican. The decorations consist mainly of scrolls and geometric devices, and in many of the buildings fruit, flowers, and leaves are mingled with the genii and animals.

**ARABIA** (a-rā'bī-a), the name of an extensive peninsula in the southwestern part of Asia. It is about 1,500 miles long and 750 miles wide, and has an area of about 1,150,000 square miles. This vast region is not well known to geographers and the area is variously estimated. The population is usually placed at 5,500,000.

**DESCRIPTION.** The surface features resemble those of the Sahara, of which it is considered an extension. It resembles the desert region of North Africa in that it contains many oases alternated by sandy and rocky wastes. Much of the interior is a vast tableland, with an altitude of about 8,000 feet, interspersed by mountains and arid deserts, and the whole surrounded by a coast plain near the adjacent waters. The northern and eastern boundaries are formed by Turkey, the Persian Gulf and the Gulf of Oman, and the southern and western by the Arabian Sea, the Gulf of Aden, and the Red Sea. On the northwest it is connected with Africa by the Isthmus of Suez. Anciently the peninsula was divided into three sections, known as Arabia Petraea, Deserta, and Felix. At present it is divided into seven districts whose boundaries are not fixed with any degree of



accuracy. These include Madian, Hejaz, Assir, Yemen, Nejd, Hadramaut, and Oman. The Euphrates River drains a portion of the northern section. Besides this stream there are no important rivers and no interior lakes, and the coasts are comparatively regular. As a whole the climate is healthful. The coastal plains have a scorching summer heat, while the more elevated interior is quite pleasant at most seasons of the year, though sand storms prevail periodically. Rain seldom falls in the interior, where the climate is excessively dry, and in most parts vegetation is very scant.

**INDUSTRIES.** Stock raising is the chief industry, and embraces the rearing of horses, camels, sheep, cattle, and mules. The mule is used largely as a beast of burden. Mining is not carried on extensively, but it is known that there are valuable deposits of salt rock, saltpetre, petroleum, coal, mineral pitch, and various kinds of building stone. Fruits are grown extensively on the coastal plains, especially the date palm. Other products include wheat, maize, tobacco, barley, millet, aloes, balsam, and gum arabic. The ostrich is grown for its plumage. In some sections this animal is found in a wild state, especially in the oases of the desert region. Among the wild animals still abundant are the panther, hyena, lion, jackal, gazelle, and many varieties of aquatic birds and birds of song.

**INHABITANTS.** The inhabitants of Arabia belong to the Semitic branch of the Caucasian family, but the tribes show marked differences in descent and tribal relations. Only a portion have fixed homes, the greater number leading a nomadic life. The wandering tribes consist mostly of Bedouins, who have allotted winter and summer camping grounds, entertain notions of the right of property, possess a strong home feeling, and are governed by a traditional code of law and honor. On the other hand, the Fellahs and Hadesi constitute the located tribes. In stature they are of medium height. They are muscular and strong, and have a brown complexion. The typical Arab is sharp-witted and quick by nature. He possesses a lofty pride and is fond of poetry. Most Arabs take much interest in rearing swift horses, and look upon a fleet animal as a most valuable possession. Education is at low ebb, and is largely in the care of the wife, whose duty it is to keep the house and educate the children. Mohammedanism of the Shiite sect is the chief religion, but the Sunnites and Wahabis are represented to some extent.

**GOVERNMENT.** The government is divided among numerous independent chiefs, who bear

the title of sheik, emir, or imam. The Sinai Peninsula is a dependency of Egypt; and Yemen, Hedjaz, and the region of El-Hasa are under the suzerainty of Turkey. Oman, in the southeastern part, is administered by an independent imam. A number of the chief cities are held by European powers, including Aden, which is a strongly fortified garrison on the Gulf of Aden and belongs to Great Britain. Other cities include Bagdad, Mecca, Medina, Mocha, Sana, Muscat, Basara, and Hodeida.

**HISTORY.** The history of the Arabs before the time of Mohammed is obscure, but under the teachings of that prophet, about 600 A. D., the different tribes became united and powerful. When his doctrines secured a strong foothold and Mecca was conquered, he brought nearly the whole peninsula into submission. He was succeeded in turn by Abu-Bekr, Omar, Othman, and Ali, who assumed the title of caliph, but the period was marked by struggles for supremacy among different tribal interests. Walid I., a sovereign of this line, abolished the Greek language and written characters and substituted the Arabic. Subsequently the capital was transferred from Cufah to Bagdad, where the Arab rulers held sway over a large part of the Mohammedan world from the 8th to the 13th century. At that time they possessed great military strength, conquered Northern Africa and Western Asia, and founded a kingdom in Spain. In the East they were generally known as Saracens, and in the West as Moors. They constructed fortifications, temples, and public highways, traces of which remain in the East and in Spain, especially in the latter country, where the Moorish temples are still sources of wonder. The British occupied Aden in 1839, and the following year most of Arabia became subject to Turkey.

**LANGUAGE.** The Arabic language is classed with the southern branch of the Semitic family of tongues, and next to the Hebrew ranks as the most important. It was generally spoken in Southwestern Asia, Northern Africa, Sicily, Malta, and a part of Spain at the time the religion of Islam spread over those regions, and is still used as the learned and sacred language of the Mohammedans. About one-third of the Turkish and Persian vocabularies consists of Arabic words. The alphabet consists of twenty-eight characters, but eleven of these are distinguished by placing diacritical points above or beneath, hence only seventeen distinct characters are used. The writing is from right to left. As a whole, the vocabulary is extensive and the grammatical forms are complicated.

**LITERATURE.** The literature had its beginning



in the time of the Queen of Sheba, who is the accredited author of several enigmas and poems. However, the rise of Arabic literature dates largely from the time of Mohammed, who gave it new direction and life. Abu-Bekr collected the precepts of faith and life laid down by the prophet, and these collections were afterward published by Othman, the third caliph, and constitute the Koran, the sacred book of the Mohammedans. The period in which literature, art, and science reached its zenith was in the time of the caliphs who ruled in 750-1258 A. D. Harun al Rashid (786-808) was a patron of learning, and by his interest and ability gave impulse to Arabic literature in his own country and many regions under Saracen and Moorish dominion.

The Moors in Spain wrote treatises of value on medicine, history, mathematics, geography, geometry, astronomy, and civics. Their writers in geography were the most noted of those who flourished in the Middle Ages, and their historians and philosophers also took high rank. Their philosophy was largely of Greek origin, chiefly after the teachings of Aristotle, and their most celebrated philosopher was Alfarabi, who flourished in the 10th century. Other philosophical writers included Ibn Sina, Alghazzali, and Ibn Roshd, who flourished in the 11th and 12th centuries. The Arabs excelled all other nations in medicine during the Middle Ages, the medical work of Avicenna, entitled "Canon of Medicine," being long an authoritative guide.

In mathematics and astronomy the Arabs patterned after the Greek writers, but they simplified and enlarged both sciences considerably. Algebra was introduced directly by them to the people of Europe. Their romances and legends are enriched by such familiar works as "The Exploits of Antar," "The Arabian Nights' Entertainments," "The Exploits of Bibars," and "The Exploits of the Champions." From these many European writers have drawn inspiration, and some of the tales drawn from "The Arabian Nights' Entertainments" are familiar to school children in America and Europe. The Arabians were devoted especially to astronomy, which they cultivated in observatories at Bagdad, Cordova, and other cities. Their chief textbooks in this branch of learning consisted of the "Almagest" of Ptolemy, which they translated into the Arabic. The literature of modern times is somewhat limited in scope, but they have several recent treatises on grammar, jurisprudence, and the Koran, and a number of newspapers and other periodicals are published. The Arabian writing, like all in the Semitic, is

written from right to left, and is essentially consonantal.

**ARABIAN NIGHTS' ENTERTAINMENTS** (a-rā'bī-an), a collection of Oriental tales first made known to Europeans by Antony Galland, a Frenchman, who published them in 1704-17. The origin of the work is still in doubt, and it is not known by whom or where it was written, but it is supposed to have been secured by the Arabs from India, and by the Hindus from Persia. The story assigned as the origin of these fables is both interesting and remarkable. It is said that Sultan Shahriyar had a faithless bride, which induced him to make a law that all his future wives should be executed the first morning after their marriage. This custom prevailed until Shahrazad, the generous daughter of the grand vizier, became his wife. She was so skilled in story-telling that she interested the Sultan with a tale every day, and broke off at a point which would lead to an interesting conclusion the next day. In this way the execution was deferred from day to day until the Sultan became reconciled. These stories of Shahrazad now constitute "The Arabian Nights' Entertainments," or "The One Thousand and One Nights," as they are often called.

**ARABIAN SEA**, a large extension of the Indian Ocean, whose northern and eastern coasts are formed by Persia, Baluchistan, and India, and its western by the Arabian peninsula. Its northwestern extension forms the Gulf of Oman, which is connected by Ormuz Strait with the Persian Gulf. On its eastern shore are the Gulfs of Cutch and Cambay.

**ARACHNIDA** (ā-rāk'nī-dā), a class of *arthropods*, variously limited by naturalists, but usually extended to include the mites, ticks, spiders, and scorpions. Most of the animals of this class have simple eyes, but they vary in number from two to twelve. The abdomen possesses no true legs, although these animals have four pairs of legs. Some species secrete poisons, and nearly all prey on other animals. Breathing is effected either by lungs or by means of tracheae, but some breathe by both these means. The history of the Arachnida has been traced to the Palaeozoic times.

**ARAD** (ör'öd), a city in Hungary, capital of the County of Arad, thirty-seven miles north of Temesvár. It is the seat of a bishopric and has a number of modern buildings, including the townhall and a Greek theological seminary. The manufactures include leather, tobacco, alcohol, and machinery. It is important as a grain and cattle market. Population, 1905, 56,260.



**ARAFAT** (ä-rä-fät'), **Mount**, a granite hill in Arabia, fifteen miles east of Mecca, elevated about two hundred feet above the plain. The summit is reached by steps cut in the rock or built of solid masonry. A great multitude of Mohammedans visit this place annually, owing to the belief that Adam and Eve met upon this hill after being expelled from Paradise. It is thought that Adam was cast upon Ceylon and Eve on Mount Arafat, and that after wandering 120 years Adam finally joined Eve on this hill. On the summit is a chapel, in which a sermon is delivered for the benefit of the visitor, who is afterward known as a Hadji, or pilgrim.

**ARAGON** (är'ä-gön), formerly a kingdom of Europe, but now a government in the north-eastern part of Spain. It was united with Spain on the marriage of Ferdinand and Isabella, in 1469, but a complete union did not take place until ten years later. It is divided into the provinces of Huesca, Teruel, and Sargossa. The area is 14,984 square miles. Saragossa is the capital. In 1907 the province had a population of 975,580.

**ARAGUAY** (ä-rä-gwī'), or **Grande**, an important river of Brazil, rises by several branches in the southern highlands of that country, and after a course of 1,350 miles joins the Tocantins River, which carries its water into the Para estuary. It incloses Santa Anna, an island 200 miles long, and is navigable for 1,000 miles. The Das Mortes is its chief tributary.

**ARAL** (är'al), an inland salt-water lake of Asia, including a surface of 26,650 square miles, and forming the outlet of the historic Oxus, or Amu River, and of the Kizil Kum. It has no outlet to the sea, but there are evidences that it was formerly connected with the Caspian Sea. The lake has valuable sturgeon and other fisheries. It is located wholly in Russian territory. At a remote period of history the lake bed was dry, and the waters of the rivers that now discharge into it flowed into the Caspian Sea.

**ARAMAIC** (är-ä-mā'ic), a language spoken in the country between the Mediterranean Sea and the boundaries of Persia and Media on the one side and Asia Minor on the other. This section of Asia contained Mesopotamia, Chaldea, and Assyria, and in ancient Hebrew histories the language is assigned to what is now known as Syria. There were two dialects, known as East Aramaic or Chaldee and West Aramaic or Syrian. The books of Ezra and Daniel and the Babylonian Talmud were written in Aramaic, and it was the official language in Palestine until Hebrew supplanted it.

**ARAPAHOS** (a-räp'a-hōs), an Indian

tribe of North America, formerly resident near the sources of the Arkansas and Platte rivers. Their survivors were transported to reservations now included in Oklahoma, where they were allotted land, and became prosperous as farmers and stock raisers. This tribe of Indians was generally friendly to the whites.

**ARARAT** (är'a-rät), a mountain of Western Asia, in Armenia, on the boundary between Persia, Turkey, and the Russian possessions. Its summit is covered perpetually with snow and rises 17,325 feet above sea level. Vegetation extends to the snow line, about 14,000 feet. It is volcanic, but is now thought to be extinct, the last eruption taking place in 1840. This mountain is historic on account of being the landing place of Noah's ark after the deluge, an account of which is contained in the Bible, in Gen. viii., 4.

**ARAUCANIA** (ä-rou-kä'nē-ä), a district in the southern part of Chile, inhabited by the Araucanians, a native race of South America. The district includes the larger part of the province of Arauco and its boundaries are not well defined. The inhabitants were the last native tribe to become subject to the Spaniards. From 1537 to 1773 they maintained their independence by force of arms, but in the latter year Spain recognized them as an independent people, and they did not submit until 1872, when their territory was made a part of Chile.

**ARAUCARIA** (är-ä-kä'rī-ä), a genus of large cone-bearing trees of the pine family, native to Australia, South America, and the islands of the Pacific. The branches spread greatly and are covered with flat sharp-pointed leaves. Several species furnish timber of value for building, especially the Chile pine of the Andes and the Moreton Bay pine of New South Wales.

**ARBELA** (ärbe'lä), an ancient town of Assyria, in the province of Bagdad, now the Turkish town of Erbil or Arbil. The modern town is built mostly with sun-dried brick, but has a number of large mosques and bazaars. It is famous on account of the last of the great battles fought between Alexander and Darius, in 331 B. C., though the battle took place at Gaugamela, about twenty miles distant. The present population is about 6,000, mostly Kurds.

**ARBITRATION** (är-bī-trä'shün), the settlement of disputes by submitting them to the decision of a private person or persons, instead of litigating in a court of justice. It is not permitted to arbitrate criminal cases, and adjustments and settlements in civil cases by this means are not necessarily binding upon the



parties thereto, even though an agreement to arbitrate be made in writing, since the contracting parties would in that case have no recourse to the jurisdiction of the courts.

It has been a direct object of trades unions to avoid strikes and lockouts through the medium of arbitration. A number of governments have laws authorizing arbitration, and in sixteen states of the United States boards of arbitration are specially provided by law. In some of the states the decision of a board of arbitration is binding on both parties for six months, or either party may give sixty days' notice to have the decision set aside, while in the other states proceedings of this kind may be enforced by judgment, or the party objecting may be punished for contempt. New Zealand has a compulsory arbitration law, which was brought about to set aside the injurious effect of strikes. It is claimed that the law has not closed a factory, that strikes and lockouts have been few, and that wages and conditions under which workmen have labored have been vastly improved. There men working on a salary as well as wage-earners may take advantage of arbitration. The last decade is notable for the growing tendency among legislators and the people to favor the principles of arbitration and gradually extend its benefits in personal cases as well as those affecting railways and other common carriers.

International arbitration refers to the settlement of disputes between states by judges chosen under an agreement, and the tribunals so constituted are governed by articles specifying the matters to be considered. In practice the judges or conference are special or general and are more or less restricted by agreement, and the relief granted may be temporary or permanent. Czar Nicholas II. recommended a peace conference, which met at The Hague, July 29, 1899, for the avowed purpose of effecting an understanding whereby a large part of the standing army might be disarmed and the general peace of nations preserved. While the object sought has not been attained, it has caused thought to turn toward means whereby prolonged wars may be avoided through peaceful means, and as a result several questions of international importance have been referred to arbitrators. The most important instance of this kind in 1905 was the arbitration of the case between Russia and Great Britain on account of Admiral Rojestvensky firing upon English fishermen in the North Sea. The result of this adjustment was that Great Britain was awarded damages amounting to \$325,000, which

sum was paid, and further difficulties were avoided.

Important among the list of arbitrations in which the United States was a party are the following:

I. Settlement of the northeastern boundary, under the Jay Treaty of 1794, in which the United States and Great Britain were interested.

II. The Treaty of Ghent in 1814, between the United States and Great Britain, which provided for determining the northeast boundary of the United States from the Saint Lawrence to the Saint Croix River, ownership of certain islands in the Bay of Fundy and the Passamaquoddy Bay, and to fix the boundary between the United States and Canada along the middle of the Great Lakes and to the Lake of the Woods.

III. Arbitration between the United States and Great Britain in 1818, relative to the ownership of slaves who had been taken possession of by the British, with the result that the United States accepted \$1,240,960 in full settlement.

IV. An adjustment between the United States and Spain in 1819, which had reference to the claims of the Americans against Spain that arose during the occupation of Florida by the latter country.

V. Adjustment of disputes regarding the northeastern boundary, in 1827, in which the case between the United States and Great Britain was referred to the King of the Netherlands, and subsequently the matter was compromised in the Webster-Ashburton Treaty.

VI. Settlement between the United States and France of claims on account of damage done at sea by the French in the wars of Napoleon. It was adjusted in 1831 by awarding \$5,558,108 indemnity to the United States. The claims were paid five years later, Great Britain acting as mediator.

VII. Settlement of the northwestern boundary, between the United States and Great Britain, in 1846, having reference to the San Juan de Fuca Straits and the Haro Canal.

VIII. Adjustment of fisheries rights, in 1855, along the shore of Canada, which was formally adjusted in 1866.

IX. Settlement of disputes between the United States and Venezuela, in 1866, on account of claims of American citizens against the latter country. An adjustment was reached under which more than a million dollars was to be paid, but a second commission reduced the award to \$980,750, which was paid to the United States.

X. Arbitration between the United States



and France on account of injury growing out of the Mexican War of 1862-67, the Civil War, and the war between France and Germany, in which \$612,000 was awarded to France.

XI. Arbitration of rights in Samoa affecting the United States, Germany, and Great Britain, in 1889, which was submitted to the King of Sweden and an agreement was signed at Washington in 1899.

XII. Arbitration of the United States and Great Britain, in 1892, regarding fisheries of the Bering Sea, in which an agreement was reached in 1896, and the United States paid \$471,151 to Canadian sealers.

XIII. Settlement of the boundary between Alaska and the British possessions, in 1897, which resulted in a final agreement in 1899.

**ARBOR DAY** (är'bēr), a day designated by legislative enactment for the planting of trees, and which has come to be a day regularly observed in many states of the United States by the pupils of the public schools. Most states of the central west publish annually a manual compiled by the State department of public instruction. This is sent to all the schools, and serves as a guide and program in conducting appropriate exercises. In some localities Bird Day is now associated with Arbor Day, the purpose being to stimulate interest in the study and protection of birds. The day came to be observed largely by the need of planting trees in the states of the Mississippi Valley. It was first inaugurated in Nebraska in 1874 by the State Board of Agriculture, at the suggestion of J. Sterling Morton, who afterward served as Secretary of Agriculture during President Cleveland's second administration. Besides planting trees for shade and ornamental purposes, it is customary to plant them in memory of authors, statesmen, and war heroes. The day is looked forward to with as much pleasure as Washington's Birthday or Thanksgiving Day, and is quite as appropriate. All other great days celebrate the past, but this day speaks for the future.

**ARBOR VITAE** (är'bēr vī'tē), a class of plants and shrubs allied to the cypress. They are evergreen, have flattened or compressed branchlets, and give off a pleasant balsamic smell. The arbor vitae common to North America is prolific and grows to a height of forty to fifty feet. Chinese arbor vitae is a species valuable for its resin, which yields a medicine useful in rheumatism.

**ARBUTUS** (är'bū-tūs), a genus of trees and shrubs belonging to the heath order. The *strawberry tree*, which is a species of arbutus, yields a fleshy fruit useful for food and in the

manufacture of beverages, especially alcoholic spirits. It is native to large parts of Southern Europe, and has been introduced to North America, especially California. The *trailing arbutus*, or may-flower, is an American species of this genus of plants. The leaves are opposite in most species, and the foliage is quite beautiful.

**ARCADE** (är-kād'), in architecture, a covered passage, either open at the side with a range of pillars, or completely covered with woodwork or masonry. The term is applied in Gothic architecture to a range of arches, supported on columns or tiers, either open or attached to a wall. In many structures of the mediaeval period they form the principal decorations both on the inside and outside, sometimes as real, and other times as blind, galleries. At present the finest arcades are in Paris, where they are convenient thoroughfares as well as decorations, and many are lined with elegant shops.

**ARCADIA** (är-kā'dī-ä), an inland and mountainous country of ancient Greece, next to Laconia the largest ancient division of the Peloponnesus. The most important mountain is Cyllene, the birthplace of Hermes. In the eastern portion are several lakes, whose waters form the great waterfall of the Styx, which was thought by the Greeks to be the principal river of the infernal regions. The inhabitants from times far remote possessed marks of simplicity and inertness, due largely to the condition of their rural life and their employment, which was principally pastoral. They conducted a number of wars against the Spartans and later joined the Achaean league, and still later their territory was merged into the Roman province of Achaia. At present Arcadia forms a province of the kingdom of Greece. The area is 2,030 square miles and its population, 147,650.

**ARC DE TRIOMPHE DE L' ETOILE** (ärk de trê-ônf' de lâ-twäl'), a triumphal arch located in Paris, at the head of Champs Elysées. It was begun by Napoleon I. in 1806 and completed 30 years later by Louis Philippe. The structure was designed by Chalgrin, is 150 feet



ARBUTUS.

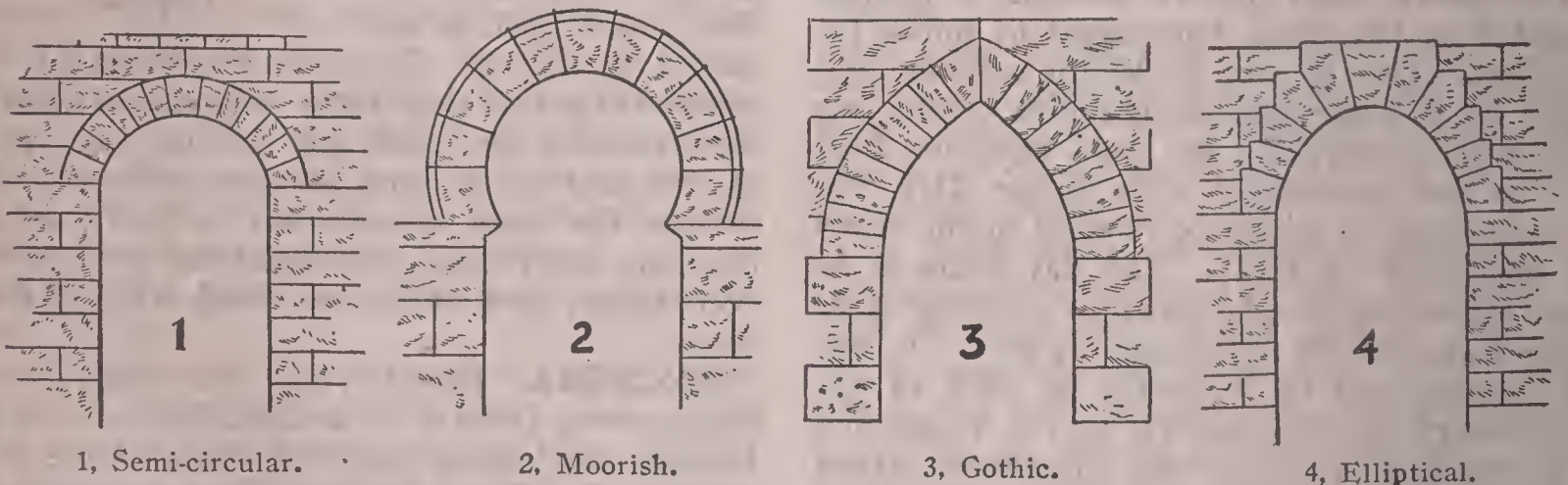


long by 160 feet high, and is ornamented with reliefs representing the victories of Napoleon. It is the largest structure of the kind in the world.

**ARCH** (ärch), in building, a portion of masonry in the shape of an arc or bow, constructed in the form of truncated wedges, and arranged in a curved line in order to support weight by mutual pressure. It is usually constructed to support the building over an open space, as a doorway, in which a single stone often forms the entire arch. When constructed of a number of stones, it contains a middle wedge-shaped stone, called the *keystone*, its purpose being to lock the whole together. The exterior or upper curve is the *extrados*; the inner curve, the *intrados*; the highest part, the *crown*; and the lowest stone on either side, the *springer*. In constructing an arch a temporary frame of wood is first put up, the top of which is shaped like the arch; then the stones are laid up to it until they connect at the top, and the keystone is put in, when

the Great Lakes, and in extensive regions of the Appalachian and Rocky Mountains. It abounds in Eastern Asia, Central Africa, and Northern Europe, extending in the last-mentioned continent from the Arctic Ocean through the Scandinavian Peninsula to the Alps.

**ARCHAEOLOGY** (är-kê-öl'ô-jÿ), the name given to the study formerly known as that of antiquities. In its wider sense it includes a knowledge of the origin of the language, law, religion, institutions, literature, manners, arts, science, customs, in fact everything that can be learned of the habits and life of a people. In a narrower signification it is understood to mean and include all the material from which a knowledge of the ancient conditions are to be attained, but usually comprehends more or less of several branches of knowledge that are recognized as distinct lines of study. Archaeology divides the primitive stages of human life and occupation into various periods, such as the stone, bronze, and iron ages. These names are



the temporary structure is taken down. In Moorish architecture the arch is in the form of a horseshoe, while the Gothic is pointed at the top. The longest stone arch ever made is in the bridge over the Adda River Italy. It is 251 feet long and was completed in the 14th century.

**ARCHAEAN** (är-kê'an), the earliest period in geological history, extending up to the Lower Silurian. It includes two ages, the Azoic and Eozoic, the former embracing the time previous to the appearance of life, and the latter including the earliest forms of life. American writers frequently refer to the Archaean period or system as the Primitive, Laurentian, and Huronian. The rocks of this period consist largely of granite, gneiss, and schist, mixed more or less with igneous formations, and they are characterized by volcanic disturbances in periods far remote. In America this system abounds in British America from the Arctic to

used to designate periods of time on account of the materials employed during the different ages for implements and weapons. The word *age* designates the stage at which a people arrived, hence *stone age* means the period of time before the use of bronze, and the phrase *bronze age*, the time before iron was employed by any particular people. These ages are again divided and subdivided until all times, conditions, and phases of human life become classified for convenience in study. In the 19th century more was learned of the antiquity of man than in all previous centuries.

**ARCHAEOPTERYX** (är-kê-öp'tê-rîks), a fossil bird of which traces are found in the rocks of the Jurassic system. Fossil remains are more numerous in Bavaria than in any other region. This animal was about the size of a crow and had thirteen teeth in the upper mandible and six in the lower, each tooth set in a separate socket. The tail was long and the



wings were large, and that it was able to fly is not doubted, since its feet indicate that it had arboreal habits. Some naturalists have traced



ARCHAEOPTERYX.

through this animal a possible relationship between the birds and the reptiles.

**ARCHANGEL** (ärk-än'jël), or **Arkhangelsk**, a city in Russia, capital of a province of the same name, on the Dwina River, 740 miles northeast of Saint Petersburg. It has good railroad and steamboat facilities, and an extensive trade with Russian and other port cities by the White Sea. Being in a cold region, the port is closed for six months by ice. It was founded in 1584, and was long the only seaport of Russia. The shortest day at Archangel is about three hours, while the longest is twenty-one hours. Archangel province has an area of 331,490 square miles and a population of 356,675. The population of the city is 21,685.

**ARCHANGEL**, a term used to denote an angel superior in power and glory to other angels, but some think it has direct reference to Christ. In I. Thess. iv, 16, is given an account of the coming of the Lord on the last day, which is to be: "With the voice of the archangel, and with the trump of God."—Archbishop, a chief bishop, or one who superintends the conduct of other bishops. This position was established in the early period of Christianity, and is continued by the Roman and Greek Catholic and several Protestant churches.

**ARCHBALD** (ärch'bald), a borough of Pennsylvania, in Lackawanna County, 10 miles northeast of Scranton, on the Lackawanna River. It is conveniently located on the Delaware and Hudson and the New York, Ontario and Western railroads. Coal mining is carried on extensively in the surrounding country. Silk textiles, clothing, and machinery are manufactured. Population, 1900, 5,396.

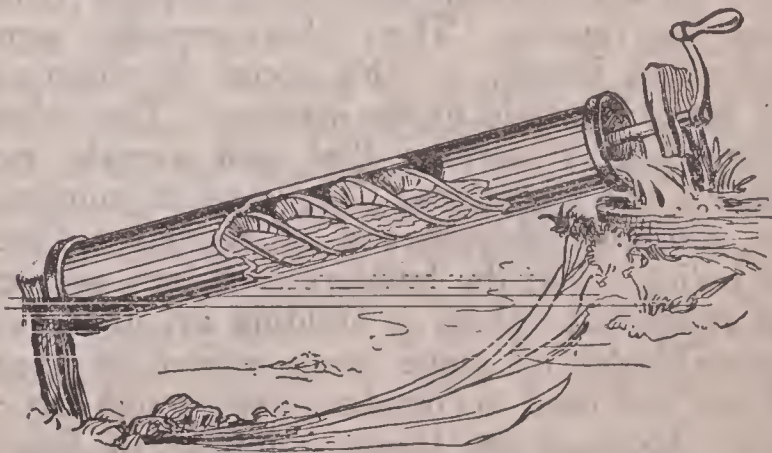
**ARCHER FISH** (ärch'ër), a small fish common to the East Indies. A species native of Java is about six inches long, has an elongated lower jaw, and its body is covered with

small scales extending to the lower part of the dorsal fins. This fish is remarkable for the manner in which it ejects drops of water at insects, causing them to fall from the air into the water, where they are caught and devoured. The projectile force with which water is thrown is so forceful that it will strike a fly at a distance of three to four feet.

**ARCHERY** (ärch'ër-ÿ), the art or practice of shooting with the bow and arrow. The use of this weapon in war and for hunting dates from early antiquity. The ancients most skilled in archery were the Cretans, Thracians, Numidians, and Parthians, and in later years the Arabs, Saracens, and Germans. Long after the discovery of gunpowder we find the bow and arrow still used, even as late as 1572, when Queen Elizabeth promised to place at the disposal of Charles IX. 3,000 archers. In the 18th century societies were formed in England to preserve archery for the purpose of enjoyment and healthful exercise, and it is still popular as a recreation in the United States and Europe. The American Indians, at the time of the discovery of America, used the bow and arrow exclusively for defensive and offensive warfare, and they still practice the art for amusement.

In recent years archery, as a recreation and healthful exercise, has grown in popularity, and clubs to promote the amusement are quite common in the United States and Canada. The practice is confined chiefly to shooting at targets. The Potomac Archery Association and a number of others hold annual contests, the rounds consisting of ninety-six arrows at sixty yards. It is common to have team competitions as well as tests for the longest flight, and in amateur contests the rounds usually consist of sixty arrows at forty yards.

**ARCHIMEDES' SCREW**, a machine for lifting water, thought to have been invented by Archimedes while in Egypt for draining and



ARCHIMEDES' SCREW.

irrigating land. It is constructed of a tube fastened around a solid shaft or cylinder, and so framed that it may be turned around its axis.



The cylinder is hollowed out to form a double or triple threaded screw. The machine is placed in position with one end in the water and the other resting on a perpendicular pillar. When in this position, the lower end fills with water, and, when the shaft or cylinder is turned, the revolution carries the water upward to the perpendicular post and causes it to fall at its base. Similar machines are now built and largely in use in Holland for draining the lowlands.

**ARCHIPELAGO** (är-kĩ-pěl'ä-gõ), the name applied to a group of islands, such as the Caribbean, Patagonian, Aleutian, and others. However, the term was originally used to designate the archipelago located in the Mediterranean Sea, commonly called the Grecian archipelago.

**ARCHITECTURE** (är'kĩ-těk-tür), the art of building. The term is used more specifically to denote the art of building human habitations, temples, or edifices of any kind, either humble or splendid. It is limited generally to the art of constructing edifices to gratify the mind, please the eye, and answer primary purposes of utility. It is often classed as a science, because it draws upon geometry and carries out the principles of various sciences. The architecture of a people indicates their mental and moral qualities, and is an index of the state of civilization to which they have attained. As a whole it is commonly divided into three classes: military, naval, and civil. Military architecture embraces the construction of fortifications for defensive purposes, as a means of subduing insurrections or repelling an invasion by foreign enemies. Naval architecture comprises the art of ship-building and includes the construction of vessels for commerce and offensive and defensive action in war. Civil architecture comprises all other lines not included in the two former, and is generally studied from an artistic, scientific, and utilitarian point of view.

**REMOTE ANCIENT ARCHITECTURE.** Numerous styles of architecture have been known from times far remote. Their characteristics were determined largely by the social development and moral aptitude of the nations. The oldest architectural structures that still remain are those of the Egyptians. They are of immense size, simple in design, and of regular outline, and indicate that the builders took into account few rules that render a building artistic. Immense blocks of stone were raised to great heights, and used to complete plain, rough structures. Most of the larger buildings of Egypt were destroyed fully 500 years B. C. Those that do remain contain great walls and pillars ornamented with hieroglyphics and drawings on stone. They are rather inelegant, but service-

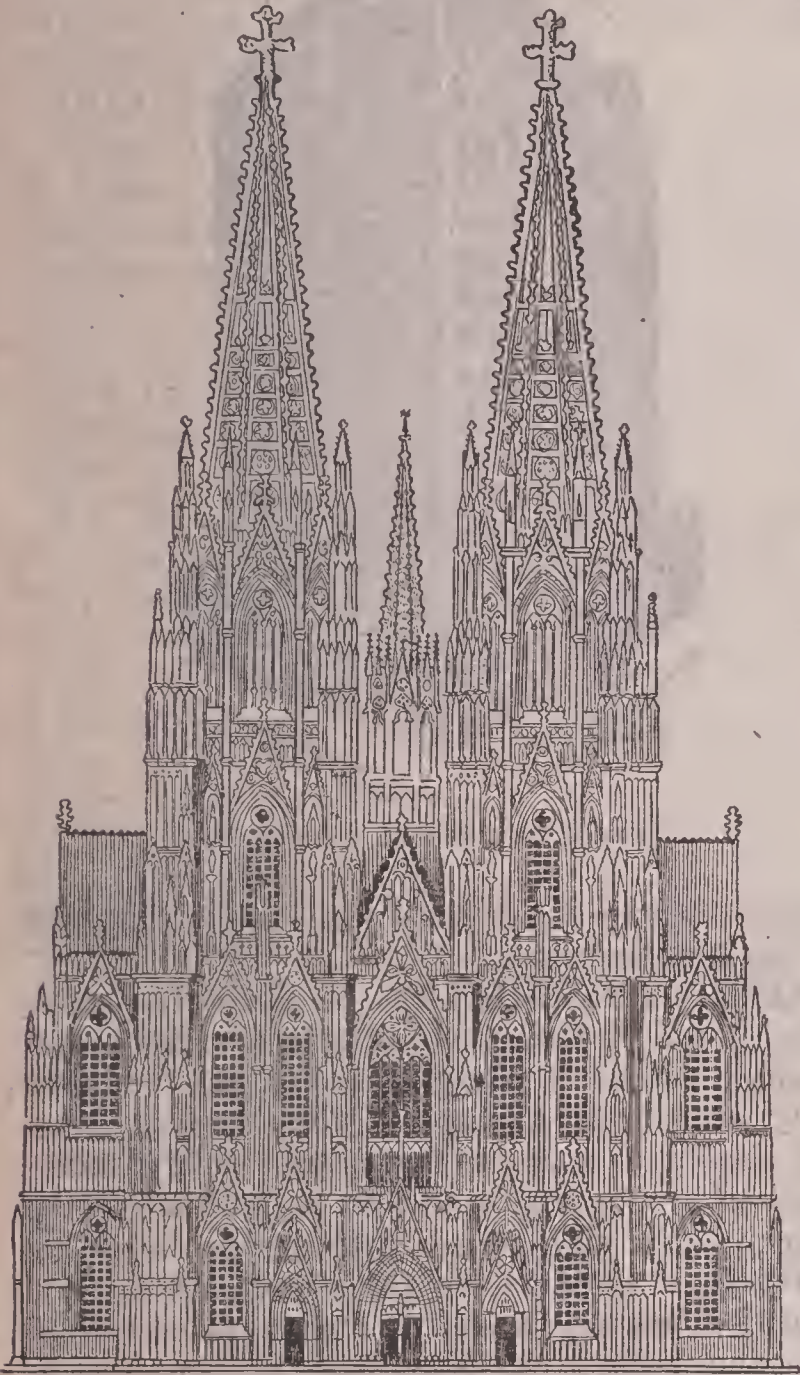
able in preserving the history of the builders. The most interesting structures that still remain are the pyramids, once the tombs of Egyptian kings, built of immense blocks of stone, and gradually narrowing from a broad base to a narrow apex. The largest still in existence is 498 feet high and 693 feet square at the base. The Grecian historian, Herodotus, in giving an account of these ancient wonders, ascribes their building to Cheops, who kept 100,000 men at work on the largest one for a period of twenty years. The obelisks were placed at the entrance of palaces and temples, and on their surface were descriptive hieroglyphics and symbols illustrating the successes achieved in war by the great kings and heroes. They were usually four-cornered shafts of immense height, cut from the quarry in single blocks, and used as ornaments in public places. Ruins of great palaces are found in Persia and Assyria, the oldest and most noted among them being the palace of Nimrod, probably built in the year 884 B. C. Others are found at Susa in Persia, and still others in Babylonia, where once reigned the great Nebuchadnezzar, a Chaldean King of Babylon, in the 6th century B. C. The brick found in these ruins bear the imprint of this famous sovereign of ancient history, and indicate that the architecture of his time was wonderful in its massive design and durable strength.

**GREEK ARCHITECTURE.** In Grecian architecture three styles are recognized, the Doric, the Ionic, and the Corinthian; the important differences in these styles consist rather in the finishing than in other respects. The most beautiful Grecian structures were erected in the period included between 650 and 324 B. C. In general, the Greek buildings were adorned with paintings and sculptures, and the details were enriched by magnificent colors. The most remarkable edifices of the Greeks were temples dedicated to the cause of patriotism, of which class the Parthenon at Athens, which still remains, is the most famous. They built large theaters capable of seating 20,000 spectators and provided them with general conveniences for the assemblage of large numbers. Ruins of many Grecian structures are still found in Sicily, Greece, and Asia Minor. With the death of Alexander the Great, Grecian architecture rapidly declined.

**ROMAN ARCHITECTURE.** The Romans patterned largely from the Greeks, and built after their style in the construction of theaters, temples, bridges, aqueducts, baths, triumphal arches, and private residences. Their orders included also the Tuscan and Composite styles. The Titus



arch at Rome is one of their finest structures. In the reign of Augustus the architecture of Rome attained its greatest perfection, which is evidenced by the fact that many magnificent edifices of his period are still intact. In the construction of aqueducts and sewers, the



COLOGNE CATHEDRAL, GERMANY.

Romans were especially skillful, in which they made extensive use of the arch. They built vast baths, or *thermae*, suitable for use by a multitude of people at the same time. Their architecture was not only utilitarian, but combined with that essential feature an imposing and costly appearance. Roman architecture began to decline soon after the death of Hadrian, in 138 A. D.

**BYZANTINE ARCHITECTURE.** At the time of Constantine the Christians were permitted to build places of worship. Their architecture still marks by its peculiarities many of the churches of Eastern Europe and Asia Minor. The style of architecture adopted by these Christians is known as the Byzantine, from Byzantium, once

the capital of Rome. Saint Sophia, at Constantinople, is one of the finest churches built in this style, but it has been converted into a Turkish mosque. It was constructed by Justinian, and to it were applied the fundamental principles of the Roman arch. Its magnificent dome is the most striking feature of the building. With the fall of Rome the most beautiful and valuable works of ancient architecture were destroyed by the Vandals, Goths, and other barbarians of Europe and Western Asia. Soon after other styles of architecture were introduced by the Normans and Lombards. The former flourished in England in the 13th century, while the latter originated in South Germany as early as the 8th century. With the conquest of Spain by the Moors in the 8th century, Moorish or Saracenic forms of architecture were introduced into Europe. The most noted Moorish building still remaining is the Alhambra, near the city of Granada, Spain. The early Germans were unskilled in architecture and did not make any progress in this line until the 8th century, when Charlemagne introduced the Roman and Byzantine styles. Later Romanesque architecture, in which the semicircular arch is prominent, became popular both in France and Germany.

**GOthic ARCHITECTURE.** Later the people of Germany and France began to develop the modern Gothic style, with its pointed arches, clustered pillars, vaulted roof, and profusion of ornaments. The best forms of architecture in England and Scotland are built after the styles introduced by the Normans, after their conquest of Britain. The finest specimen of Gothic architecture in Europe is the Cathedral of Cologne, Germany, and the best representative of this style in England is Westminster Abbey, London. At a later date the windows were divided into small panes, the doorways were constructed with square tops over pointed arches, and other departures from former styles were made, as, for instance, by tracery in straight lines instead of waving lines. In the 17th century England adopted largely what was known as the Elizabethan style, divers characteristics of which are still found in many buildings in that country. The Gothic style was superseded in Italy by the Renaissance style, which was in fact a revival of the classic style and aimed rather to make ornamental than useful.

**RECENT ARCHITECTURE.** Modern architecture is a term used to designate all varieties of styles in building since the Renaissance. Though not always, it is quite generally in imitation of older forms. Private dwellings are of the Re-



naissance style, while churches are constructed more or less after the Gothic. However, modern architecture employs different materials more largely than were employed in former times, especially iron and steel. Besides, in cities many buildings are of considerable height, largely on account of the enormous rise of values in real estate in the business centers and advantages gained by location in close proximity to the great avenues of business. However, a building with twenty to fifty stories is no disadvantage so far as convenience is concerned, for the reason that the general use of elevators has made access to the upper stories a matter of only a few moments. In some of the great cities of the United States and Canada structures have been erected in which more business is transacted in a year, and in many more lines, than in whole cities containing a population of 10,000 people. Such vast buildings are used for department stores and the jobbing trade, and in many cases for a large combination of interests.

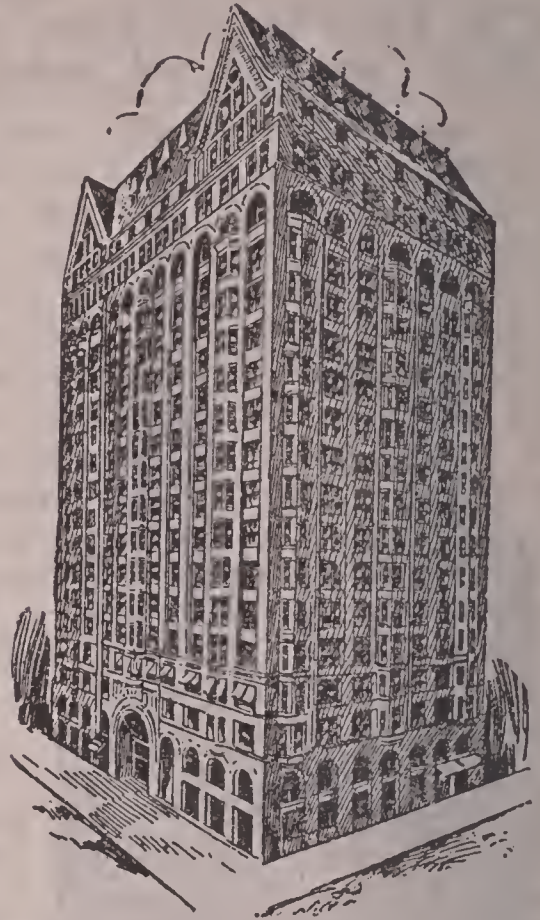
Modern architecture is so diversified and partakes of such a large variety of forms that it has become difficult to classify all the different styles. The most modern structures erected in large cities, and which are designed for much capacity on a small foundation, contain a framework entirely of steel. In these buildings the steel frame carries the whole building. Among



MODERN RESIDENCE.

the advantages accruing from such architectural styles are rapidity in construction, large capacity, great durability, and entire safety from fire. Some of the most wonderful and finest buildings of recent design are the Masonic Temple, Chicago; the Union Trust Company's office, St. Louis; and the Singer Building and the Metropolitan Life Building, New York City. The last mentioned is 48 stories high and is the tallest office structure in the world. Other buildings quite as substantial and serviceable have been constructed in many of the large cities of Canada and the United States. A

personal inspection of any of these will inspire feelings of awe and admiration. What a wonderful transition from the Indian hut of prime-



MASONIC TEMPLE, CHICAGO.

val America to the colossal structures witnessed in the 20th century!

**ARCH TRIUMPHAL**, a decorated arch built by the Romans to celebrate a victory, and through which a victorious general and his army passed in triumph. This custom grew and caused permanent structures, richly sculptured in bronze and stone, to be built after the pattern of a city gate. Among the most remarkable of these arches still remaining in good condition are the arch of Trajan at Beneventum, the arches of Titus and Constantine at Rome, and that of Augustus at Armini. See *Arc de Triomphe de l' Etoile*.

**ARC LIGHT**, a kind of electric light produced by current of high electro-motive force passing between a pair of carbon rods, kept a short distance apart, one being in contact with the positive and the other with the negative terminal of a dynamo. It is unsteady because the arc leaps from side to side as the carbon wears away, the carbon rods being kept at the proper distance by an automatic regulator. The arc light is the most brilliant artificial light known, and is used for lighting halls, streets, and other public places.

**ARCOLE** (är'kō-lā), a village in Italy, on the Alpone River, a tributary of the Adige, 15 miles southeast of Verona. It is celebrated for



a decisive battle between the French under Napoleon and the Austrians under Aldinczy, on Nov. 17, 1796, in which the Austrians were defeated. The battle commenced on the 14th of November, and in the series of engagements the Austrians lost 18,000 men and were compelled to abandon the relief of Mantua, which was besieged by a French army. At present the population of Arcole is 5,259.

**ARCOS DE LA FRONTERA** (är'kōs dā lä frōn-tā'rā), a town of Spain, in the province of Cadiz, on the Gaudalete River, about 30 miles northeast of Cadiz. It is the seat of seven monasteries, a Gothic church, and a public library. Considerable trade is carried on in wine, fruit, and tanned leather. Magelhaens started from this place in 1569 on his first trip to circumnavigate the globe. Population, 1900, 14,393.

**ARCTIC** (ärk'tik), the term which implies the opposite to Antarctic and has reference to the region surrounding the North Pole. The North Pole was so named from its proximity to the constellation of the bear, called *Arktos* by the Greeks.—Arctic Circle, a circle imagined drawn parallel to the Equator, at a distance of 23° 28' from the North Pole. It includes the North Frigid Zone, and is of equal extent to the South Frigid Zone, which surrounds the South Pole. These are called the two polar circles. Within each of these circles occurs a period of the year when the sun does not set, and another when it is not seen. Each of these periods is longest at the poles, at which the days and nights are of six months' duration.

**ARCTIC EXPEDITIONS**, the designation applied to the expeditions designed to penetrate and explore the vast regions surrounding the North Pole. Formerly the prime object of Arctic explorations was to seek and establish a passage by way of the polar regions to Asia, but it was also thought for many years, and this view is still held by some, that an open sea lies near the North Pole. To explore this supposed open expanse and establish a passage by it were undoubtedly the objects that first led to these expeditions. When it became known that passage through these regions is impossible, expeditions were still sent for the purpose of scientific discovery, and to experiment in endeavoring to get to or nearest to the pole. Up to the present time the farthest point north was reached by the Duke of Abruzzi, Prince Luigi Amadeo, born in Madrid, Spain, in 1873. The following are among the points farthest north reached by famous explorers, including those of Nansen and of the Duke of Abruzzi, both these explorers sailing from Norway:

YEAR.	EXPLORERS.	N. LATITUDE.
1607	Hudson .....	80° 23' 0''
1773	Phipps .....	80° 48' 0''
1806	Scoresby .....	81° 12' 42''
1827	Parry .....	82° 50' 0''
1874	Meyer (on land) .....	82° 0' 0''
1875	Markham and Parr (Nares' expedition) .....	83° 20' 26''
1876	Payer .....	83° 07' 0''
1884	Lockwood (Greeley's party).....	83° 24' 0''
1896	Frithjof Nansen .....	86° 14' 0''
1900	Duke of Abruzzi.....	86° 33' 0''

See **Polar Expeditions.**

**ARCTIC OCEAN**, the ocean which surrounds the North Pole. It is bounded on the south mainly by the grand divisions of North America, Europe, and Asia, and is wholly included within the Arctic Circle. A wide expanse of the sea between Norway and Greenland connects it with the Atlantic, and it communicates with the Pacific by the narrow channel of Bering Strait. Within it are numerous islands, including Nova Zembla, Spitzbergen, Franz Josef Land, New Siberia, and the Arctic Archipelago of North America. Among the principal rivers that flow into it are the Mackenzie, Lena, Obi, and Yenisei. The Arctic Current flows southward between Iceland and Greenland, doubles Cape Farewell, and passes into Davis Strait, where it is joined by the Labrador Current. A small drift of water passes into the Arctic through Bering Strait.

A large part of the Arctic Ocean is frozen during the greater part of the year. Owing to dense fogs, floating icebergs, severe storms, and long nights, only a comparatively small part is accessible to navigators. However, it is a prolific source of whales, and many ships visit the southern portions annually. The most valuable regions for fishing are west of Spitzbergen, in the vicinity of Greenland, and in the waters contiguous to Alaska. The region of Bering Strait yields annually large quantities of whales, cod, and walrus. On the eastern coast of Siberia are found numerous bones of mammoths. These bones are inclosed in ice, and are released at the time of the thaws in the summer season. Besides fossil remains of ivory, there are large beds of wood, some of it petrified, and some in an advanced state of decay. Some of these wood deposits are forty feet below the surface, and indicate that in prehistoric times luxuriant vegetation existed in the far north, both in Eurasia and North America. Sea water freezes at about 28°, and the ice reaches a thickness of about seven feet in one season, from which the intense cold of the polar regions may be understood.

The icebergs met with in the Arctic Ocean reach an enormous thickness, being an accumu-



lation of snow and ice that is piled up for many years. The presence of these obstructions endangers navigation and makes it necessary that exploring expeditions proceed with great caution. While a region of about 2,500,000 square miles surrounding the North Pole is unknown to geographers, it is reasonably certain that the unknown part is a vast sea of ice. The northern lights, known as the aurora borealis, are beautiful illuminations of the Arctic seas, and extend far into the heavens, hence they may be seen a long distance toward the south from the north polar regions. They appear in a variety of forms. At times great pillars of light move rapidly across the heavens, or the entire northern sky is lit up by one great flash of rapidly moving beams. The illuminations more frequently observed consist of arches of fire, from which long streamers flash toward the zenith.

**ARCTURUS** (ärk-tū'rūs), a fixed star, the largest in the constellation of Boötes. It is a star of the first magnitude, in the northern heavens, and may be found by continuing the curve of the tail of the Great Bear.

**ARDMORE** (ärd'môr), a city of Oklahoma, in the Chickasaw nation, about ninety miles southeast of Oklahoma City, on the Atchison, Topeka and Santa Fé and other railroads. It is surrounded by a fertile farming region, and has a considerable trade in farm produce, live stock, and merchandise. Bituminous coal is mined in the vicinity. Among the public improvements are several fine school and church buildings, waterworks, and electric lights. It is the seat of Hargrove College. The city was incorporated in 1898. Population, 1910, 8,618.

**ARE** (âr), the unit of land measure used in France. It is equal to 100 square meters, or 1,076.44 square feet. There are 100 ares in a hectare, which is equal to 2.47 acres.

**ARECIBO** (ä-râ-sē'bô), a seaport of Porto Rico, on the north coast of the island, 50 miles west of San Juan. It is located at the mouth of the Arecibo River, but the harbor is shallow and cannot be entered by the larger vessels. Several churches, the government building, and a number of public schools are its chief improvements. It is on the railroad running along the northern coast and has considerable trade in sugar, tobacco, and fruit. Population, 1910, 9,612.

**ARENA** (ä-rē'nâ), the portion of a Roman amphitheater where the combats of wild beasts and gladiators were exhibited. It was provided with four main entrances, and was inclosed by a wall fifteen feet high to protect the spectators. The floor was covered with sand. The term is now applied to places of combat and large summer theaters.

**ARENDAL** (ä'rën-däl), a city in Norway, on Bohus Bay, 41 miles northeast of Christiansand. It is built partly on islands and partly on the mainland, hence it has been called "Little Venice." It has railroad facilities and a good harbor, and carries a large export trade in iron and timber. Population, 1900, 11,250.

**AREOPAGUS** (är-ë-öp'ä-güs), or **Mars Hill**, a rocky eminence in ancient Athens, situated near the acropolis, famous as the seat of the celebrated council or court known by the same name. In this court sat as judges all who had filled the archonship without having been expelled, though the number varies considerably. The judges occupied seats in the open air. It is said that Pericles deprived the judges of some of their power and later they became responsible to the people, but the court still flourished in the time of Emperor Theodosius. Paul plead the cause of Christianity before this august court, the highest that Athens could boast. See Acts xvii., 19-22.

**AREQUIPA** (ä-râ-kē'pä), a city of Peru, in a state of the same name, on the Chile River, near the volcano Arequipa. It is surrounded by a fertile region, which also produces valuable minerals, including gold and silver. The city has railroad connections with Molliendo, its seaport, and also with Cuzco and several cities on Lake Titicaca. In the 16th century it was nearly buried in ashes thrown from the volcano of Misti, and it has since suffered severely from earthquakes. Population, 1903, 35,500.

**AREZZO** (ä-rët'sô), a city in Italy, capital of the province of Arezzo, about 50 miles southeast of Florence. It has railroad conveniences, two colleges, and an extensive museum. The manufactures embrace silk textiles and ironware, and it has a brisk trade in fruit and cereals. Arezzo was founded by the Etruscans, and is the birthplace of Petrarch, Cesalpino, Maecenas, and Pietro Aretino. Population (commune), 1901, 44,316.

**ARGAND LAMP** (är'gänd), a lamp invented by Aimé Argand, a Swiss chemist, in 1782, and designed for burning oil. In this lamp a wick in the form of a hollow cylinder is used, which permits a current of air to ascend, so the supply of oxygen is increased, thus diminishing the waste of carbon and increasing the amount of light. This burner, supplied with a glass chimney to create a draft, is used extensively in kerosene lamps.

**ARGENTINA** (är-jën-tē'nâ), or **Argentine Republic**, a republic of South America, next to Brazil the largest country of that continent. It is bounded on the north by Bolivia and Para-



guay; east by Paraguay, Brazil, Uruguay, and the Atlantic; south by the Atlantic and Chile, and west by Chile. The length from north to south is about 2,100 miles, and the width ranges from 200 miles in the south to nearly 1,000 miles in the north. A portion of the island of Tierra del Fuego, the eastern part, and several islands along its coast are included as possessions of the republic.

**DESCRIPTION.** Along the western boundary are the elevated ranges of the Andes, which separate Argentina from Chile, and the northern part is more or less elevated and hilly. A few ranges of mountains characterize the country east of the Andean Plateau, such as the Sierra de Córdoba and the Ventana Highlands, but the larger part of the surface is slightly undulating in the central part and quite level along the Atlantic coast. Among the natural features of the country are its extensive plains, which occupy more than three-fourths of the surface. In the south are the plains of Patagonia, in the central part are the pampas, and in the northeastern section are the Chico plains. The plains are fertile in the region where rainfall is abundant and abound in luxuriant vegetation. Along the streams are belts of valuable forests, but the plains of Patagonia are almost treeless, though they have a growth of shrubs, herbs, and tufted grass. The soil is from three to eight feet deep, made largely by decaying vegetable matter, under which is a sedimentary subsoil made by alluvial deposits.

The drainage is wholly toward the south and east into the Atlantic. On the eastern border is the Uruguay, which separates the country from Brazil and Uruguay. The Paraná, which forms a part of the boundary with Paraguay, receives the Rio Salado and the Pilcomayo, and discharges a large volume of water into the Rio de la Plata. Among the streams that flow directly into the Atlantic are the Colorado, the Negro, the Chubut, the Deseado, and the Chico. Many fresh-water lakes abound in the tablelands east of the Andes, including lakes Chiquila, Amarga, Porongos, Musters, and Viedma. Lake Buenos Ayres, the source of the Deseado River, is in the south central part. Along the eastern shore are numerous inlets and bays, including the Bay of Samborombon and the gulfs of San Matias, Nueva, and San Jorge.

The climate ranges from the subtropical region of the north to the cold belt of the south. In the northern part the hottest months have an average temperature of 80°, while the extremes range from 30° in July to 105° in January. In the cold belt of the south the temperature frequently falls below the freezing point.

A semiarid region stretches through the southern part, but the central and northern sections have an abundance of rainfall, from 30 to 70 inches, amply sufficient for all agricultural purposes. Sudden changes occur in the weather on the pampas, where the cool, dry winds from the south are frequently followed by the moist, hot winds from the north.

**MINING.** Although the mineral resources of the country are extensive, they have received but little attention. Mining is confined chiefly to the mountain districts in the west, where considerable quantities of tin, nickel, copper, iron, gold, silver, and precious stones are obtained. Marble of a good quality is found in the Sierra de Córdoba, but it is not quarried extensively. Mineral waters of a superior quality are abundant in the western highlands. Other minerals include petroleum, natural gas, salt, mica, and borate of soda.

**AGRICULTURE.** Farming is the most important industry, but the country is sparsely settled and admits of material development. The leading cereals grown in Canada and the United States yield good returns, such as wheat, barley, oats, maize, and rye, but wheat continues to be the most important crop. Among the minor farm products are cotton, tobacco, linseed, canary seed, rice, and sugar cane. Silk culture has been introduced successfully in the northern part, where the climate is particularly favorable for the cultivation of the mulberry tree. Other products include coffee, potatoes, peanuts, and hay. The country has large interests in the live-stock industry, especially in cattle, horses, swine, and sheep. Among the minor domestic animals grown extensively are goats, mules, and poultry. Immigration from Europe is having a marked and favorable influence upon the development of the industries, especially upon farming and stock raising.

**MANUFACTURES.** Comparatively little attention has been given to the manufacturing enterprises until within recent years. A large majority of the products consist of materials that are produced and partially finished for exportation, such as leather, lumber, and packed or cured meat. Flour and grist mills are operated in many sections of the country, and sugar refineries are well distributed throughout the region where sugar cane is grown. Among the general manufactures are boots and shoes, clothing, earthenware, furniture, chemicals, and farming machinery.

**TRANSPORTATION.** Argentina has an extensive coast on the Atlantic, and many of the larger streams are important as avenues for transportation. This is true in particular of the La



Plata and the Paraná, which are navigated about 1,200 miles, and some of the larger tributaries are accessible by small craft. While the southern section is almost destitute of railroads, many lines have been built and are operated in the northern section. Buenos Ayres, Rosario, and Santa Fé are the chief railroad centers. A transcontinental line extends from Buenos Ayres to Valparaiso, a Pacific seaport in Chile. The lines in operation include a total of 15,500 miles. Electric railways are operated in many of the larger cities and towns, from which numerous branches extend to interurban points.

**COMMERCE.** Argentina stands at the head of countries in South America both in domestic and foreign commerce. Foreign trade is largely with Great Britain, Germany, the United States, Italy, France, and Belgium, in the order named, and the principal ports are at Buenos Ayres and Rosario. The imports somewhat exceed the exports, but both give evidence of considerable development the past decade. Among the leading imports are iron and metal goods, paper, textiles, chemicals, foodstuffs, and machinery. The exports include timber products, minerals, hides, cereals, flour, and dressed meat.

**GOVERNMENT.** Argentina is a constitutional republic, and the present constitution dates from 1853, but it was materially amended in 1860 and in 1898. The executive authority is vested in a president, elected for a term of six years, but he is not eligible to reelection. He is assisted by a ministry of eight secretaries of state, who, like the president, are responsible to congress, the legislative branch. The senate consists of thirty members, two from each province and two from the capital, and the house of deputies is composed of 120 members. Justice is administered by federal and provincial courts, and the highest authority is vested in the federal supreme court. At present the country is divided into fourteen provinces and ten territories. Each province has its local executive, legislature, and system of courts, but the territories are administered under the direct supervision of the national government. Gold is the standard of value. The peso is the monetary unit, valued at about \$.965 in the money of Canada and the United States. A peso has 100 centavos. The principal sources of revenue are import duties and excise taxes, but direct taxes are levied by the provinces and smaller subdivisions.

**EDUCATION.** The system of public schools was organized in 1870 and is supervised by the department of public instruction. Aid is given by the general government to numerous colleges and universities, but each province has

direct charge of the public schools within its own boundaries. In this respect the educational system resembles that of Canada and the United States. All children between the ages of six and sixteen years are required to attend school, but the compulsory attendance provision is not enforced strictly in the sparsely settled districts. A number of technical schools and normal institutes for the training of teachers are in a flourishing condition. Spanish is the official and spoken language. The Roman Catholic faith is that of the state, but freedom of religion is guaranteed to all under the constitution.

**INHABITANTS.** Nearly one-half of the people reside in towns and cities, a circumstance rarely met with in new and partially undeveloped countries. About one-third of the inhabitants are of foreign birth, and this element consists chiefly of Italians, Spaniards, Frenchmen, Germans, and English. Buenos Ayres, on the La Plata, is the capital and largest city. Other cities of importance include Cordova, Rosario, Tucuman, La Plata, Salta, and Corrientes. In 1905 Argentina had a population of 5,678,198.

**HISTORY.** The first European explorers of the region now included in Argentina were the Spanish, who visited the Rio de la Plata in 1516. They sailed under the leadership of Juan Diaz de Solis, who left Europe with an expedition to search for a southwestern passage to the East Indies. All who sailed with the company failed to return, and it is supposed they were captured and killed by the Indians. In 1519 the King of Portugal sent Magellan on an expedition to explore the southern part of South America. He sailed through the strait that bears his name and claimed a large portion of the mainland, including the Rio de la Plata and the present site of Buenos Ayres, for Portugal. By the end of the 16th century Argentina became a Spanish possession and continued as such until 1810, when it cast off the dominion of the Spanish crown. Ten years later independence was formally declared, but the country was not freed until after undergoing a series of wars. Spain recognized its independence in 1842. Buenos Ayres undertook to set up a republic in 1854, but it was defeated and obliged to reënter the confederation in 1859. A revolution in 1890 on account of political corruption and subsequent boundary disputes with Chile and Bolivia are among the more recent events.

**ARGENTINE** (är'jĕn-tĭn), a city of Kansas, in Wyandotte County, about four miles west of Kansas City, on the Atchison, Topeka and Santa Fé Railroad. It has electric lights, waterworks, and other conveniences. The city has manufactures of ironware, furniture,



and tobacco products, and is the seat of large gold and silver smelting works. Other industries include elevators and railroad repair shops. Population, 1904, 6,230.

**ARGON** (är'gön), an element contained in the atmosphere, which possesses the property of being chemically inert, and was recently discovered by Lord Rayleigh and Professor Ramsey of England. It is estimated that one per cent. of atmospheric air is argon. This element is heavier than nitrogen but somewhat resembles it. The discoverers were each awarded a prize of \$10,000, one from the French Academy of Science and the other from the Smithsonian Institution. The National Academy of Sciences of the United States awarded Lord Rayleigh the Barnard Medal in 1895.

**ARGOS** (är'gös), a city of ancient Greece, situated in the northeastern part of the Peloponnesus, in the region known as Argos. It was founded about 1500 B. C., and is believed to be the most ancient city of Greece. Homer mentions it in connection with the Trojan War, at which time it was a noted center of influence, and its people were called Argives. It contained many temples to the gods, among them the temple of Hera, of which remains have been excavated by recent explorers. Argos played an important part in the history of Greece, both in ancient and comparatively modern times. The modern city of Argos, a railroad and commercial town, has a population of 11,500.

**ARGUS** (är'güs), a creature mentioned in Greek mythology, and supposed to have had a hundred eyes, of which only two slept at a time. Juno employed Argus to watch the priestess Io, who had been transformed into a heifer. This being was lulled to sleep by Mercury, who played soothing tunes on the pipe of Pan, and was slain by Hermes. It is said that Juno afterward transferred the eyes of Argus to the tail of the peacock.

**ARID REGION** (är'id), a tract or district in which the rainfall is not sufficient for the successful cultivation of crops. The line of demarkation between the humid and arid regions is usually irregular, being influenced more or less by the direction of prevailing winds, the character of the surface, and the time of year when the rains occur. It is assumed by most writers that the plains of North America lying between the Rocky Mountains on the west and the 100th meridian on the east comprise an arid region, and besides this large scope of country there are districts in the Rocky Mountains and the Pacific coast plain where the precipitation is too small to con-

duct agriculture without irrigation. A mean annual rainfall of 20 inches is the approximate minimum, but if the rains occur principally in the growing season less is required. Between the arid regions and those having sufficient rainfall is usually a belt of country in which farming is successful in relatively moist years and a failure in others. However, it is thought that the improvement of a prairie country by cultivation and the planting of trees cause rains to become more regular and abundant. This, for instance, is true of a large part of the Staked Plains, or Llano Estacado of Texas, which was formerly thought to be too dry for farming, but in recent years has become well settled by those interested in mixed farming and stock raising.

The arid region of North America extends from central Mexico to north central British America, but its boundary east and west is very irregular. The southern part of Alberta, Montana, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, and the north central part of Mexico are included in this region. In addition are to be included the western parts of North Dakota, South Dakota, Nebraska, Kansas, and Oklahoma, and a part of Idaho, northwestern Texas, eastern Washington and Oregon, and a large part of California. See **Irrigation**.

**ARIES** (ä'rī-ēz), the ram, a sign of the zodiac, the first 30° measured from the point at which the equator intersects the ecliptic. The sun enters Aries the 21st of March. At present the sign Aries is about 30° west of the original sign, in the constellation Pisces.

**ARISTOCRACY** (är-is-tök'rá-sÿ), a form of government by which the wealthy and noble, or any small privileged class, rule over the mass of citizens. It signifies a government of the best, or by the best. The ruling officers hold their position by right of birth or by appointment, and include mostly the nobility or chief persons of the state.

**ARITHMETIC** (ä-rith'mê-tík), a science that treats of numbers and of the art of computation by means of them. It is usually considered either abstract or practical. Abstract arithmetic includes notation, numeration, addition, subtraction, multiplication, division, fractions, measures, multiples, powers, and roots. Practical arithmetic embraces the application of the abstract with rules, such as reduction, compound addition, subtraction, multiplication, and division; proportion, aliquot parts, interest, profit and loss, etc. However, the fundamental principles of arithmetic are addition, subtraction, multiplication, and division, and these are em-



ployed more or less in all arithmetical computations.

The ancients, even the Greeks and Romans, made little progress in this science, owing to their clumsy means of notation. The most important writings that have come down to us from them are those of Archimedes, Euclid, Nicomachus, and Diophantus. After the introduction of the Arabic numerals, which occurred about the 11th century, arithmetic began to assume greater convenience in form and came to be better known. The Arabic scale of notation is the one now universally used and consists of the following ten digits: 1, 2, 3, 4, 5, 6, 7, 8, 9, 0. Each digit is given a value dependent upon its place occupied in a number made up of several figures. It increases in a tenfold proportion from the right toward the left in whole numbers, and decreases in a tenfold proportion from left toward right in decimal fractions. Thus any value from the largest to the smallest can be definitely stated by this system.

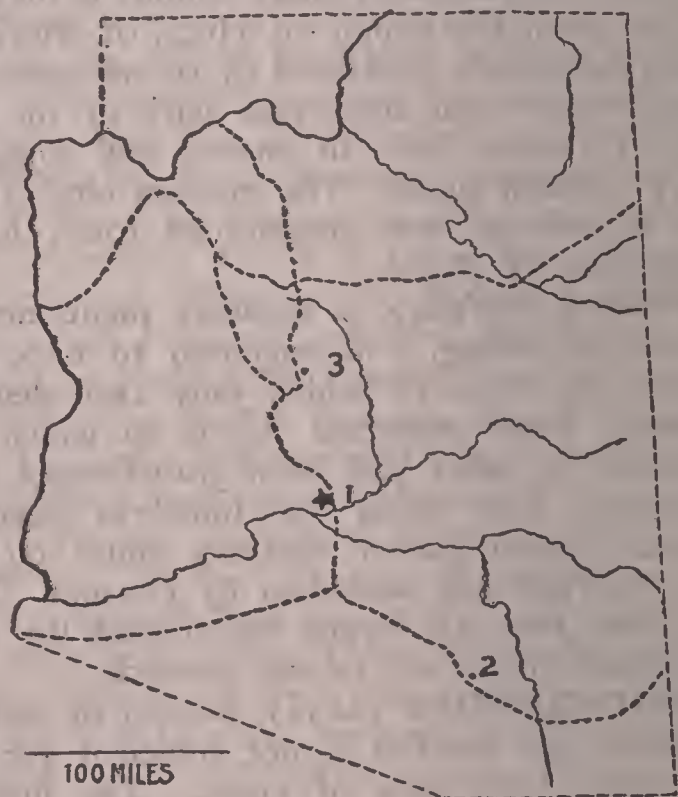
The Roman system came into use with the ascendancy of the Romans. They employed several letters to express numerical values. The letters employed are the following: I, V, X, L, C, D, M, and express values in this order respectively: 1, 5, 10, 50, 100, 500, 1,000. When a letter is written after another letter of the same or greater value, they express together the sum of their value. Thus, II=2; XII=12; XXV=25; CX=110; MX=1,010. When a letter is written before another letter of greater value, the two together express the difference of their value. Thus, IV=4; IX=9; XL=40; XC=90; CM=900. A bar placed over a letter multiplies its value by a thousand. Thus,  $\bar{v}$ =5,000;  $\bar{l}$ =50,000;  $\bar{m}$ =1,000,000.

In the study of arithmetic the three stages of mental development involved should be carefully kept in view. The earliest stage requires a large proportion of work in the concrete. The faculties chiefly exercised at this time are observations, or perception, and memory, and a beginner is not able to formulate thought, or to derive benefit from abstract or formal statements of principles or processes. In the intermediate stage the reasoning faculties, such as abstraction and judgment, come into prominence, and at this time the student needs to acquire a clear perception of the definition and principle involved, and be able to state and define abstract terms intelligently. The ultimate stage is reached when the mental powers are so matured and trained that the student is competent to receive instruction from the abstract or formal

statement of propositions. Definitions, principles, propositions, and statements of processes may be stated to a student at this time before the illustration or demonstration of the processes involved is given.

**ARITHMETICAL SIGNS** (à-rĭth-mĕt'ĭ-cal), the signs or symbols used to designate the operations to be performed, or the facts to be obtained. The following are the common signs used in arithmetic: + signifies that the numbers between which it is placed are to be added;  $\times$ , that the former is to be multiplied by the latter;  $-$ , that the latter is to be subtracted from the former;  $\div$ , that the former is to be divided by the latter;  $=$ , that the number or the process is equal to the number following; and  $:$ ,  $::$ ,  $:$  are signs used between the members of a proportional series, as  $6:12::8:16$ . A period placed to the left of a figure, or a series of figures, indicates that they are decimal fractions, as .206.

**ARIZONA** (är-ĭ-zō'na), a Territory of the United States, bounded on the north by Utah, east by New Mexico, south by Mexico, and west by California and Nevada. The larger part of



ARIZONA.

1, Phoenix; 2, Tucson; 3, Prescott.  
Chief railways are shown by dotted lines.

the western boundary is formed by the Colorado River. The breadth from east to west is about 335 miles, and the length from north to south is 350 miles. It has an area of 113,020 square miles, of which about 100 square miles is water surface.

**DESCRIPTION.** The surface is largely elevated and mountainous. The highlands consist of a portion of the Rocky Mountains and attain



heights of from 12,000 to 14,000 feet. Among the principal ranges are the Mogollon Mesa, in the east; the Santa Ana and Dragon, in the south; the Granite Wash, in the west; the Santa Catalina, in the southeast; and the Gila, San Francisco, and Black Mesa, toward the center and northwest. The high plateaus and mountains are furrowed by rivers whose beds, in some places, are 6,000 feet below the level of the surface. Buttes and mesas characterize the aspect of the plains in many localities, and many of the streams are dry a large part of the year.

The drainage is by the Colorado and its tributaries. The latter include the Little Colorado, the Gila, and the Bill Williams Fork. The Salt and Rio San Pedro discharge into the Gila River. The Colorado, one of the great rivers of North America, passes through the northwestern part of Arizona and separates it on the western boundary from Nevada and California. It discharges into the Gulf of California after passing through a part of Mexico. It is navigable about 500 miles from its mouth, but navigation is somewhat hindered by the rapid flow of its waters. The total fall of the river within Arizona is more than 3,000 feet. In its course it flows through the Grand Canyon of the Colorado, whose vertical walls rise to a height of from 4,000 to 6,000 feet. These walls are vast sections of almost horizontal strata, and, with the smaller canyons of the tributaries of the Colorado, present well-marked geological formations in regular order to a depth of 25,000 feet.

Arizona is located in the arid region (q. v.) of North America, but the climate is healthful and the sky is clear a larger number of days than in any other part of the United States. The mean annual temperature of the northern part is 45°, while in the southern section it is placed at 69°. Rain falls more abundantly in the northern than in the southern part, being about 20 inches annually in the former, while in the southern half it ranges from 10 to 13 inches. Vegetation is correspondingly scant, but bunch grass and pasture lands are abundant. The soil in the valleys is fertile, which is true of most of the level land, but in some parts alkali occurs quite extensively in the soil. The plants and animals are about the same as those found in southern California and New Mexico.

**MINING.** Mineral-bearing land is found in a large part of Arizona, and the mining industry is being developed as rapidly as the transportation facilities will permit. In the production of copper the Territory takes high rank, having extensive and valuable deposits. In the output

of this mineral it is surpassed only by Montana and Michigan, and the product is about one-fifth of the total output of the United States. Gold mining is next in importance, the annual output being about \$2,750,000, and the output of silver is placed at \$1,130,000 per year. Other minerals are lead, salt, tin, quicksilver, gypsum, and precious stones, including onyx, opal, garnet, and sapphire. Marble and building stone are abundant. Near Holbrooke is a section where a large amount of petrified trees are found, frequently referred to as the petrified forest.

**AGRICULTURE.** Stock raising is the chief industry, but irrigation on a large scale is fast extending all classes of farming. The government constructed the Salt River Dam, thereby redeeming a large scope of arid land, and irrigation is employed in the vicinity of Phoenix and other places. Alfalfa is an important crop and is grown largely. The cultivation of wheat, barley, and oats is receiving marked attention, and the acreage devoted to fruit culture is being extended largely, especially in the southern part, where the semitropical varieties are grown, such as almonds, figs, and raisin grapes. Potatoes, apples, and vegetables flourish in all parts of the Territory.

**MANUFACTURING AND TRANSPORTATION.** Manufacturing enterprises have been developed to some extent, though the smelting and refining of copper remain the chief enterprises. Among the general manufactures are flour and grist, butter and cheese, earthenware, and timber products. An abundance of coal and considerable other material of value are factors contributing to the development of manufacturing enterprises, especially in the preparation of material used in the building trades. The only navigable river is the Colorado, but it is available for navigation only in its lower course. Railroad building has received marked attention, and trunk lines of the Southern Pacific and the Santa Fé cross the Territory, furnishing convenient means of transportation to the east as well as to the Pacific coast. In 1908 the lines included a total of 2,115 miles and several electric railways were in operation.

**INHABITANTS.** In 1900 there were only 1.1 inhabitants to the square mile, of which about twenty per cent. were of foreign birth, mostly Mexicans. Excellent schools are maintained by a system of taxation and public grants, including the two normal schools at Temple and Flagstaff and the university at Tucson. The asylum for the insane is at Phoenix and the penitentiary at Yuma. A number of libraries, benevolent and charitable institutions, and scientific and educational associations are maintained. Phoenix is



the capital. Jerome, Prescott, Tucson, and Yuma are thriving business centers. Arizona, in 1900, had a population of 122,212, a gain of 125 per cent. in ten years. The Indian population was 26,480. Population, 1910, 204,354.

**HISTORY.** A powerful race resembling the Aztecs inhabited the region occupied by Arizona before it was visited by white men. This is evident from the fact that ruins of aqueducts, fortifications, and cities have been discovered in many of the valleys, and there are traces of large irrigation canals maintained by the early inhabitants. A Spanish expedition explored the country in 1539, and the following year a second expedition visited the section. The Apaches and other tribes of Indians resisted the pioneers who undertook to make settlements, and little progress was made until after the Mexican Revolution of 1827, when the mines that had been opened at Tucson and Tubac began to attract considerable attention and ranching began to yield returns. Arizona was acquired by the United States, in 1848 as a result of the Mexican War, though a tract south of the Gila belonged to the Mexican state of Sonora, and this was secured by the Gadsden Purchase (q. v.). It was a part of New Mexico until 1863, when it was made a separate Territory. Efforts to have it admitted as a State were made in 1905, and Congress took some action to unite Arizona and New Mexico as one State, but the proposition was not accepted, and up to 1908 it still remained a Territory.

**ARIZONA, University of,** an educational institution located at Tucson, Ariz. It was established in 1885, is coeducational, and is attended by about 250 students. The library contains 7,500 volumes, and the courses include academic and higher branches of study. The buildings and ground are valued at \$165,000.

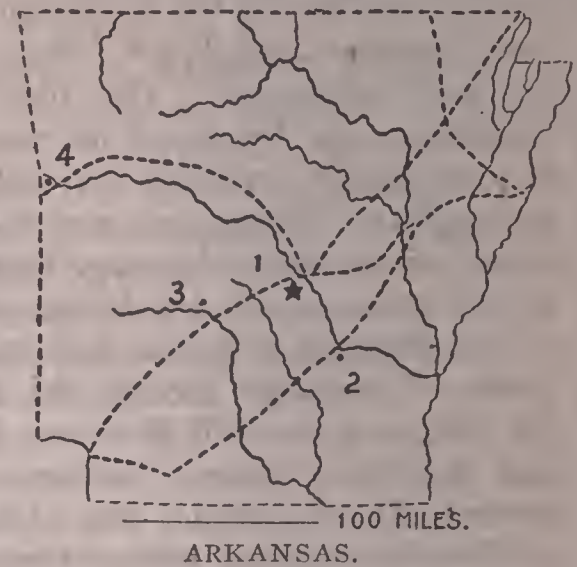
**ARJISH** (ar-jesh'), a river of Rumania, rises in the Carpathian Mountains, and flows into the Danube after a course of 175 miles. It passes through a fertile country.

**ARK** (ärk), the vessel built by Noah, and in which he and his family and many animals were preserved during the flood. It was 525 feet long, 87½ feet wide, and 52½ feet high, and was built to float and not for speed. In the Bible the word *ark* is applied to the basket in which Moses was found by the daughter of Pharaoh, and also to the ark of the covenant.

**ARKANSAS** (är'kan-sä), a south central State of the United States, bounded on the north by Missouri, east by Tennessee and Mississippi, south by Louisiana, and west by Texas and Oklahoma. The greatest length from north to south is 275 miles; breadth, 240 miles; and area,

53,850 square miles. It has a water surface of 805 square miles. The State was named from the Arkansas River, which flows diagonally through it from northwest to southeast. It is popularly called the Bear State.

**DESCRIPTION.** The surface slopes toward the southeast, and in the direction of the Arkansas River, from elevations in the northwest. Along the Mississippi, particularly in the southeastern part of



1, Little Rock; 2, Pine Bluff; 3, Hot Springs; 4, Fort Smith. Chief railways are shown by dotted lines.

the State, are low and marshy tracts, subject to overflow where the low bottoms are not protected by artificial embankments, while the interior of the State is generally undulating. Much of the surface is highly fertile, especially the alluvial tracts in the eastern part. In the northern part are ranges of the Ozark Mountains, which extend into it from Missouri, and attain a height of about 2,800 feet. Smaller elevations wholly within the State, known as the Black Hills and the Washita Hills, stretch over a considerable area, but are less elevated. The Arkansas River enters the State from Oklahoma, near Fort Smith, and joins the Mississippi 20 miles north of Arkansas City. This river and its tributaries drain the larger part of the State. The White River, which crosses the boundary from Missouri, receives the Black and the Cache rivers, and discharges into the Mississippi near the mouth of the Arkansas. The Saline, the Ouachita, and the Bartholomew are tributaries of the Red River. The Mississippi River, which forms the eastern boundary, is important as an avenue of commerce.

The climate as a whole is genial, though malarial fevers are not infrequent in the marshy districts during the warm summer season. The annual rainfall aggregates forty inches in the western part, and about sixty inches in the eastern part, while the mean annual temperature is placed at 61°. Hot Springs and other cities are popular resorts for invalids, especially those suffering with pulmonary diseases. The State has extensive and valuable forests, virgin growths of timber covering a large part of the surface.



Among the chief varieties are the oak, yellow pine, hickory, maple, sycamore, cypress, hackberry, elm, palmetto, cottonwood, and black walnut. In the lowlands are extensive canebrakes, and the wild plum, persimmon, whortleberry, and other native fruits abound.

**MINING.** The region traversed by the Arkansas River has deposits of a fine grade of bituminous coal, and oil and gas are found in paying quantities in several parts of the State. An excellent grade of whetstone is made from salicious rock abundant in the mountains. Other minerals mined largely are bauxite or aluminum ore, zinc, lead, nickel, granite, and manganese. Slate, sandstone, limestone, and granite are quarried. Mineral waters are obtained at Hot Springs and other localities.

**AGRICULTURE.** Farming is the chief occupation, more than half of the area being in farms. In the production of cotton, which is the most important crop, the State takes seventh rank. Corn, wheat, and oats are the most important cereals, in the order named, and hay and forage crops are correspondingly large. Apples, peaches, and strawberries are grown for the market. Stock raising is receiving marked attention, expanding as land is cleared and converted into pasture, and dairying has developed into a productive enterprise. Horses, cattle, mules, swine, and sheep are the principal domestic animals.

**MANUFACTURES.** Manufacturing has been of secondary consideration, but the large forests and extensive mineral interests are stimulating development of this branch of industry, particularly in the output of lumber products and machinery. Flour and grist, cotton-seed oil and cake, and tobacco products are manufactured extensively. The manufacture of cotton textiles has been increasing to a considerable extent the past decade, but the larger part of the raw cotton produced is still exported. Little Rock, Pine Bluff, and Fort Smith are the leading manufacturing and railway centers.

**TRANSPORTATION AND COMMERCE.** The Mississippi, which forms the eastern boundary, gives the State an outlet by water communication to many states of the Mississippi valley. Many of the rivers within the State are navigable during high water, including the Saint Francis, White, and Arkansas rivers. While communication by railway does not extend to all the counties, important lines pass through many sections of the State. These include the Saint Louis, Iron Mountain and Southern, the Choctaw, Oklahoma and Gulf, the Saint Louis Southwestern, the Kansas City Southern, and many other lines. In 1907 the State had 3,500 miles of railroads. Electric

railways are operated in the cities and many sections of the State where settlements are well established. Large quantities of fruit are transported to the northern markets during the early spring and summer. Among the leading exports are cotton, coal, timber products, and live stock. A large share of the foreign commerce is carried through the port of New Orleans, La.

**EDUCATION.** Advancement in educational affairs in Arkansas has been marked the past few years. This helpful uplift is due largely to laws passed by the Legislature in 1907, under which the county superintendency was established and the teaching of elementary agriculture was inaugurated in the rural schools. This law provided for the establishment of a State normal school for white teachers, located at Conway, a town situated about thirty miles west of Little Rock, and increased the State levy for school purposes from two mills to three mills. The University of Arkansas is located at Fayetteville and is in a flourishing condition, having more than one thousand students in attendance, and being supported by liberal appropriations from the State. Among the leading denominational schools are Ouachita College and Henderson College, at Arkadelphia; Gallaway College, at Searcy; Hendrix College and Central College, at Conway; Arkansas College, at Batesville; and Cumberland College, at Clarksville. Two institutions are maintained for the higher education of Negroes, including Philander Smith College and Arkansas Baptist College, both located at Little Rock. The State has about forty preparatory schools and academies of high rank. Most of the towns have good public school systems embracing work of the primary, grammar, and high school grades. Many educational associations are maintained and are doing much in arousing public sentiment in favor of better sanitary conditions, school libraries, and better equipment for the public schools of the State.

**GOVERNMENT.** The present constitution was adopted in 1874. It provides for State elections to be held biannually, at which the Governor and other State officers are elected for a term of two years. The right to vote is limited to those who have paid poll tax and resided in the precinct one month, in the county six months, and in the State a year. A Senate of 35 members and a House of Representatives in which the membership cannot exceed 100 comprise the legislative department. The judicial system embraces the supreme court, the circuit courts, and the county court. Local government is administered by the counties, municipalities, and townships. At Little Rock the State maintains



institutions for the blind and deaf and the State penitentiary, and there is a State prison and a hospital for the insane in Pulaski County.

**INHABITANTS.** In 1900 the State ranked twenty-fifth in the order of population, and the density was 24.7 people to the square mile. Immigration has not been large, averaging not more than about 14,000 per year. A large proportion of the people reside in small villages and rural districts, and not more than eight places have a population exceeding 4,000. The Negro population has been increasing more rapidly than that of the whites, and in the number of colored inhabitants the State ranks tenth. In religious affiliation, the membership in churches is represented largely in the Baptist, Methodist, Presbyterian, and Christian denominations, in the order named. Little Rock, the capital, is the largest city. Fort Smith, near the line of Oklahoma, Texarkana, Pine Bluff, Hot Springs, and Helena are among the thriving business centers. In 1900 the State had a population of 1,311,564, as compared with 1,574,449 in 1910.

**HISTORY.** The authentic history of Arkansas begins with 1641, when a portion of it was explored by the Spaniards under De Soto. Subsequently explorations were made by the French under Joliet, Marquette, La Salle, and Hennepin, and in 1682 the region was claimed by France. Later it formed a part of Spain, was then ceded to France, and in 1803 was secured as a part of the Louisiana Purchase by the United States. The first permanent settlement was made by the French at Arkansas Post in 1695. It was organized as a Territory in 1819 and became a State in 1836, and in 1861 seceded to join the Southern Confederacy. A constitution prohibiting slavery was ratified by a vote of the people in 1868, and a new constitution was adopted in 1874. Since 1876 it has made rapid development of its resources, especially in agriculture and mining.

**ARKANSAS,** an important river of the United States, rises in Colorado, flows through Kansas, Oklahoma, and Arkansas, and joins the Mississippi after a course of 2,170 miles. The chief tributaries include the Cimarron, Grand, and Verdigris rivers. It drains a basin of 190,000 square miles, and its lower course is navigable for steamboats nine months in the year. There are periodical overflows near its mouth, the difference in depth between the dry and the wet seasons being not less than twenty feet. A large proportion of its water in the upper course is used for irrigation. Among the chief cities on its banks are Pine Bluff, Little Rock, and Fort Smith.

**ARKANSAS, University of,** a State insti-

tution located at Fayetteville, Ark., established in 1872. It is supported by Federal and State endowments and appropriations, and with it are affiliated a normal college at Pine Bluff and the medical and law schools at Little Rock. The value of its grounds and buildings is \$300,000. It has forty professors and instructors and is attended by 1,200 students.

**ARKANSAS CITY,** a city of Kansas, in Cowley County, on the Missouri Pacific, the Atchison, Topeka and Santa Fé, and other railroads. It is finely situated on the Arkansas River about fourteen miles south of Winfield, and has considerable jobbing and retail trade. The manufactures include clothing, ice, furniture, flour, machinery, earthenware, and tobacco products. It is the seat of a United States Indian school, and has two parks, a public library, and city waterworks. In the vicinity are deposits of coal and natural gas. The city was incorporated in 1871. Population, 1904, 7,124.

**ARLBERG** (är'l'bërg), a mountain pass in Austria, between the Rhaetian and the Lech Alps. A highway was located and improved across the mountains in 1786 and it remained the only means of communication from points in Austria to Vorarlberg until 1880, when a railroad was built. This line passes through the Arlberg Tunnel, situated between Sanct Anton and Langen, a distance of six and a half miles. The tunnel has an elevation of 4,260 feet above the sea. The cost of construction was \$7,500,000.

**ARLES** (ärlz), a city of France, on the Rhone River, 44 miles northwest of Marseilles. It has remains of a Roman amphitheater, and was the meeting place of several important councils of the church between 314 and 475 A. D. A cathedral and a college are its chief buildings. Silk textiles, hats, and wine are manufactured here. Population, 1901, 15,506.

**ARLINGTON** (är'ling-tün), a town of Middlesex County, Massachusetts, six miles northwest of Boston, on the Boston and Maine Railroad. It has a fine public library and several commodious church buildings, and is popular as a residence suburb. It was formerly a part of Cambridge, from which it was separated in 1807 and called West Cambridge. Since 1867 it has been known by the present name. Population, 1905, 9,668; in 1910, 11,187.

**ARLINGTON,** a village in Alexandria County, Virginia, across the Potomac River from Washington, D. C. It was the home of Robert E. Lee, but was seized by the government at the time of the Civil War, and at present is the site of of the Arlington National Cemetery. The Lee mansion can be seen from Washington's Monument and other prominent



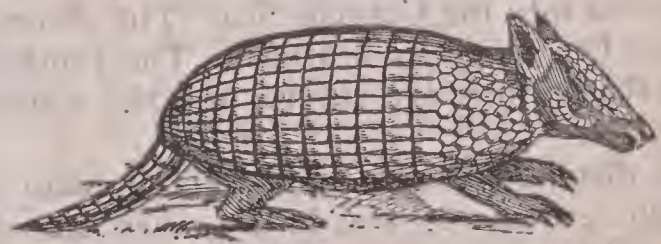
places in the city of Washington, and is a fine specimen of Colonial architecture. The cemetery surrounds this building and is the last resting place of about 18,500 persons, including many of high military rank. The village is reached by the Alexandria and Arlington Electric Railway. Population, 1900, 3,200.

**ARM** (ärm), the upper extremity of the human body, on either side, extending from the shoulder to the hand. It consists of two portions: the arm proper, called the upper arm, and the forearm, or lower arm. The former has one bone, the humerus, which moves freely by a ball and socket joint upon the scapula, forming the shoulder joint, while the forearm has two bones, the ulna and radius. These two bones move on the lower end of the humerus, thus forming the elbow joint, and below articulate with the bones of the carpus, forming the wrist. Motion depends largely upon several well-defined muscles, including the deltoid, which lifts the arm from the side; the triceps, which extend the forearm; and the biceps, which govern largely the flexion or bending of the ulna and influence the movement of the humerus. Blood is supplied to the arm by the brachial artery, by the side of which large cords of nerves pass. The arm furnishes a fine example of muscular development, whose structure affords excellent illustrations of some of the principles of mechanics.

**ARMADA** (är-mä'dä), or **Invincible Armada**, a Spanish term applied to a powerful expedition sent by Philip II. of Spain in 1588 to conquer England. The prime object of the expedition was to strike a decisive blow against the Protestant interests, an enterprise that Pope Sixtus V. had assigned to him. It was placed in command of the Duke of Medina-Sidona. In July, 1588, the fleet set sail with 130 large war vessels, thirty smaller ships of war, 19,900 marines, 8,460 sailors, and 2,080 slaves, and was armed with 2,631 cannon. Soon after leaving Lisbon a heavy storm effected much damage, which required a refitting at Corunna. The design was to pass through the channel and at Flanders coöperate with the Duke of Parma, who had gathered a force of 35,000 men. Large forces were to be landed at several points on the British coast, and the Armada was to ravage the sea and occupy the English Channel. The English organized strong defenses and put their fleet under the command of Lord Howard, with Drake, Frobisher, and Hawkins as lieutenants. By prompt and brave attacks the landing of Parma was prevented, and by dexterous seamanship the English were enabled to inflict severe damage to the lumber-built vessels of

Spain. At Dunkirk many Spanish vessels were destroyed or captured. It soon became apparent to the Duke of Medina-Sidona that the enterprise must be abandoned; accordingly, he attempted to sail round the north of Great Britain and return home, but his fleet was almost destroyed by severe storms. Many of the Spaniards attempted to save themselves from drowning by escaping to the shore of Ireland, but were captured and slain. The enterprise was entirely unsuccessful in accomplishing the object for which it started out. Spain lost seventy-two large vessels and over 10,000 men.

**ARMADILLO** (är-mä-dil'lö), an animal native of South America, where it inhabits the selvas and pampas in large numbers. It is commonly classed with the *Edentata* or toothless animals, but is not entirely toothless. Its teeth are molars and are so constructed that the upper fit in between the lower. It is covered with a hard, bony shell, made up largely of bony bucklers and polygonal plates, into



ARMADILLO.

which it draws its head and limbs for protection. The different species attain a length of from ten inches to three feet. Their food consists chiefly of roots, fruit, worms, and insects. The flesh is relished as an article of food by the native Indians. Armadillos are mammals; the female brings forth from two to ten young at a birth.

**ARMATURE** (är'mä-tür), an appliance used in permanent and electro-magnets, and first introduced in 1895. Its purpose is to preserve and increase the magnetism of the original bars. It is usually, but not always, constructed of thin sheet-iron rings, around an inner soft iron ring, with coils wound between toothed edges, and is held in place by wooden wedges. The shaft carrying the armature is made to revolve rapidly before the poles of the permanent magnet. By these means the electro-magnetic forces are caused to constantly change their direction, hence the currents produced are alternating. The number of magnetic poles in the field frame and the speed of rotation determine the number of times per second such currents change their direction. In the arc and incandescent lamps, and for certain kinds of electric motors, the alternating



current is used largely. Other armatures are used for various purposes. A common form of armature consists of a piece of soft iron placed in contact with the pole of a magnetic bar to preserve its magnetism while not in use. When used in this form, it is commonly termed the *keeper*. When a horseshoe magnet is laid aside, it should not be separated from its armature, and straight-bar magnets should be laid side by side in pairs.

**ARMENIA** (är-mē'nĭ-à), an ancient country of Western Asia, located between the Caspian Sea and Asia Minor. It includes the northwestern part of Persia, the southern region of Transcaucasia, and the northeastern section of Asiatic Turkey, and embraces an area of about 137,000 square miles. The surface is characterized with high tablelands traversed by mountains, of which Mount Ararat is the most prominent, and much of the region is drained by the Tigris and Euphrates rivers. A part of the drainage is by the Hayls into the Black Sea and by the Aras or Araxes into the Caspian Sea. The climate is variable but generally heathful. The rainfall is scant, the winters are severe, and the summers are hot.

The district includes numerous Persian and Turkish settlements, and in the cities are many Jews. The Armenians, like the Jews, are widely scattered in different countries. Wars between them and the Turks have been numerous and were frequently attended with massacres and rank cruelty, causing Russia and other countries to threaten intervention and the establishment of a protectorate. In 1895 incursions of Kurdish soldiers committed revolting atrocities with the avowed intention of exterminating the Armenians and populating the district with Mohammedans. This almost led to international complications and a dismemberment of the Turkish empire, for the reason that the Sultan of Turkey, who is sometimes called "The Sick Man of the East," is largely in sympathy with the opponents of Christianity. The Turkish government promised reforms to a joint commission made up of representatives of England, France, and Russia, but the pledges were not carried out and indiscriminate massacres, though less frequent, occurred as late as 1908. The total number of Armenians is estimated at about 2,500,000, including those embraced in the region as described.

Armenia was once a powerful kingdom, and was conquered in 325 B. C., by Alexander the Great. It remained subject to the Macedonians or Syrian-Greeks nearly 200 years, when it

became independent and was divided into Armenia Minor and Armenia Major. The former was made a Roman province in 70 A. D., and was for a time governed by the Byzantines, the Arabs, and the Persians, and became a possession of Turkey in 1541. Armenia Major was conquered by the Parthians about 150 B. C., and passed through successive wars and under the control of different nations until 1828, when it was made Russian territory. At present the entire region that comprised ancient Armenia is divided among the Turks, the Russians, and the Persians. To unite the Armenians into a nation has been the ambition of these people, but they remain scattered over Asia Minor and a considerable number have emigrated to Europe and America.

The Armenians were adherents to the Zoroastrian religion until about 285, when Christianity was introduced by Gregory the Illuminator, under whose missionaries the king, Tiridates III., was converted. A considerable number belonged to the Roman and the Greek Catholic churches, but the greater part adhere to a sect of Christians formerly known as the Monophysites, from which the Armenian church was evolved at an early period in the history of Christianity. They are industrious, intelligent, peaceable, and faithful to their church and to their traditions. The Armenian language is classed with the Indo-European family of languages, being associated with the Iranic group, but the spoken form is somewhat mixed with words derived from the Turkish and Persian dialects. They have a considerable literature, which includes a number of representative works on religion, history, and the sciences. The Bible was translated into the Armenian language as early as the 5th century, the translation being by Isaac, the Armenian patriarch, and is from the Septuagint version.

**ARMISTICE** (är'mĭs-tĭs), a short suspension of hostilities between two armies or two nations at war, concluded by mutual agreement. An armistice is usually agreed upon when an endeavor to make peace is pending, or when both parties are exhausted. A very notable example is the armistice of the 25th of February, 1856, when five nations of Europe, then at war, agreed to a temporary suspension of hostilities with the view of concluding peace. The armistice may be either *general* or *particular*. In the former a general cessation of hostilities results, while in the latter there is a suspension only between two contending armies of the nations at war.

**ARMOR** (är'mĕr), the defensive arms used as a covering to protect the body, worn espe-



cially in war as protection against the weapons of a foe. In ancient times this custom was general. Homer describes the heroes of the Trojan War as equipped with armor. The custom of wearing armor reached its greatest development in the age of chivalry, when a warrior was almost entirely covered. The early Britons bore little other armor than their shield, but during the Norman conquest the Anglo-Saxons were fully equipped with this character of protection. When gunpowder began to be used largely in warfare, these appendages went rapidly out of use. In modern warfare life is protected by the construction of breastworks and forts, and armor plate is used to protect ships for the same purpose.

**ARMOR PLATE**, the name applied to the strong iron or steel plates used to cover warships with the view of rendering them proof against gun and cannon fire. The first use made of armor plate in naval warfare was in 1782, in the attack on Gibraltar, when the French used bars of iron to protect the hulls of their wooden ships. An increased demand for armor followed the combat of the Monitor and the Merrimac on Hampton Roads in 1862, and since then much thought has been given to the problem of obtaining the best protection that can be devised to overcome the destructive force of a modern steel-capped projectile. It has been found that the best armor plate is made of different varieties of steel, a hard surface to break up the projectile, or to deform it so as to lessen its power to penetrate, and this is backed up by a tough composition which will not crack easily. Nickel steel combines hardness with toughness and its power to resist penetration is about twice that of wrought iron. The larger warships are protected by plates about a foot thick, and a single plate is about nine feet wide and eighteen feet long. Between the plates and the iron frame of the ship is a packing of teakwood or something similar, which serves to lessen the concussion when the armor plate is struck by projectiles. A large ship carries about 4,000 tons of armor. The Mersey works in England, the Krupp works in Germany, the Carnegie works in Pittsburg, and the works of the South Bethlehem Steel Company at South Bethlehem, Pa., are the most noted manufacturing establishments where armor plate is made.

**ARMS** (ärmz), the weapons used for offense and defense in times of war. Some arms are used both for offensive and defensive operations, but there are some designed only for one of these purposes. Among those intended for offensive operations are pistols, rifles,

muskets, swords, bayonets, machetes, and cannon; while those designed for defensive purposes are shields, cuirasses, greaves, and helmets. The class of arms used in warfare depends entirely upon the state of civilization common to a people. In ancient times, and among savage people in modern times, the bow and javelin were favorites for long range, and the straight dagger for close fighting. The Greeks used heavy spears at long range, and generally employed short swords when contending parties engaged, in a hand-to-hand combat. In Macedon, Alexander the Great used the pike, a weapon about twenty feet long, to form a phalanx with the view of presenting an impregnable wall against both infantry and cavalry. This form of weapons continued in use more or less during the early civilization of Europe, although the Romans preferred and used extensively a short massive javelin six or seven feet long, which they hurled at their antagonists, and in short-range fighting employed the broadsword. They moved and operated in such a manner that each man had ample room to wield his instrument of war and inflict the greatest possible damage upon the enemy.

The Middle Ages witnessed the use of cavalry armed with steel-pointed weapons. The lance, battleax, two-handed sword, and mace were peculiar to this period. At that time the lance was a weapon about eighteen feet in length, with a butt end almost a foot in diameter some distance from the extremity, and was designed to fit the arm. The warriors of Scotland, Gaul, Germany, and other regions used either pikes, spears, halberds, or bills with heavy sideblades.

Modern firearms date from the 16th century. The first to be used was the matchlock musket. However, the early pattern was so heavy that a rest was required when taking aim, and later it was supplied with a bayonet, designed to give the musketeers means of defense when in close contact with the enemy. The invention of the musket added greatly to the use of powder as a means of aggressive operation. Arms of this class were used largely in the American Revolution, and in the Revolution of France in 1789. Subsequently many improvements were made in all classes of firearms. The percussion lock, revolving pistols, breech-loading rifles, self extracting and loading magazine guns, and arms especially designed for the use of powerful explosives have all had a marked influence in offensive and defensive warfare. In the war with Spain in 1898 the United States supplied her army with the Krag-Jor-



gensen gun, one of the newer inventions. Equipped with these, a skillful soldier can take aim and fire twenty or more shots per minute. Since several of the great powers employ these guns for use in the infantry, they may be considered among the best military rifles now made.

**ARMY** (är'my), a body of men enlisted, brought together, and so drilled, disciplined, and armed as to form a vast movable force for offense and defense in warfare. It may comprise the entire body of military men employed by a nation, or a portion of it under a particular commander. To be of greatest efficiency it must be perfect in organization and discipline, otherwise it is not available for the highest utility in action. A well constituted and disciplined army implies a trained leader, who communicates orders to subordinate commanders, and they again transmit to others of inferior rank, until, by regularly recognized order of transmission, the original command is communicated to the private soldier. It is necessary that the army be divided into groups gradually decreasing in size so that every portion may be not only commanded with facility, but clothed, fed, armed, and paid. In early times warfare was conducted in a stealthy manner from forest, marsh, and wilderness, led by the most daring and reckless. In modern times war has advanced to an art and is conducted by men who have been trained at institutions designed to give insight to and skill in managing large affairs.

**ANCIENT ARMIES.** The earliest history of organized armies comes down to us from the 16th century B. C. From this it appears that Sesostris, an Egyptian king, maintained a regular army, equipped, disciplined, and salaried. He divided his kingdom into thirty-six military provinces, established a national militia, allotted lands for the support of the soldier, and used this army both in offensive and defensive warfare. With it he became a conqueror of Northern Africa and a large part of Western Asia. Later the Persians extensively fostered military art. They organized a standing army, established garrisons, equipped infantry and cavalry, and provided rules of discipline. The Greeks maintained a national militia in various small states, which united in one great army in times of foreign war. By means of their superb organization and strict discipline they gained the great victories of Marathon and Plataea. The phalanx was originated by the Spartans, while the Athenians organized troops of cavalry to cover the front of their army and harass the enemy in the rear. Philip, the father of Alexander the Great, established the

world's second standing army, added to the efficiency of the phalanx, and made Macedonia strong in war. To him is due the early use of the pike, a weapon about twenty feet in length and efficient in warfare, which, glittering in the hands of a solid phalanx, made an almost impregnable array of muscle and steel. In Rome, about 200 B. C., all able-bodied men between the ages of seventeen and forty-six were liable to service upon a call for military duty. The Roman soldiers were trained from early childhood, as a means of securing both muscular development and efficiency in discipline. Magistrates enrolled the names of those liable to military duty, from which lists were chosen the legions of the Roman army, a military force excelling all others then known. With a gradual decline in discipline, and a draft of slaves and criminals into the service, the decline of Roman power commenced.

**MEDIEVAL ARMIES.** It is not strange that the decline of Rome and the barbarian conquests paved the way for a decline of skillful warfare, which continued until all organized tactics were lost. The invaders from the north possessed little learning, and relied upon personal bravery and daring to secure the fortunes of war. The armies of the Gauls and Germanic tribes represented the nation. During the prevalence of the feudal system national armies again appeared, and each chief or baron possessed a small army, well equipped, but too small for great effect. When the Crusaders organized under a great cause to oppose a common enemy, they discovered the need of organization and discipline. They, accordingly, began to organize large forces of foot soldiers, which took the place of cavalry. The invention of gunpowder effected great changes, but progress in securing its general use was not rapid for the reason that guns and cannon were unknown, and the art of making them was slow in developing. Besides, each knight was ambitious to distinguish himself, and preferred to dash forward by himself and engage in personal combat, rather than lead an army, direct its movements, and gain distinction by leadership.

**MODERN ARMIES.** With the use of firearms and increased facilities for providing them on a larger scale, came gradual changes in modern military affairs. The first standing army of modern times is ascribed to Turkey, where the Janizaries organized an efficient military body in the 14th century. However, the modern military system dates from the time of Charles VII. of France. About the middle of the 15th century that king of France first organized an army of 9,000 men, and afterward added 16,000 more.



During the Thirty Years' War, including the period of 1618-48, Gustavus Adolphus experimented in the use of infantry. His method was to spread the forces of infantrymen out to a great width, while his opponent, Wallenstein, preferred to mass them in a more solid front. In the reign of Louis XIV. armies were grouped into brigades and divisions; while Frederick the Great, a hundred years later, won his victories because of skill in discipline. On account of prolonged wars military service was made legally compulsory in France in 1798. Under this statutory requirement every male citizen between the ages of twenty-one and twenty-five years was liable to four years' service. This plan of Napoleon was later adopted by other European nations.

At present most nations have a standing army constituted of several corps, with which is associated a body of cavalry, together with army reserves of two classes, one subject to immediate call and the other a militia or second reserve. England is the only one of the great powers of Europe in which military service has not been made compulsory, but the recent war in South Africa and the unrest shown in India caused a general agitation more or less to such measures. The time of actual military service varies in different countries from six months to fifteen years, and, besides this, there are annual periods when those subject to military duty are required to pass a limited time in drill and reviews by officers high in authority. The cost of maintaining these armies is enormous, and in recent years several organized efforts were made to secure a general reduction in standing armies. An international conference was held at The Hague in May, 1899, at the suggestion of Czar Nicholas II., for the purpose of promoting general disarmament. All the great powers were represented at this conference and at several held since, and the evils of militarism were freely discussed. While the deliberations have led to no immediate results, they have awakened inquiry, and may yet lead to a condition under which the industrial classes will be largely freed from excessive taxes necessitated by large standing armies and enormous navies.

In the United States the army is authorized by the Constitution. According to its provisions the President is commander in chief of the army and navy. Congress has the power to raise and support armies, to regulate them, and to provide for the execution of the law, the suppression of insurrections, and the repulsion of invasions. Congress several times placed a general limitation on the number of

men that are to constitute the regular army, but in times of war the President calls for volunteers that aggregate many times the number usually maintained. In 1790 the regular army as fixed by Congress included 1,216 men; at the commencement of the War of 1812, 25,000; during the Mexican War, 29,000; at the beginning of the Civil War, 12,000. The law of 1874 limited the standing army to 25,000; and in March, 1899, the regular army was limited to 65,000, with a volunteer service of 35,000 at the option of the President. The highest number of men ever called into service in the United States was during the Civil War, when it aggregated 2,759,049 men and officers. The army of the Confederate States aggregated 1,100,000 men, thus making the total number engaged on both sides about four million men. An order issued in 1901 under an act of Congress placed the numerical strength of the regular army in enlisted men on the basis of one enlisted man for each 1,000 of population. According to this provision, the total of enlisted men is placed at 77,287.

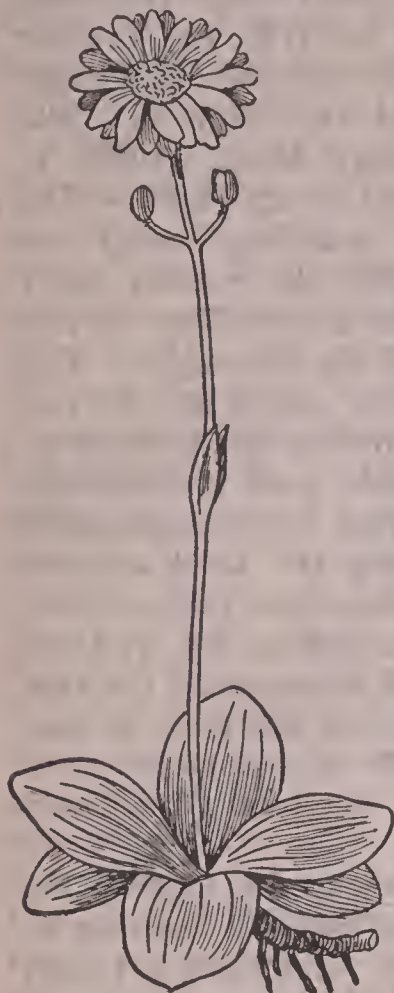
**ARMY WORM**, the larva of a night flying moth, so named from its habit of moving in colonies of large numbers. It attains a length of about one and one-half inches, and may be distinguished easily by the greenish-gray color and yellowish stripes. Army moths make their appearance periodically, and sometimes prove very destructive to crops and other form of vegetation. The best method to destroy them is to plow deep furrows, and, when large numbers of the worms have fallen into the channel, they may be killed by burning straw spread loosely, or by dragging a heavy log over them. The log should be about ten feet long and slightly pointed at the end to prevent pushing the ground as it is pulled by a team of horses. These pests are quite common in North America, especially in the United States, but they do not frequently become troublesome.

**ARNHEM** (är'n'hēm), or **Arnheim**, a city of Holland, capital of the province of Gelderland, situated on the Rhine, thirty-five miles southeast of Utrecht. It has a Reformed Church dating from 1452, in which is the tomb of the Duke of Gelderland. Other buildings of note include a museum, a public library, and a normal school. The favorable location on the Rhine and several railroads make it important as a commercial center. The trade is chiefly in cereals and clothing, and it has manufactures of furniture, machinery, and scientific instruments. Population, 1906, 62,279.

**ARNICA** (är'nī-kā), a genus of plants belonging to the *Compositae* order, many species



of which yield an essential oil and a resinous matter called *arnicin*. A tincture of it is used as an external application for chilblains, bruises,



ARNICA.

and wounds. The plant is native to the mountain districts of Middle Eurasia. It grows to a height of about two feet, has a perennial root, and bears a dark golden yellow flower. A species sometimes called mountain tobacco is native to Central Europe.

**ARNO** (är'nō), an important river of Italy, rises in the Apennines, and after a course of 140 miles flows into the Mediterranean Sea. The source of the Arno is 4,450 feet above the level of the sea. It is navigable for barges as far as Florence. A canal connects the Arno with the Tiber at Arezzo. The valley through

which it flows is highly fertile.

**AROMA** (ä-rō'mā), a term employed to designate the constituents of substances that possess minute particles which affect the organs of smell and produce fragrant odors. These odors are diffused without a perceptible loss of bulk or weight of the substances producing them. Among the chief aromatic substances are cloves, vanilla, coffee, and lavender.

**AROMATICS** (är-ō-mät'iks), the medicines or drugs that owe their properties to the essential oils, and which are secured from the plants that yield camphor, odorous resins, or essences. Many have a warm, pungent taste, as pepper, ginger, cinnamon, saffron, and nutmeg. Some have a bitter taste, as tansy and wormwood, while others are highly fragrant, as myrrh, musk, and storax. In the United States medicines are usually associated with aromatics, but in some countries they are added only on prescription.

**ARRAH** (är'rā), a city of India, in the presidency of Bengal, 33 miles west of Patna. The surrounding country is fertile. It is important as a railroad and commercial center. In 1857 it was the scene of a battle in which the British gained a decisive victory over 3,000 Sepoy insurgents. Population, 1907, 51,500.

**ARRAN** (ä'ran), an island of Scotland, in the Firth of Clyde, about 13 miles west of Ayrshire. It is a narrow strip of land, about 20 miles long, and has an area of 165 square miles. The surface is mountainous, culminating in Goatfell, which has an elevation of 2,860 feet above the sea. The island is remarkable because of its numerous strata of rock, including trap, limestone, mica, granite, and sandstone. Population, 4,950.

**ARRAS** (är-räs'), a city in France, capital of the Department of Pas-de-Calais, 100 miles north of Paris. It has manufactures of lace, hosiery, and cotton goods, and carries a large trade in cereals and live stock. The public library has about 36,000 volumes. In the Middle Ages the city had extensive manufactures of tapestry, and its name has been given to a grade of highly figured hangings. Population, 1901, 20,697.

**ARROW** (är'rō), a missile weapon to be shot with a bow, the latter being bent for that purpose into an angular form. Arrows are usually straight and sharply pointed, and, to inflict a more deadly wound and prevent them being easily pulled out, are often barbed and poisoned at the point. The arrow is frequently mentioned in the Bible as a weapon used in war, and is still employed by savage people. Arrowheads of flint stone were made by the American Indians, many of which are still found in different parts of the continent.

**ARROWROOT** (är'rō-rōōt), the name of a variety of starch derived from the roots and grains of several plants and used as an article



ARROWROOT.

of food. The best quality is secured from the roots of a plant cultivated in tropical countries, especially in the West Indies. The roots of this plant are about twelve inches long and nearly an inch thick. They are peeled and ground into a pulp, from which the starch is taken by means of bathing in water, and it is then spread out and dried in the sun. In Brazil a class of arrowroot known as tapioca meal is



secured in great quantities from the roots of several plants, and a fine quality is made from Indian corn, known in the market as Oswego arrowroot.

**ARRU** (ä'rōō), the name of a group of islands in the Arafura Sea, southwest of New Guinea. The group consists of a number of small islands. The surface is low and the area is about 3,000 square miles. Some of the natives have adopted Christianity. Dobo is the chief town. It is a market for pearls, trepang, and edible birds' nests, which are exported. The islands belong to Holland and have a population of 15,000.

**ARSENAL** (är'sē-nal), an establishment for the manufacture and repair of munitions of war. In most instances separate arsenals are maintained for the manufacture of guns, though formerly all the munitions of war, including explosives and cartridges, were made in general establishments. Great naval arsenals are maintained at Venice, Toulon, and Cherbourg, at which ships are built, repaired, and fitted out. The royal arsenal at Woolwich was established by England in 1720. It comprises a laboratory, and manufactures warlike implements for the army and navy. In the United States each State has an armory for storing arms and ammunition. Large arsenals are located at Fort Monroe, Va., Rock Island, Ill., San Antonio, Tex., and Benicia, Cal.

**ARSENIC** (är'sē-nīk), a chemical element found widely distributed in nature, closely resembling a metal in physical properties, but ranking with the nonmetals. Pure arsenic is a shining, steel-gray, hard, and brittle substance. The white powder known as arsenic in the market is an oxide, and is secured largely from vapors that rise in extracting pure arsenic from the ore. Arsenic is a deadly poison, and when taken into the system causes cramps and a burning pain. The workmen who engage in the manufacture of arsenic, or products in which it is used extensively, are very liable to become unhealthy unless the best possible sanitary regulations are observed. Arsenic is found chiefly in Germany, Chile, Mexico, New Zealand, and in the northern section of the Appalachian Mountains, especially in New Hampshire. It is used in medicine and in the manufacture of shot, glass, and other products. When mixed with copper, it produces a beautiful green color, which is used extensively for coloring wall paper. See **Poisons**.

**ARSON** (är's'n), the willful and malicious burning of a dwelling or outbuilding belonging to another. The crime of arson includes willfully setting fire to any barn, ship, church,

produce, coal mine, or other valuable property. Arson is punishable by common law as a felony, and when death results from it the offender may be punished by inflicting capital punishment, or its legal equivalent. An attempt to set on fire valuable property of another is also punishable as a penal offense. In case the offender sets fire to property for the purpose of defrauding an insurer, the penalty is usually increased.

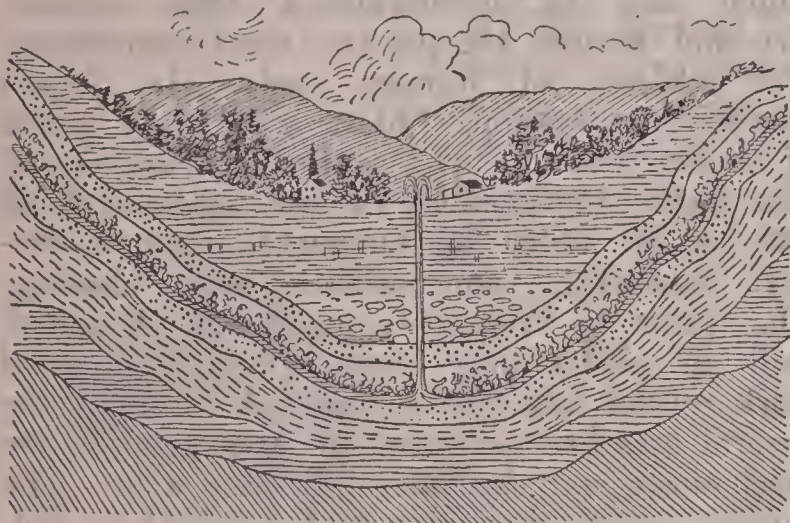
**ART** (ärt), the principles of artistic construction and aesthetic criticism, or the application of such principles to artistic works. In an extended sense the word implies everything which may be distinguished from nature. Art and nature are the two most comprehensive subjects of human study. In Pope's familiar expression, "Blest with each grace of nature and of art," is included everything that exists independent of our study and all that can be added by human exertion to render beautiful, appropriate, and pleasing. The term is commonly used to designate skill in performing some specified kind of work, either physical or mental. Usually the several arts are arranged in two groups: the mechanical and the liberal or fine arts. The former engage workmen who successfully follow an occupation in which genius is not the most material element, but rather skill and facility to work with an efficiency imparted by long practice, as the arts of the watchmaker, carpenter, blacksmith, and others. These are usually called the trades. Liberal or fine arts are such as require, not only manual skill, but great genius. These include sculpture, painting, music, architecture, and all that minister to the sentiment of taste by means of the beautiful in color, form, rhythm, or harmony.

**ARTERY** (är'tēr-ÿ), the name of any one of the vessels through which the blood is conveyed from the heart to the different parts of the system. These organs are so named because the ancients found that the arteries of dead bodies contained air, and supposed them to be air tubes leading through the body. The arterial system starts from the left ventricle, where it consists of one trunk, called the *aorta*. From it several branches pass to the head, after which it makes a bold curve, known as the *arch of the aorta*, and sends numerous branches to all parts of the lower extremities. Arteries are tubelike canals, by which the pure blood is carried from the heart to the cells. They are nearly straight and are located as near the bones as possible, so as to be less liable to injury. In composition they are elastic, which causes them to



yield to every pulse of the heart. They are made up of three layers or coats, including the external or cellular, the middle or fibrous, and the internal or serous, and are encased in a sheath. Where they penetrate muscles, they are often protected by fibrous rings to prevent compression by muscular action. A large canal, not a part of the general arterial system, carries the impure blood from the heart to the lungs to be purified. It is called the pulmonary artery.

**ARTESIAN WELL** (är-tē'zhan), a boring in the ground through which currents of water rise from various depths toward or



ARTESIAN WELL.

above the surface. The possibility of securing a flow of water in this way depends upon the geological structure, though water is found more or less abundantly in all rock formations. Soil and rock constituted largely of sand contain pores and cavities that easily fill with water, which flows out in case a well is sunk to a depth below the regular cavities in which the liquid is stored. Nearly one-third of the apparent sand mass at the seashore or near water beds is made up of water. Artesians wells are sunk in comparatively low places, and in districts where the lower or older strata are formed into basin-shaped curves. Rain falling on the outer portion of the strata saturates the whole porous bed, and, when the bore reaches below the common water surface, the water rushes up toward the level by hydraulic pressure, the height of the flow being equal to the height of the water in the basin-shaped strata. Wells with a good supply of water can be obtained in nearly all parts of Canada and the United States, but artesian wells are not so common. However, in many localities where holes have been sunk in prospecting for coal, salt brine, gas, petroleum, and other minerals excellent flows of water have been found.

In the eastern part of the United States, particularly in the manufacturing centers of New York, Ohio, and Pennsylvania, and in many of the Southern States, such wells are utilized extensively for industrial purposes. In New York City a vast supply of water is secured at a depth of 500 feet; at Saint Louis a well at a depth of 2,250 feet discharges seventy-five gallons of water per minute. At Terre Haute, Ind., are several wells from 1,500 to 2,000 feet deep; and at Columbus, Ohio, a good flow is obtained at a depth of 2,275 feet. New Orleans, La., has several such wells, and many have been obtained in the states on the Pacific coast. These wells supply water for city consumption, manufacturing, and irrigation. In South Dakota and in portions of the Sahara Desert wells have been sunk that yield vast volumes of water for the irrigation of large tracts of arid land. The census returns show that over 10,000 of these wells are used for irrigation purposes in the western half of the United States, of which number about 3,000 are in California. These wells are secured at a depth of from twenty to nearly 3,000 feet.

In late years the process of boring wells for oil, gas, and other minerals has become a distinct branch of hydraulic engineering. Usually a hole is bored for some distance, which is cased by driving an iron pipe into it, and this is lengthened from time to time in the process of construction by attaching other sections. Iron piping is used in constructing drill rods, and a valve opening from beneath is attached about every thirty feet. The drill below the rod contains a hole, through which the borings pass, through the agency of a supply of water poured into the well. These borings work upward through the drill rods as they are moved up and down by machinery on the ground above. In this way drilling becomes a process of pumping, which is not only effective in all grades of clays, but is capable of penetrating through the hardest kind of granite. As the drill passes downward into the earth, iron casing is driven down to prevent caving, and additional rods are put in from time to time as the work progresses. In some localities large augers are used a portion of the time, but in most instances the best steel drills are suitable to carry on the work. However, in the harder substances, such as granite and other rock, the diamond drill is used, which is set with black diamond. In making tests for minerals, a careful account is kept of every strata and formation through which the drill passes, by



means of which an accurate knowledge of the various deposits is secured and the expense of further improvements can be easily estimated.

**ARTHROPODA** (är-thröp'ô-dâ), or **Articulata**, one of the divisions of the animal kingdom. The body of animals belonging to this family is divided into segments, each of which has a pair of jointed feet or appendages, hence Cuvier named the whole group articulata. Many species have been described, including a class that is parasitic in its habits, and in these some of the organs disappear or lose their functions as the animal grows older. In most species the mouth is upon the lower surface of the anterior end; the seat of the nervous system is above and in front of the mouth, and the heart is dorsal and propels the blood forward, but, as the veins are often lacking, the venous circulation, in some species, is returned to the heart through the tissues of the body. The nerves pass from the brain to the eyes, which are simple in some species and compound in others, and the outer wall of the body is usually hardened by a peculiar substance known as *chitine*. They reproduce exclusively by eggs. The three divisions of articulata are arachnida, crustacea and antennata. The first mentioned group breathe by lungs, gills, or air tubes; the second by gills entirely; and the last mentioned by air tubes. Those belonging to the antennata are provided with antennae. Among the animals classed in this family are lobsters, spiders, cockroaches, butterflies, mites, flies, bees, etc.

**ARTHUR'S SEAT**, a famous hill near Edinburgh, Scotland, so named from King Arthur. It is 822 feet above the level of the sea; contains many beautiful drives and valuable monuments, and furnishes an excellent view of the city. It has come to be a favorite pleasure resort of Edinburgh, which is frequently called "Modern Athens."

**ARTICHOKE** (är'ti-chök), a perennial plant resembling the thistle, found native in Europe and Asia. The stem is from two to ten feet high. It is cultivated for food in many parts of Southern Europe. The unripe flower heads and the lower part of the surrounding leaf scales are the chief parts taken for food. The Jerusalem artichoke, a species of sunflower, is cultivated for its root tubers, which resemble potatoes. These may be prepared for the table like potatoes, or eaten raw with vinegar and salt in the form of a salad.

**ARTICLE** (är'ti-k'l), in grammar, one of a class of limiting adjectives, which embrace the adjective elements *a*, *an*, and *the*. *A* is

used before consonant sounds and *an* before vowel sounds; both are called *indefinite* articles, because they refer to any one of two or more objects. *The* is called the *definite* article.

**ARTICLES, The Thirty-Nine**, a statement of the points of doctrine agreed upon by the Church of England. These articles, 39 in number, were confirmed by royal authority after having been agreed upon by a convocation held in London in 1562-63. They are articles of religion, a formula, rather than a creed, and originally were 42 in number. A convocation of the Irish Church adopted them in 1635, and they were ratified by the Scottish Episcopal Church in 1804. The General Conference in 1801 made them applicable to the American Episcopal Church, but inaugurated a few slight changes. Formerly the clergy was required to subscribe to the articles, but now they give assent to them and to the Prayer Book. The Methodist Episcopal Church of America reduced these articles to 25, which is the number now published in its Book of Discipline.

**ARTICLES OF CONFEDERATION**, an instrument adopted by the thirteen colonies of America for their mutual protection and general government. Congress proposed them in 1776 with the condition that they should not be binding until ratified by all the states. Maryland ratified them on March 1, 1781, the last of the States to grant approval, and Congress convened the next day. The delay on the part of Maryland was due to the fact that it demanded that the states cede their claims to territory in the Northwest Territory to the Federal Government, which was done by all the interested states. The instrument united the colonies under the title *United States of America*. While they did not provide a satisfactory plan for government, they remained in force as the fundamental law until March 4, 1789, when the Constitution became operative and the first Constitutional Congress assembled.

**ARTIFICIAL ICE** (är-ti-fish'al). See **Ice**.

**ARTIFICIAL LIMBS**, the mechanical contrivances employed to fill the functions of a lost limb or part thereof. The construction of artificial limbs possessing considerable merit dates from the beginning of the 19th century, although Herodotus and others mention their use in early history. A Roman artificial leg discovered in a tomb in Capua, and which was used about 300 B. C., is now in the London Royal College of Surgeons. The German Knight, Gotz von Berlichingen, in 1504, wore an iron hand constructed to



grasp a sword, which weighed three pounds. Many other remarkable incidents in history may be cited as evidence that artificial limbs have been worn for many ages.

Artificial limbs of recent manufacture possess many points of utility and show much skill in construction. Various kinds of substances are used in the manufacture, but mostly such as possess lightness, strength, and noncorrosive qualities. Aluminum possesses all these elements and has gone largely into the manufacture of these appliances. Arms are often contrived so the hand may be unscrewed and a hair brush, knife, fork, or some similar instruments can be put in its place. Cork, rubber, and wood with leather bands have gone largely into the manufacture of devices to replace lost limbs. Artificial fingers, ears, and noses are skillfully shaped from papier mache. This material may be waxed and varnished so as to have in effect the same complexion as the real organs of the individual. Such an artificial part, if carefully made, cannot be distinguished from the real, except by the very closest examination. Glass is used in the manufacture of artificial eyes, which are so skillfully made that they agree in size, measurement, color, and other essentials with the real eye. They serve a useful purpose in preserving the natural appearance, especially where the wearer still possesses one of the natural eyes.

**ARTILLERY** (är-til'lēr-ÿ), the term formerly used to designate any instrument of war, even bows, slings, and arrows, but now applied to cannon and general ordnance, including guns, mortars, howitzers, and machine guns. It is also applied to officers and men of the army to whom the care and management of the artillery is intrusted. It may be taken for granted that the history of artillery proper commenced with the discovery of gunpowder. The first large implements of war to throw missiles of considerable size were constructed of stone. The scientific casting of cannon did not begin until the 17th century, but there is evidence that implements of rough construction were used as early as the 12th century.

With the advent of field guns came the necessity of employing a special body of men skilled in the management of heavy masses of field artillery, though this branch of warfare received little attention until the beginning of the last century. Early experiences showed the large cannon to be unwieldy and it was often lost by mismanagement or rendered of small effect for want of means to move it about. Besides, there was a want

of men skilled in the arts of taking aim and calculating distances and the range of guns, whereby effective results might follow. This led to the establishment of artillery schools, where men might be trained to efficiency and skill. These schools date from 1675, when Louis XIV. founded such an institution and organized a special artillery force. France and Germany long possessed the best artillerymen and artillery service of the great powers of Europe. They were trained, not only in institutions, but by personal inspection at the seats of war. This was the case in the war between the English and the Boers, in South Africa in 1900, when Germans and French managed largely the artillery of the latter. However, it was demonstrated in the Spanish-American War of 1898 that the United States cannot be excelled in military marksmanship.

Woolwich is the seat of the artillery and engineering school of England. However, most countries of Europe separate the school of artillery from that of the engineers. In the United States the organization of batteries is largely under the direction of the President. In time of peace the mounted artillery organization is small, while in time of war it constitutes a considerable portion of the general army. At least one battery for every regiment is required to be mounted. Owing to the late wars in the colonial possessions, garrisoned fortifications have been constructed at which a large portion of the artillery is utilized. To enlarge the skill of the American army and secure expert artillerymen, a school with a suitable course of study and a practical department is maintained at Fort Monroe, Va. The course consists of two years, and is a post-graduate adjunct to the United States Military Academy, at West Point, N. Y.

**ARTILLERY SCHOOLS**, the institutions designed to impart skill in artillery practice. The first was established in France in 1675, which was followed by one in Germany in 1766, and England founded the Royal Military Academy at Woolwich in 1741. The artillery school of the United States is located at Fortress Monroe, Va. It was founded in 1824, and has a course of study covering two years.

**ARUWIMI** (ä-röö-wē'mě), a river of Africa, one of the tributaries of the Congo. It rises west of Lake Albert Nyanza and flows westward through a region of dense forest. At Yambuya, to which it is navigable, are a number of rapids. In different parts of its course of about 800 miles it assumes the names of Ituri and Bijerre.



**ARYANS** (är'yans), the name applied to the Indo-European races. The Aryans originally inhabited the region of Asia near the upper Oxus or Amu River. They engaged in farming and stock raising, and were advanced in some of the arts of civilization. Their origin is traced to the Japhetic nations from Japheth, son of Noah, of whom they are held to be descendants. These people spoke one language, the Sanskrit, from which the modern languages spoken by their descendants have originated. Although many of these languages appear to show no affinity, yet upon close examination it is found that all were derived from the same source and had one common origin. The Aryan nations of Asia are the high-caste Hindus and the ancient Persians, while those of Europe include the Greeks, Latins, Slavs, Leets, Celts, and Teutons; the last mentioned include the Germans and Scandinavians. While little is known of the ancient Aryans, it is thought they engaged chiefly in tilling the soil and in pasturing their flocks. They lived in villages, practiced the grinding of grain and weaving of cloth, and possessed well-formed ideas of government. The English are a branch of the Aryan race, and descended from them through the German people.

**AS** (äs), or **Libra**, a Roman weight, divided into 12 *unciae*, and nearly equal to the English pound. A Roman coin called *as* originally weighed a pound, but it was afterward reduced in size and weighed one thirty-sixth of a pound.

The older coins bore the figure of some domestic animal, as an ox or a sheep, and on one side of those of more recent date was stamped the head of an important personage.

**ASAFETIDA** (äs-ä-fēt'ī-dä), the name of several plants common to Persia and the East Indies. These plants yield a drug useful in medicine, especially for asthma, hysteria, worms, and gaseous distentions of



ASAFETIDA.

the intestines. To secure the drug old plants are tapped for their juice, which is dried in the sun and hardened, in which state it is ex-

ported largely. This drug has a very disagreeable odor, but is used for seasoning articles of food among some tribes in the East.

**ASBESTOS** (äs-bēs'tös), a substance named from its property of not being affected by fire. It is a highly useful mineral of a silky luster, having fibers that in some species are delicate, flexible, and elastic, and in others brittle and stiff. Its chief property is that it will not burn, which renders it highly important as a means of protection against fire in buildings and as a sheath or covering to confine heat to a particular channel. The ancients knew of it and used it in preparing flexible cloth for shrouds to cover dead bodies. Deposits of this mineral are found in various localities of all the grand divisions. It occurs in Montana and Georgia in paying quantities, where it is mined profitably. The quality of the American product is equal to any in the world. At Sall Mountain, a foothill of the Blue Ridge in Georgia, an asbestos ledge has been discovered that is more than 800 feet long, about 250 feet wide, and of great depth. Canada has large deposits of white asbestos, which can be spun into fine thread and woven into yarn and rope. Large quantities of this product are marketed annually and its use is extensive. Electrical supply companies employ it in the manufacture of insulators. It is used extensively in making asbestos cement, quick-setting plasters, fireproof roofing, deadening for walls and floors, sectional covers for steam pipes, refrigerator insulation, and many other useful purposes in manufacturing. It has proved especially beneficial in the manufacture of stage curtains in theaters and for the protection of dead bodies that have been embalmed.

**ASBURY PARK**, a town of New Jersey, in Monmouth County, on the Pennsylvania and the Central of New Jersey railroads. It is finely situated on the Atlantic coast, six miles south of Long Branch, and is one of the most famous health and pleasure resorts of the Eastern states. A short distance south is Ocean Grove, from which it is separated by Wesley Lake. It is visited by many thousands of people annually, who are amply accommodated by facilities for entertainment. Population, 1905, 4,526.

**ASCALON** (äs'ka-lön), or **Askalon**, an important city of ancient Palestine, situated midway between Gaza and Ashdod, on the Mediterranean Sea, thirty-eight miles southwest of Jerusalem. It is mentioned several times in the poetical books of the Scriptures, but is noted more particularly on account of its history in connection with the Maccabees and the Cru-



saders. The Christians under Godfrey de Bouillon and Tancred attained a noted victory at Ascalon in 1099, and Baldwin III., King of Jerusalem, also gained a victory here in 1153. It was recaptured by Saladin in 1187, and three years later was destroyed by a joint treaty under the Moslems and Christians. The ancient city contained a number of noted temples and was celebrated for the production of wine in the time of Pliny. On the site of the ancient city are ruins and a small village of Turks and Christians.

**ASCENSION** (äs-sën'shün), an island in the Atlantic Ocean, 750 miles northwest of Saint Helena. It has an area of 35 square miles, is of volcanic origin, and belongs to Great Britain. Green Mountain, the highest elevation, rises 2,870 feet above the sea. It is important as a coaling station. Georgetown, the chief business center, is a naval station. Population, 390.

**ASCENSION DAY**, often called *Holy Thursday*, the day on which the ascension of Christ is commemorated. It has been observed as a feast since about 68 A. D., and is movable, occurring on the second Thursday before Whitsuntide.

**ASH**, a genus of forest trees common to North America and Eurasia. More than fifty species have been described, of which the common ash is the most widely distributed. The species native to North America include the red ash, white ash, blue ash, and swamp ash. The ash tree is distinguished by its size and graceful foliage. It attains a height of sixty to ninety feet and has widespreading branches. It yields a good quality of timber for the manufacture of plows, vehicles, furniture, and agricultural implements. The weeping ash is a species with drooping branches, and the mountain ash is planted largely as an ornamental shade tree. A species native to Palestine, the flowering or manna ash, yields the substance called manna. This product exudes from incisions made in the bark. Some varieties yield a sap useful in the preparation of medicine.

**ASHANTEE** (ä-shän'tê), or **Ashanti**, a country in Western Africa, situated north of the Gulf of Guinea, and extending toward the interior from the Gold Coast. Though its boundaries are not accurately defined, its area is placed at 50,000 square miles, and the population at 3,000,000. It is one of the largest native kingdoms of Africa, but within recent years many changes have been wrought on account of the extension of European interests, particularly those of France, England, and Germany. The country is rich in gold dust and

ivory, and there are considerable productions of fruits, cereals, vegetables, and fish. Several wars have been carried on with European powers. The government is a despotic monarchy, in which slavery is still recognized. In 1896 it was placed under British protection and was annexed to that country in 1901. The chief seat of government is at Kumassi, which, in 1905, had a population of 5,940.

**ASHBURTON TREATY**, a treaty negotiated between the United States and Great Britain at Washington in 1842, the former country being represented by Daniel Webster and the latter by Lord Alexander B. Ashburton. By this treaty the northeastern boundary between the United States and Canada was finally settled, the United States securing about seventwelfths of the territory in dispute. It was also stipulated that the slave trade should be mutually suppressed.

**ASHEVILLE** (äsh'vil), a city in North Carolina, county seat of Buncombe County, on the French Broad River, 210 miles west of Raleigh, on the Southern Railroad. It is finely situated in the midst of the Blue Ridge Mountains, at an elevation of 2,300 feet, and enjoys a large manufacturing and jobbing trade. The city has well-paved streets, rapid transit, electric lights, and excellent school and church buildings. It is the seat of Asheville College, a Methodist institution founded in 1843. Among the chief buildings are the city hall, the post office, the Auditorium, the Asheville Normal and Collegiate Institute, and the Battery Park Hotel. Richmond Hill, Overlook Park, Pisgale Forest, and the Vanderbilt estate are among the points of interest. It has manufactures of cigars, clothing, earthenware, machinery, flour, and furniture. Its favorable location has made Asheville famous as a health resort, both for summer and winter visitors. The region was first settled in 1792. Population, 1900, 14,694.

**ASHLAND** (äsh'land), a city of Boyd County, Kentucky, on the Ohio River, and on the Norfolk and Western and the Chesapeake and Ohio railroads. It is surrounded by a fertile farming country, which contains extensive deposits of coal. The manufactures include ironware, boilers, furniture, nails, and machinery. The city has good municipal improvements, and enjoys the advantages of good school and church facilities. It was first settled in 1854 and became an incorporated city in 1870. Population, 1900, 6,800.

**ASHLAND**, the county seat of Ashland County, Ohio, 65 miles southwest of Cleveland, on the Erie and other railroads. It has a











large trade in grain and produce. A public library and the county courthouse are among the chief buildings. It has waterworks, electric lights, and manufactories of machinery. Population, 1900, 4,087.

**ASHLAND**, a city of Oregon, in Jackson County, fifteen miles southeast of Jacksonville, the county seat. It is on the Southern Pacific Railroad, in a fruit growing country, and granite quarries and gold mines are worked in the surrounding country. Railroad shops, lumber yards, and flouring mills are among the industries. It is the seat of a State normal school. In the vicinity are mineral springs. Population, 1900, 2,634.

**ASHLAND**, a borough in Schuylkill County, Pennsylvania, twelve miles northwest of Pottsville, on the Philadelphia and Reading and the Lehigh Valley railroads. It has large foundries and machine shops, and anthracite coal is mined in the vicinity. The State Miners' Hospital is located at this place. It has a municipal system of waterworks and several fine schools. Ashland was incorporated in 1857. Population, 1900, 6,438.

**ASHLAND**, a city in Wisconsin, county seat of Ashland County, on Ashland Bay, 200 miles north of La Crosse. It is on the Northern Pacific, the Wisconsin Central, the Chicago and Northwestern, and other railroads, and has a large trade in lumber, iron, and building stone. The manufactures include lumber products, ironware, machinery, furniture, and clothing. Among the chief buildings are the county courthouse, the post office, the North Wisconsin Academy, the Vaughn Public Library, and the Knight Hotel. The city has a fine system of public schools and numerous churches, and is substantially improved by pavements, electric lights, and street railways. There are several fine parks and libraries. It was first settled in 1854 and was chartered as a city in 1887. Population, 1905, 14,519.

**ASHTABULA** (ăsh-tă-bŭ'lă), a railroad center and manufacturing city of Ohio, in AshTABULA County, at the mouth of the Ashtabula River, on the New York, Chicago and Saint Louis, the Lake Shore and Michigan Southern, and other railroads. The surrounding country is productive, yielding considerable quantities of cereals, live stock, and fruits. The city has a fine harbor on Lake Erie, and direct steamboat connections are maintained with Chicago, Cleveland, and other lake cities. The manufactures include ships, boilers, engines, leather, machinery, furniture, clothing, and tobacco products. It has a fine system of public schools, many well-built churches, and good municipal

improvements, including electric street railways, pavements, waterworks, and several fine parks. The first settlement was made in 1803. Population, 1900, 12,948.

**ASHTON-UNDER-LYNE** (ăsh'tun ũn'der lĭn), a manufacturing town of England, in Lancashire, six miles east of Manchester. It is nicely situated on the Tame River and several railroads, and has large industries in calico printing and the manufacture of machinery. A canal connects it with Manchester and other important towns. It was founded by the Saxons and has a church built in the time of Henry V. Population, 1901, 43,900.

**ASH WEDNESDAY**, the first day of Lent, so named from the Roman Catholic ceremony of sprinkling ashes on the heads of penitents then admitted to penance. It is thought probable that this custom was established by Gregory the Great. The ashes are secured by burning palms, after which they are consecrated on the altar and sprinkled with holy water, and a small portion is then cast on the head of the penitents as they kneel at the altar.

**ASIA** (ă'shĭ-ă), the largest of the grand divisions, comprising an area of 16,775,000 square miles, about twice the extent of North America. The principal boundaries on the north are formed by the Arctic Ocean, east by the Pacific, south by the Indian, and west by Africa and Europe. As a whole, the coast line is indented by numerous inlets, many of which are deep and expansive seas. On the north are the Kara Sea and the Gulf of Ob. The eastern shore is indented by the gulfs of Anadir, Tartary, Pechili, and Tonkin, and by the Sea of Okhotsk, the Japan Sea, the Whang Hai or Yellow Sea, and the East China Sea. On the south are the gulfs of Siam, Martaban, Cambay, Cutch, and Oman, the Bay of Bengal, the South China Sea, and the Arabian Sea; to the southwest are the Gulf of Aden and the Red Sea; and the western boundary is formed partly by the Mediterranean, the Black Sea, and the Caspian Sea. Few great lakes or inland waters characterize the continent, those of most importance being Lake Baikal, the Aral Sea, and lakes Tenis, Balkash, and Tungting.

The continent is separated from Europe by the Ural Mountains, the Ural River, the Caspian Sea, the Caucasus Range, and the Black Sea. It is connected with Africa by the Isthmus of Suez, through which the Suez Canal has been cut, and it is separated from Africa mainly by the Red Sea and the Gulf of Aden. Near the continent are a large number of islands, especially off the eastern coast, many of which are the peaks of volcanic mountains







belonging to systems partly submerged. The East Indies constitute the largest group of islands, and include Borneo, Sumatra, and New Guinea. North of the East Indies are the Philippines, Formosa, and the group included in Japan. North of the continent, in the Arctic Ocean, are Anjou or New Siberia, and a number of small groups not well known. Small islands are located in the seas east and south of the continent, including Hainan in the China Sea, the Andaman islands and Ceylon in the Sea of Bengal, and numerous small groups in the Arabian Sea.

**PHYSICAL FEATURES.** The altitude of Asia is varied to a greater extent than that of any other portions of the earth, ranging from a considerable tract below sea level to the highest mountain summits in the world. A tract of 50,000 square miles in the region of the Caspian Sea is below sea level, while the highest extensive region on earth is included in the lofty highlands of the interior. The Plateau of Pamir is situated about 1,000 miles southwest of the center of the continent, where the boundaries of Afghanistan, India, and Turkestan meet. This plateau is near the center of the mountain systems, which radiate from it in various directions. Southeast of it are the Himalayas; northwest, the Hindu Kush; and northeast, the Thian Shan. East of the Pamirs are the Kuenlun Mountains, which extend east into China, and southwest of them is the Plateau of Tibet. The Hindu Kush attain a height of 25,000 feet and are extended westward by the Elburz in the northern part of Persia, where Mount Demavend has a height of 18,500 feet. South of the Elburz is the great Plateau of Iran, situated mostly in Persia and Afghanistan.

The Himalaya Mountains trend in a slight curve from the northwest to the southeast, forming a natural barrier between India and China, with many chains and groups of mountains both north and south of the central ridge. Mount Everest, the highest peak, has a summit 29,002 above sea level, and, like many others in the continent, is covered perpetually with snow. The Desert of Gobi occupies a large part of Northern China, east of which are the Great Khinghan Mountains, trending north and south, and north of it are the Yablonoi Mountains. Arabia is a tableland, made up largely of the Desert of Roba el-Khali, with a narrow coast bordering on the surrounding waters. The mountains of Armenia culminate in Mount Ararat, famous as the landing place of Noah after the Deluge, and Asia Minor is characterized by the Taurus Range and other moun-

tains. The Deccan, a region elevated about 2,000 feet, stretches over a part of India, and the Altai Mountains extend from Siberia into the northern part of China. Although most of the rivers have their source in the Himalayas, the Hindu Kush, and the Altai mountains, the drainage is practically in all directions from the borders of the Desert of Gobi. Asia contains large tracts that belong to the desert and arid regions, including the Tarim Desert, the Desert of Gobi, the Arabian Desert, and a portion of the Kirghiz Steppe.

**RIVERS.** The continent has seven great river systems, which include a number of the largest water courses on the globe. Since railroad building has not been developed to a large extent, these water courses remain as important in transportation as they were in remote antiquity. The Tigris and Euphrates discharge into the Persian Gulf; the Ob, the Lena, the Indigirka, and the Yenisei flow into the Arctic Ocean; the Ural flows into the Caspian Sea; the Amur, the Hoang Ho, the Yang-tse-Kiang, and the Si-Kiang flow east into the Pacific; and the Mekong, the Ganges, the Indus, the Irrawaddy, and the Brahmaputra carry their drainage south into seas and bays connected with the Indian Ocean. Some of the rivers are inland and have no visible connection with the sea. This class of streams include the Amu Darya and the Sir Darya, flowing into the Aral Sea, and the Ili, which discharges into Lake Balkash.

**CLIMATE.** In the northern part the climate is cold during most of the year, the extreme northern point, Cape Chelyuskin, being somewhat farther north than Nova Zembla. Here the temperature rises quite high during the short summer season, though the warm portion of the year is only momentary as compared with the long winters, and in a large portion of Northern Siberia; particularly in the Tundra, the ground never thaws out entirely. In the central region the temperature is extremely cold in the winter, and hot in the summer; on the southern slope of the great mountain systems the climate is warm, while along the southern coast it is very hot, though all parts are comparatively healthful. In the southern portion, owing to the equatorial winds, rain falls abundantly about one-half of the year, while the other half is practically rainless. The northern part, owing to the presence of lofty plateaus in the interior, is generally arid. As a whole, the climate is not wet, which is due partly to its vast extent and partly to the absence of a considerable water surface in the interior. The continent has a wide range of temperature, the maximum ranging from 75°



on the northern coast to  $120^{\circ}$  in Persia and Arabia, and the minimum is from about  $65^{\circ}$  in the southern part to  $58^{\circ}$  below zero in the northern section. In Northeastern Asia, at Verkoyansk, the temperature falls as low as  $92^{\circ}$  below zero. Hot winds from the deserts, oceanic currents, and the monsoons of the Indian Ocean affect the climate to a considerable extent in different sections.

**ANIMAL LIFE.** The animals of Asia are very numerous and include the largest species of mammals. Tropical Asia has the Asiatic elephant, a species different from the elephant of Africa. The buffalo, rhinoceros, deer, porcupine, squirrel, and many varieties of apes and monkeys are found in the southeastern part. In the highlands of Tibet and the plateaus of the Himalayas the yak is common. This animal is used extensively as a beast of draft and burden. The camel is native to Asia and fills an important function in the industries. Other animals common to different sections are the goat, lion, hyena, and many species of birds and reptiles. The domestic animals, besides those common in America, are the buffalo, Angora goat, camel, elephant, and sacred ox. In Central Asia the mountaineers rear the sheep, horse, goat, and ass extensively, while the camel is almost indispensable in the arid region, and the yak is reared and used chiefly in the highlands and regions having a temperate climate. Fish are abundant off the Asiatic coast and in the interior waters. The dolphin, dugong, crocodile, boa, and cobra de capello are Asiatic animals.

**PLANT.** Many species of plants abound that are common to the same latitudes in Europe, but the variety is greater than the plants classed in the flora of that grand division. Some of the deserts are barren and almost destitute of vegetation, but they are bordered by vast areas of pasture land, and where the climate is sufficiently moist and the temperature favorable plant life thrives luxuriantly. In the north are vast forests in which the willows, pines, and birches predominate. Maples, oaks, poplars, walnuts, limes, and the mulberry are found in Japan, China, and the regions having a similar climate. Aromatic shrubs abound in Persia and Arabia and in most of the southern sections thrive the date palm, the banyan, the mahogany, the magnolia, and the gum-producing acacias. A large variety of the cultivated plants of Europe are common to Asia and have been cultivated for many centuries. The chief economic plants are rice, maize, wheat, oats, barley, tea, sugar cane, cotton, tobacco, buckwheat, millet, potatoes, and rye. Fruits are cultivated

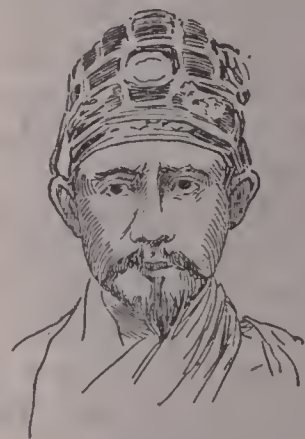
on a large scale for the market in the south, especially the banana, yam, plantain, and raisin grapes. Spices, pepper, and the opium poppy are grown extensively.

**MINERALS.** The minerals are very abundant, but mining has not been developed as extensively as in Europe and America. Petroleum and mineral oil abound in many places, especially in parts of India and in the vicinity of the Caspian Sea. Coal is mined in Siberia, Eastern China, and India, and salt and saltpeter are abundant in Persia and Asia Minor. Limestone, sandstone, and granite are quarried for building purposes, and beds of gypsum have been developed and are used in the manufacture of Portland cement. Other minerals more or less predominant are silver, gold, manganese, copper, lead, iron ore, and precious stones, including rubies, diamonds, and sapphires.

**INHABITANTS.** The people of Asia are greatly diversified, and at least five races or divisions are well represented. These include the Mon-



CHINESE.



THIBETAN.

golian in the eastern and central parts, the Caucasian in the western part and India, the Malay in the Moluccas and the Indian Archipelago, the Drividas in southeastern India and Ceylon, and the Papuans and Negritos in the Philippine Islands. With respect to society the people of Asia are largely diversified from the lowest savage state to the higher civilizations. Within the last few decades the Mongolian races, which in numbers greatly exceeds all others, has been influenced materially by the education and political advancement of Europe, especially the Japanese, who have reformed their government in a large measure and reorganized their educational system to conform to the needs of an advancing civilization. The spirit of progress has influenced to a considerable extent the people of China, India, and some sections of Western Asia, but the stationary condition that has prevailed among the Malaysians remains the same. Mohammedanism, Brahamanism, Buddhism, and Confucianism are the chief religions in numerical strength, but the Christians and



Jews are quite well represented. In 1907, the population was 874,409,856; hence more than half of the human race live in Asia.

**GOVERNMENT.** The systems of government differ widely and have been influenced more or less noticeably by the people of Europe and America. A considerable area is at present controlled or governed by nations that are not Asiatic in location or racial affiliation. The independent countries are Japan, Persia, Asiatic Turkey, China and its dependencies (Eastern Turkestan, Mongolia, Tibet, Sungaria, and Manchuria), and portions of Arabia. Corea belongs to Japan and Afghanistan and Baluchistan are under the control of Great Britain.

Russia possesses the largest scope of territory which is under the government of nations not located in Asia. The Russian possessions comprise Turkestan, Siberia, and Transcaucasia, and embrace an area of 6,390,000 square miles. The British possessions, comprising about 1,800,000 square miles, include Ceylon, India, and the Straits Settlements. France has territory equal to 25,000 square miles, confined to the peninsula known as Indo China, which embraces Cambodia, Oman, Tonkin, and Cochin China. The Philippine Islands are territory of the United States and the larger part of the East Indies belong to the Netherlands. Germany has a small territorial possession in China, known as Kiauchau, and the Caroline and other islands, and Portugal has a small possession in India.

The great diversity of races, languages, customs, and religions has given rise to varied economic conditions. Until recently there were no telegraph and telephone lines, and railroads were unknown. With the growth of European influence and the consequent reforms in government and methods of commerce, wonderful changes have been wrought. Russia constructed and operates the great transcontinental railroad, a continuous line from Saint Petersburg, across the northern portion of Eurasia, to Vladivostok on the Sea of Japan. India alone possesses 30,000 miles of railroads, and several trunk systems and many shorter steam and electric lines have been built in the Philippines, Japan, Turkey, and Turkestan. Many of the seaport cities have extensive and well improved harbors, but the foreign trade is handled largely by European vessels. Numerous telegraph and telephone lines have been constructed and modern municipal facilities have been introduced into the larger cities.

**HISTORY.** The history of Asia is recounted in the oldest historical documents, and that continent is generally regarded the cradle of

the human race. In Genesis is an account dating back to a period about 1,600 years before the Christian era, in which Moses details the biblical history of the creation of man, and gives a recital of the facts relating to the Deluge and to the establishment of the Mosaic code. Western Asia contains antiquities quite as old as those of Egypt, while authentic history in China is traced to a period fully 1,000 years before the Christian era. These early dates are more or less associated with the kingdoms of Egypt, Assyria, Media, Babylon, Persia, and Phoenicia. Not only do we trace the early seat of the Aryan race to the vicinity of the Amu or Oxus River, but we find in Asia the origin of practically all popular religions, including the Jewish, Christian, and Mohammedan. From Asia vast populations moved westward over Europe, distributing themselves more or less from the Caspian Sea to the British Isles, but in the long period of the Middle Ages little was known of the original seat of mankind.

With the modern rise of European civilization, and the spread of Christianity and education, we are brought in closer contact with the people of Asia. The natural desire to learn as much as possible of former development in the arts and sciences induced the scholars of modern times to explore the ruins of former states and the seat of ancient civilizations. With the invention of the steamboat came a new era of navigation and large armies were transported to the continent with the view of extending the trade of the leading nations of Europe. Although unwilling to cooperate in the new order of things the native races were unable to prevail against the improved implements of war and the superior discipline of the armies with which they were confronted. Thus, we find practically all parts of Asia overrun with Europeans in the eager strife for political and industrial advantage. This impetus of the newer and larger commercial life, though opposed by the native races, is developing the mines and forests as well as building up the higher educational arts. For further information, see special articles on the different countries, especially subheads *History* and *Description*.

**ASIA MINOR**, a peninsula at the western extremity of Asia, situated between the Black Sea and the Mediterranean, and forming a part of Asiatic Turkey. The area is about 220,000 square miles. The surface is an elevated plateau, with a narrow coast on the bordering seas. Among the chief mountain ranges are the Taurus and the Anti-Taurus, between which



are extensive and fertile valleys. There are many lakes, some of which are salt, but only few rivers of importance are within the region. The chief drainage is into the Black Sea by the Sakaria and the Kizil Irmak rivers, and by the Meander into the Grecian Archipelago, or Aeagean Sea. Most of the inhabitants are Turks, though there are a variety of races, and the total population is about 7,000,000.

The region included in Asia Minor was once the seat of many great cities linked closely with history. Anciently it was divided into Ionia, Lydia, Phrygia, Galatia, Caria, Bithynia, Pontus, Mysia, Paphlagonia, Lycia, Pisidia, Cilicia, Isauria, Cappadocia, and Pamphylia. Among its chief cities were Smyrna, Ephesus, and Troy, and there were fought some of the most renowned battles of the world. The coast regions and many valleys are fertile and are cultivated. Though the interior is arid, it yields nutritive grasses. Cereals, fruit, wine, minerals, timber, and domestic animals are the chief products. Angora, Smyrna, Scutari, and Erzerum are among the present cities of Asia Minor.

**ASP** (äsp), a species of snake native to Egypt and Libya, and distinguished for its venomous bite. It became well known in ancient times by the circumstance that Cleopatra chose the bite of an asp to accomplish her suicide. This species is quite similar to the cobra found in various parts of Arabia, but differs from it in having a narrower neck and some slight differences in color. The bite produces acute

pain in the first instance, and the poison is said to act so quickly that the application of an antidote is impossible. The Bible makes mention of the asp in Romans iii, 13.

**ASPARAGUS** (äs-pär'ä-güs), a perennial plant of the lily family, largely developed by cultivation, and now grown as an article of food. It is propagated in beds heavily mulched, the young shoots being the only portions eaten. These boiled and enriched with butter and seasoning are nutritious and healthful. This plant was ex-



ASPARAGUS.

and enriched with butter and seasoning are nutritious and healthful. This plant was ex-

tensively cultivated by the Greeks and Romans, but is found in a wild state in the warmer parts of Europe and Asia. It is grown extensively for market in the United States. The best yield of young shoots is obtained from plants at least three years old.

**ASPEN** (äs'pën), a species of poplar sometimes called trembling poplar on account of the highly tremulous motion of the leaves. It is native to the mountainous regions of both Europe and Asia. The wood is light, soft, white, and smooth, and is used chiefly to make troughs, pails, trays, and arrows. The tree usually is slender and rootstalks spring in large numbers at a considerable distance from the main stem. This species of tree is planted largely for ornament, but in many regions, as in the Mississippi valley, the tops die when the rootstalks begin to spring from the roots.

**ASPHALT** (äs'fält), a mineral pitch, so called from the name applied by the Greeks to the Dead Sea, where it was anciently obtained in considerable quantities. It is probably composed of decayed animal and vegetable substances, and belongs to the series of hydrocarbon compounds, which include petroleum and natural gas. The odor resembles that of pitch, the color is black or dark brown, and it is not soluble in water. It melts easily when heated and may be dissolved in ether or turpentine. The pure article burns without leaving ashes. It is artificially produced in making coal gas, but the article of commerce is taken from the beds of lakes. Asphalt occurs most abundantly in Cuba, California, Venezuela, Palestine, and various parts of Europe. However, the largest asphalt districts are in the northern parts of South America, in the regions lying west of Lake Trinidad. The product obtained there is used in manufacturing varnish and patent leather, and for street paving. In constructing pavements a limestone mixed with asphalt is used to some extent, but asphalt paving is made more largely of cement covered by coats of asphalt, put on at a temperature of from 275 to 300 degrees.

**ASPHODEL** (äs'fö-dël), a genus of plants found in Southern Europe and the countries bordering on the Mediterranean Sea. Two species, the yellow and the white asphodel, are cultivated as garden flowers. The former has a stem from two to three feet high, which is covered with long narrow leaves, and flowers late in the spring. In the white asphodel the flowers are in clusters. The genus is represented in England by the bog asphodel, which is the daffodil of English poets. Allied species



are found in the United States and the southern part of Canada.

**ASPHYXIA** (äs-fix'ĩ-à), a term used to signify a loss of pulsation resulting from an arrest of the function of respiration. This state may be produced by breathing gas destitute of oxygen, by submersion in water, strangulation, or suffocation, or by any cause that tends to prevent the breathing of pure air. Death results from asphyxia, if the person affected is not relieved in a very short time. Relief in a case of apparent death by this cause is often obtained by maintaining the heat of the body and inflating the lungs.

**ASPINWALL** (äs'pĩn-wal), or **Colón**. See **Colón**.

**ASPIRATE** (äs-pĩ-rât). See **Voice**.

**ASS** (äs), an animal of the horse family, but differing from the horse in being smaller, in having no hard, bony warts on the hind legs, and in its ears being longer. The hoof is smaller than that of the horse. It is thought to be an offspring from the wild ass of Abyssinia, because of its unwillingness to cross streams and its great fondness of rolling in loose soil. Asses are used more or less as beasts of burden and for draft purposes. A light, graceful breed is used in Syria by women for pleasure riding. In Arabia it is bred for the saddle, while in Damascus and other coun-



DOMESTIC ASS.

tries it is used for draft and plowing. It excels the horse on account of possessing better health in diversified climates and consumes a smaller quantity and coarser quality of food, and is superior as a beast of burden in mountainous districts, being safer on foot than any other domesticated animal. In some localities the flesh is valued as an article of food, and its skin is used in the manufacture of parch-

ment, drum covers, shoes, and for other purposes. The hybrid offspring of this animal and the female horse is known as the mule, which is a very valuable animal for many purposes, and is extensively reared in America. It is almost as large as the average horse. The mule is reared more extensively in the southern part of the United States than in the North.

**ASSAM** (äs-säm'), a province of British India, bounded by Bengal, Manipur, Burma, and China. The area is 52,057 square miles. It embraces the valley of the Brahmaputra and several tablelands and mountain districts. It has a heavy rainfall and a moderate climate, but in the southern part, near the lower course of the Brahmaputra, is an extensive region of swamps and jungles where the climate is unhealthful. The jungles are infested by tigers, leopards, elephants, rhinoceroses, and other wild animals. Rice is the chief product, but tea, cotton, and fruits are grown to a considerable extent. Iron, coal, and petroleum are the chief minerals. This section is populated largely by Hindus, most of whom are Brahmans, and about one-fifth of the people are Mohammedans. Schools and colleges are maintained and there is considerable Assamese literature. Assam has been a British possession since 1826. Sylhet, the largest town, has a population of 15,000. Shillong is the seat of government. Population, 1901, 6,122,201.

**ASSASSINATION** (äs-säs-sĩ-nã'shũn), the crime of murder committed treacherously, without immediate provocation, and usually without resistance from the person whom the assailant seeks to kill. The word originated from a secret military and religious society of Persia, founded by Hassan ben Sabbah in the 11th century, and those who are guilty of the crime are said to be *assassins*. A number of assassinations have been committed in all periods of history. In most cases perpetrators hope to further their ideas by causing the death of some public official, which is the case with anarchists and others who labor under illusionary hopes. Among the most noted assassinations during the last half century are the following:

Montenegro, Prince Daniel, killed Aug. 13, 1860.

United States, President Lincoln, shot April 14, 1865.

Servia, Prince Michael, killed June 10, 1868.

Turkey, Sultan Abdul Aziz, stabbed June 16, 1876.

Russia, Czar Alexander II., killed with dynamite March 13, 1881.

United States, President Garfield, shot July 2, 1881; died Sept. 19, 1881.



France, President Carnot, stabbed June 24, 1894.

Italy, King Humbert, shot July 29, 1900.

Uruguay, General Borda, killed Aug. 26, 1897.

Guatemala, President Barrios, killed Feb. 9, 1898.

Austria, Empress Elizabeth, stabbed Sept. 10, 1898.

United States, President McKinley, shot Sept. 6, 1901; died Sept. 14, 1901.

Servia, King Alexander I., shot June 11, 1903.

Russia, Katcheslav von Plehve, minister of the interior, assassinated in Saint Petersburg, by a Finn, July 28, 1904.

Russia, Grand Duke Sergius, killed by the explosion of a bomb near the Kremlin, Moscow, Feb. 17, 1905.

Russia, General Sakharoff, assassinated at Saratov, Dec. 5, 1905.

Portugal, King Carlos I. and Crown Prince Luiz, shot in Lisbon, Feb. 2, 1908.

**ASSASSINS** (äs-säs'sins), a secret military and religious society founded in Persia by Hassan Ben Sabbah, in 1090 A. D. The principal aim was the assassination of those not members of the society. It was most prosperous shortly after its organization, but later fully 12,000 were massacred for the purpose of exterminating the order. A few adherents still remain in India.

**ASSAULT AND BATTERY**, a misdemeanor punishable by fine or imprisonment. An assault consists of physical force partly or fully put in motion, contrary to law, as the act of pointing a loaded gun at a person, or raising a cane to strike some one. Battery consists of actually inflicting injury upon the person of another in an angry, spiteful, or insolent manner. It may consist of striking or constraining him, or in touching him in any way while angry. An assault is assumed when the offense of battery has been committed, hence, in law, it is customary to use the phrase *assault and battery*. The crime varies in degree according to the intents with which the offenses are committed. Thus, we have the simple assault, assault and battery, assault with intent to commit great bodily injury, and assault with intent to commit arson, robbery, murder, etc.

**ASSAYING** (äs-sä'ing), the art or process of subjecting coins, quantities of bullion, or alloys to examination and experiment for the purpose of ascertaining what proportion of each of the various metals they contain, as to find the amount of copper in a quantity of ore, or the amount of gold in a coin. The process of assaying depends upon the kind of metal or ore to be tested. In assaying ore containing

silver the apparatus employed is a *cupel* and a muffle, a kind of fire-clay oven. The ore is placed in the cupel, which is then put into the muffle, and is heated to such an extent that the ore is melted. Some parts of the ingredients are carried away by union of the oxygen in the air with lead, and the silver remains in the cupel in the form of a molten metallic globule. When all of the ingredients have been driven out, the silver lightens in color and becomes a brilliant white. When cooled, the silver is weighed, and the amount of pure metal determined. This process is called *cupellation*. When silver contains copper, it is necessary to mix lead with the alloy before attempting to separate the copper. Another process, called *humid*, consists of dissolving the compound containing the silver with a solution of nitric acid, and afterward adding a solution of common salt. The salt causes a precipitation of the chloride of silver into white globules or small lumps. When no further precipitation is obtained by adding the salt solution, the operation is concluded, and the quantity of silver is measured by the quantity of salt solution employed. The process of assaying, of course, depends upon the kind of metal or ore tested. A skilled assayer is able to form a fair estimate of the richness of the ore from the weight and color, but accurate knowledge can be obtained only by a careful chemical test.

**ASSEMBLY** (äs-sēm'blŷ), a convention or body of men gathered to deliberate, as a convention of a religious society or a political party. The legislative branch of many states of the United States is known as a General Assembly, as in New York, Iowa, and other states, while in New Jersey the lower house is known by that term. An unlawful assembly is a gathering of a number of persons, usually three or more, bent on aiding or performing an unlawful act.

**ASSIMILATION** (äs-sim-ĭ-lā'shŷn), a term used in physiology to designate the action of the vital organs whereby food, in the course of digestion, is modified in various ways and fitted for the use of the body, of which it finally becomes a part. The materials assimilated are brought by the blood in the capillaries to the cells, where the development of living tissues takes place. See Absorption.

**ASSINIBOIA** (äs-sin-ĭ-boi'ä), formerly a district in the southern part of the Dominion of Canada, but divided in 1905 and made a part of the two provinces of Alberta and Saskatchewan. See Alberta, Saskatchewan.

**ASSINIBOIN** (äs-sin'ĭ-boin), a tribe of Indians, so named because they dropped hot



stones into water to heat it. This tribe formerly occupied the region between the Missouri and Saskatchewan rivers, on both sides of the boundary of Canada, but these Indians are now on reservations in Montana and Canada. They seceded from the Sioux and speak a dialect of the Sioux language. The total number of Assiniboin is 2,670, about half of whom are in Canada, and the balance are at Fort Peck and Fort Belknap, Mont.

**ASSINIBOINE** (äs-sin'i-boin), a river in Canada; formed in Macdonald County, Manitoba, by the junction of the Mouse or Souris and the Qu'Appelle. From the head water of the latter to its junction with the Red River of the North, at Winnipeg, it has a length of about 475 miles. The river is so named from the Assiniboin Indians, who formerly inhabited the region through which it flows.

**ASSISI** (äs-së'zë), a small town of Italy, in the province of Umbria, fourteen miles east of Perugia. It is noted as the birthplace of Saint Francis, the founder of the Franciscan Order of Monks, and his remains are in the first monastery of this order built in Assisi. The town is visited by many pilgrims every year. It is a beautiful place, surrounded by olive groves, and is the seat of several churches and twelve monasteries. The commune, in 1901, had a population of 17,378.

**ASSOCIATED PRESS** (äs-sö-shi-ä'tëd), an organization founded for the purpose of collecting and distributing news. The first association for this purpose was formed in 1849 by the owners of several New York newspapers, among them the *Herald*, *World*, *Times*, *Sun*, *Tribune*, and *Express*. Since then other associations of the kind have been organized. The object is to systematize the gathering of news by sending correspondents to different sections of the country, or even to foreign countries, by employing cable and telegraph lines and by utilizing any other means for the rapid accumulation and distribution of news. These associations not only use the news themselves, but sell all or certain classes of news in different parts of the world for use in making up daily and weekly periodicals. The Associated Press is now the largest association of the kind in America. It controls over 30,000 miles of telegraph wire and several cable lines, and is in touch with news centers in all parts of the world. The cost of the service is about \$150,000 each month, and over 2,000 newspapers, published in the region from Maine to California, are furnished news daily from time to time. To facilitate the transmission of news,

it is divided into Eastern, Southern, Central, and Western branches.

**ASSOCIATION** (äs-sö-si-ä'shün), in psychology, the mental process by which the mind unites objects or ideas in thought so that one tends to recall the other, especially in matters relating to memory. For example, in coming to a place where some important event occurred, or something unusual happened, the sight of the place is certain to recall the occurrence. Again, two objects long associated together, when separated, one suggests the other much more easily than if it had been associated with several different objects. This may be illustrated by the habit of a person who is accustomed to wear a coat of a peculiar color; such a coat seen under different circumstances is much more liable to suggest that person than if similar coats were worn by a large number of persons. Psychologists have formulated certain primary laws of suggestions, which, if understood by the teacher, can be made highly serviceable in the instruction of pupils. By means of a knowledge of these laws, the mind may be led from things known to a wider field through association of similar objects, or a contrast of dissimilar objects. These primary laws include similarity, under which a precept tends to suggest the concept of something like it; contrast, by which a mansion may suggest a cottage; continuity of time or place, as objects associated in time or place suggest each other; cause and effect, which tend to suggest that a certain instrument caused a wound. Under the same law the sight of a weapon suggests its danger.

**ASSUAN** (äs-swän'), a town in Egypt, located on the Nile, near the boundary of Nubia. It is about two miles below the first cataract, and is important as a station for the caravan trade with the Sudan. Near it is the great dam built across the Nile by the British government, and it has railway connection with Alexandria and other commercial centers of Egypt. In its vicinity are granite quarries and the ruins of a town built by the Saracens. Population, 10,000.

**ASSUS** (äs'sus), or *Assos*, anciently a city and seaport of Asia Minor, on the Gulf of Adramyttium. It was built by the Greeks and in its vicinity are ruins of a theater and several temples. It remained important as a shipping point up to the beginning of the Christian era. In Acts xx., 13, it is related that both Saint Paul and Saint Peter visited Assus on their way from Troas to Mitylene.

**ASSYRIA** (äs-sir'i-a), an ancient country of Asia, in Mesopotamia. The boundary on



the north was formed by the highlands of Armenia, east by Media, south by Susiana and Babylonia, and west by the Tigris. It is thought that the larger part of the valley of the Euphrates was included, but the country cannot be accurately separated from Babylonia either in the light of history or geography. The history of these two nations seems closely intertwined, and to measure the power of one is to know the weakness of the other. However, each has a history common to itself. Assyria was known to the Hebrews as Asshur and to the Persians as Athurd. The region included in Assyria is thought to have had a length of about 380 miles, a breadth of 250 miles, and an area of not less than 100,000 square miles. It is known to have possessed one of the oldest



ASSYRIAN GOD NINIP.

civilizations, an extensive literature, and considerable advancement in the arts and sciences. A decipherment of the cuneiform documents, inscriptions that contain much valuable information, has added materially to the knowledge of this interesting and ancient people. Besides, by the discovery of certain fragments of literature, that lay buried underneath rubbish and ashes until the middle of the last century, and by locating the site of many of the larger cities, the knowledge of this nation has been generally widened. In the Bible we are told that Nineveh, the capital city, was founded by Asshur of Babylonia, and it is probable that Assyria became powerful long after Babylonia had risen to the dignity of a mighty empire.

Assyria and Babylonia were interdependent, and the early rulers of the former were appointed by the kings of Babylonia. After many years Assyria became independent, and by the year 1320 B. C. attained much power. The first empire was founded about 1140 B. C. by Tiglath-Pileser I., and under his reign Assyria expanded its dominion over Western Asia. He was succeeded by his son, who proved an in-

competent ruler, and two centuries later Assyria was in a state of decadence. At the time of the decline of Assyria, the Hebrew kingdom developed power under David and Solomon, but in the year 930 B. C. it again grew to importance. With the ascension of Shalmaneser II., in 858 B. C., the empire reestablished its dominion over Western Asia. This king reigned for thirty years and fought against the kings of Damascus, Hamath, and Israel. A Babylonian named Pul usurped the throne in 745 B. C. and assumed the Assyrian name Tiglath-Pileser II. However, a successful revolt occurred under Sargon, a great general of Assyria, who carried 27,000 Babylonian citizens into captivity. Later his son Sennacherib conquered Judaea and besieged Jerusalem, where a pestilence destroyed his army and saved the city from being captured. In 681 B. C. Esar-Haddon organized great military forces, effected internal improvements, made Assyria a powerful empire, and brought under its dominion, not only Western Asia, but Egypt and large portions of Northern Africa. This monarch reigned thirteen years and was followed by three others, the last of whom was known as Sarakos, whose reign terminated in seven years with the fall of Nineveh in 606 B. C., when it was captured by the allied army of the Medes and Babylonians.

Assyria was far advanced in industry, art, and civilization. In its cities were many large buildings and palaces constructed of brick, alabaster, and stone. The interior of many of these structures contained exquisite sculptures, principally figures in relief. They consisted chiefly of scenes of war and of the chase, besides other favorite subjects. It is evident from literature and ruins that have been uncovered that the Assyrians understood the construction of arches, tunnels, drains, and aqueducts, and the use of the lever, the roller, and the pulley. They engaged in the manufacture of various ornamental figures and articles of household utility, such as jars and dishes of metal, porcelain, and glass. They were acquainted with the lens, practiced the arts of inlaying and enameling, designed ornaments of ivory, bronze, gold, and silver with marked skill, and displayed a rare taste in designing and making household furniture. To the Assyrians is ascribed considerable knowledge in astronomy, since they made star charts, divided the year into twelve months, naming them after the signs of the zodiac, and divided the week into seven days, observing the seventh as a day of rest. Records were kept of the eclipses of the sun and moon, which they learned to foretell with considerable accuracy, and there



is evidence that they studied the transits of stars. An astronomical work, entitled "The Illumination of the Bell," is an Assyrian publication, copies of which are now in several European museums, and in which are treated the motions of Mars and Mercury, the north polar star, the phases of the moon, the conjunction of the sun and moon, and several planets observed anciently. A department of knowledge termed *Assyriology* relates to the modern study of Assyrian antiquities. Formerly our fund of knowledge in relation to Assyrian history was based largely upon Jewish records and the writings of Herodotus, but since 1842 many extensive explorations and excavations of ancient ruins have added material of considerable extent and value.

That the Assyrians possessed an extensive literature is evidenced by various explorations of their ruined cities and excavations leading to a restoration of numerous sculptures and monuments. The most important objects of discovery were several palaces, including the palace of Assurbanipal at Nineveh, where the remains of a large library were found. The contents included numerous tablets, text-books—some of these relating to mathematics, zoölogy, and astronomy—and various devices for representing geographical and astronomical phenomena. The literature included many poetic productions and extensive and interesting mythological writings. There were included descriptive works in geography, botany, history, architecture, chemistry, and various other lines of study, though in some of the theories held a marked similarity was shown to those entertained by other ancient nations. This circumstance is evidenced by the story of a flood represented to have destroyed all forms of life, the description being quite similar to that of the flood mentioned in the Scriptures, and they possessed a history of the creation quite like that described in Genesis. Though many of the writings were produced in the reign of Assurbanipal, about 650 B. C., many seem to date from an earlier period.

**ASTER** (äs'tēr), a genus of plants of the *Compositae* order, so called from the close resemblance of the expanding leaves to a star. These plants are native to America and Eurasia. Many species have been developed under a long line of cultivation, some including beautiful flowering forms. The flowers are greatly variegated in color, including purple, white, blue, yellow, and reddish, and from their tendency to flower late in the season, together with their resemblance to the daisy, they are frequently called Christmas daisies. Though

several American species are counted among the finest, the China aster, a double flowering species, is generally admired as the most beautiful and showy.

**ASTEROID** (äs'tēr-oid), or **Planetoid**, the name of any individual of a great group of small planets known to exist between the orbits of Mars and Jupiter. Their origin is thought to be due to the influence of gravity exercised by Jupiter in the early formative stage, by which the formation of a separate planet was prevented according to the general principles of the evolution of planets, and as a result a large number of small bodies were composed of the existing materials. The asteroids are not evenly distributed, but occupy a position at irregular intervals, either separately or in groups. Bode's law, which indicates that a large planet should lie between Mars and Jupiter, led to an association of twenty-four astronomers in 1800, whose object was to search for the missing body. The first discovery was made by Guiseppe Piazzi (1746-1826) of Sicily in January, 1801, when he located an asteroid which he named Ceres. Three others, named Pallas, Juno, and Vesta, were discovered in 1807. A fifth was discovered in 1845, and since 1847 new bodies have been found almost every year, the whole number now being placed at about 500. They revolve around the sun at a distance of from 200,000,000 to 300,000,000 miles. Their total mass is equal to about one-fourth the mass of the earth. The asteroid Flora revolves around the sun once every 1,191 days and Hilda completes one revolution in 2,868 days, and the length of the year of the others is between these extremes.

**ASTHMA** (äz'mä), a disease characterized by shortness of breath, and whose effects are spasmodic after intervals of comparatively good health. In common asthma the lining membrane of the air passage is affected somewhat similarly to the affections experienced in chronic bronchitis, but the affection of the mucous membrane is seated farther down in the bronchial tubes and lungs. Chronic asthma, though disagreeable and weakening, seldom shortens life. Asthma is most common among persons advanced in years, and frequently affects those of a nervous temperament. It is more common among men than women and frequently follows attacks of measles and bronchitis.

**ASTIGMATISM** (ä-stig'mä-tiz'm), a defect in eyesight, which arises from the defective structure or malformation of the eye. It results in defective vision by inclining the affected individual to fail to see objects in the



same place, though they really may be so. This is due to the rays of light converging to a point on the retina, thereby forming a line of light instead of a circular apparition. It can be remedied by the use of glasses.

**ASTORIA** (ăs-tō'ri-ă), a port city of Oregon, county seat of Clatsop County, on the Columbia River, seventy miles northwest of Portland. It is situated on the Astoria and Columbia River Railroad, has an excellent harbor, and is surrounded by a cereal and fruit-growing country. The industries include a large trade in lumber, salmon packing, and manufactures of furniture, clothing, machinery, and earthenware. It has several excellent public school buildings, a fine county courthouse, a public library, a United States custom house, and a hospital. Electric lights, pavements, telephones, waterworks, and sewerage are among the facilities. Astoria was founded by John Jacob Astor in 1811 and was chartered as a city in 1876. Population, 1900, 8,381.

**ASTRAKHAN** (ăs-tră-kăn'), a city of Russia, capital of a government of the same name, situated on an island at the mouth of the Volga, about twenty miles from the Caspian Sea, on which it is the principal Russian seaport. It has traffic connections by railroads and steamboat lines, electric street railways, and numerous schools, hospitals, and churches. The city has extensive stockyards, engages largely in manufacturing, and is important as a commercial city. Among the chief manufactures are clothing, machinery, cured meat, and canned fish. Salt is obtained in large quantities in the marshes of the steppes, near the city. Population, 1907, 121,580.

**ASTRINGENT** (ăs-trīn'jēt), in medicine, an agent which causes contraction in the organic tissues and canals of the body, and used to check discharges and excessive purging. The astringents include both vegetable and animal substances. Vegetable astringents used commonly are derived from blackberry root, kino, oak bark, rhatany, and logwood. The chief mineral astringents are nitrate of silver, acetate of lead, alum, carbonate of lime, and the sulphate and chloride of iron.

**ASTROLOGY** (ăs-trōl'ō-jy), a term meaning originally the knowledge of the stars, but later limited to the practice of predicting future events from the position of the heavenly bodies. In ancient times the practice of undertaking to foretell the fortunes of men and nations was looked upon as a real science, while the mere knowledge of the fixed stars and the planets, and of their motion and volume, was considered secondary. Astrology was one of the most ex-

tensive forms of ancient superstition, and had a wide foothold at the dawn of early history among the Egyptians, Chaldaeans, Hindus, Chinese, and other people of Asia and Africa. From the East this superstition spread to Western Asia and Europe, and became firmly lodged at Rome at the beginning of the Christian era. Old writings cannot be well understood without a knowledge of astrology, while the Bible contains many allusions to this so-called science. The utter fallacy and worthlessness of this study or science was not discovered until some advancement had been made in astronomy. By the so-called "viewers of the heavens" the successes or misfortunes of a nation were predicted, this depending upon the signs that prevailed at the time of its founding, and the temperament of a child was designated from the planet under which it was born, as jovial from Jupiter. The medicinal virtue of herbs was supposed to be due to their ruling planets, and phases of the moon were taken as the index of the future greatness of a newborn child. In some countries almanacs are still published that contain astrological predictions, though the "science" has fallen into disrepute, and the authors themselves do not believe in them.

**ASTRONOMY** (ăs-trōn'ō-my), the science which investigates the distances, magnitudes, motions, and various other phenomena of the heavenly bodies. While the parent of all the sciences, it is truly the most perfect and beautiful. Besides, it is a science both old and ancestral, coming with resistless progress from shepherds of the Orient watching their flocks by night, thence passing to the rulers of ancient empires and the giants of modern thought until to-day it has attained a state which combines the beauty of poetry and the exactness of geometry. It has caused the civilized world to be dotted with observatories in which a great variety of instruments are utilized for weighing, measuring, and studying the celestial bodies, each striving for new discoveries and greater knowledge of the infinite space that surrounds us.

The ancient nations, including Assyria, China, Hindu, Egypt, Chaldaea, and Greece, had made material progress in studying this science long before the Christian era. A law of China required the astronomer to foretell eclipses under penalty of death. The Chinese thought that the eclipse represented a great monster, in deadly conflict with the sun, and to drive him off it was necessary to employ the gong and other instruments to frighten him away. Thales, a Grecian astronomer of 640 B. C., is regarded the early founder of the science, since he was



among the first to teach that the earth is a sphere, and gave valuable aid to navigation by pointing out that the Lesser Bear is a better guide upon the sea than the Great Bear. In the year 500 B. C. Pythagoras taught that the sun is the center of the universe, around which the earth circulates. By demonstrations he made it clear that a morning and an evening star may be the same body, the difference being due to a change of position. The history of astronomy proper begins with Hipparchus, who lived in the 2d century B. C. His observations enabled him to make a chart of the heavenly bodies, which included 1,081 stars. He was succeeded by Ptolemy in the 2d century A. D., who published a book called the "Almagest," in which the Ptolemaic system was explained. He erroneously taught that the earth is the center of the universe and that the heavens revolved around it, each period of revolution occupying twenty-four hours.

Copernicus in the 16th century disproved the teaching of Ptolemy, and held that many of the theories of Pythagoras are true. His system places the sun as the center of the universe, from which the planets receive light and heat in their revolution around it. At that time his discovery could not be clearly demonstrated, and for this reason it was not generally accepted. Later Kepler announced his famous laws, and Galileo studied the heavens with a telescope. Newton won fame and added the greatest assistance to promulgate scientific study by the discovery of gravitation. By means of this discovery it became possible to account for the revolutions of the planets and satellites, and to assign a cause for their occupying exact positions in space. The satellites of Jupiter and the rings of Saturn were observed by Laplace, who also gave much valuable assistance by the publication of many works of merit. Since that time, especially during the latter part of the last century, divers notable discoveries have been made through the medium of improved instruments.

Astronomy is a very useful science, since a knowledge of the natural phenomena governing the sun, planets, and stars has made it possible to fix disputed dates of ancient battles and of the reigns of kings. It has enabled us to establish definitely the exact length of the units of time requisite for the calendar, and has aided in navigation by making it possible to guide ships from port to port at a smaller cost and a material saving of human life. Astronomy has given us a knowledge of the exact size of the earth, thereby enabling us to make accurate maps of the continents and oceans,

and it is of material value in general surveying. It has enabled us to determine the exact units of time, which has made it possible to construct clocks and watches with such a degree of exactness that we may be guided by them without error in all parts of the earth.

Astronomy is interested chiefly in a consideration of the earth, sun, moon, satellites, planets, comets, meteors, and fixed stars. It teaches that the sun is the center of the universe, from which all other bodies in our solar system receive light and heat, as they revolve around it in regular orbits under the laws of gravitation. There are eight so-called planets, including Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune, the first two having their orbits within that of the earth, and the last five having orbits larger than that of our planet, and to these Vulcan, a supposed inferior planet, is sometimes added. Various symbols are used to express in an abbreviated form certain astronomical terms and the names of the sun, satellites, and planets. Below is a list of the more important symbols:

- |                            |                         |
|----------------------------|-------------------------|
| ☉ = The sun.               | ♊ = The ascending node. |
| ☾ = The moon.              | ☿ = Mercury.            |
| ● = The new moon.          | ♀ = Venus.              |
| ○ = The full moon.         | ⊕ = The earth.          |
| ♌ = Conjunction.           | ♂ = Mars.               |
| ☽ = Quadrature, or differ- | ♃ = Jupiter.            |
| ing 90°.                   | ♄ = Saturn.             |
| ♁ = Opposition, or differ- | ♅ = Uranus.             |
| ing 180°.                  | ♆ = Neptune.            |

With the invention of elaborate instruments and the construction of gigantic observatories, great strides of advancement have been made, both in the discovery of heavenly bodies and in their measurements and analysis. This has caused astronomy to be divided into several branches. Astronomical geography treats of the earth, and uranography of the heavens. The study of the fixed stars is called sidereal astronomy. Physical astronomy not only investigates, but accounts for the facts observed.

Several observatories have been giving considerable attention to the study of sun spots. The authentic records of meteorological research do not extend back more than about fifty years, and in the study of solar phenomena the investigator is still more restricted. There is no record of solar prominences earlier than 1872. The largest sun spot has a diameter of 70,000 miles, and two other large spots have each a diameter of 40,000 miles. It has been found that the spots vary periodically in size, the cycle being 11.1 years, and there is also a marked variance in the number of spots visible at different times. When examined through a telescope spots appear like large irregular holes in the surface of the sun, and it is rea-



sonably certain that they are cavities and not elevations. The sloping sides, when seen through a large telescope, seem to be made up of white filaments, while the central part resembles a great flame ending in fiery spires. It cannot be doubted that these solar phenomena have an influence on terrestrial life, but science has yet to discover their effect and purpose. See **Earth, Sun, Asteroids, Moon, Jupiter, Satellites**, etc.

**ASUNCION** (ä-söön-sê-ôn'), the capital and most important city of Paraguay, on the Paraguay River, 645 miles north of Buenos Ayres. It is the converging center of several railroads, and has a number of fine public buildings and modern municipal improvements. A college, the custom house, a hospital, a cathedral, and the national capitol are among the chief buildings. It has an important trade by steamship navigation on the Paraguay River and by railroads with the interior. The manufactures include clothing, machinery, tobacco, and textiles. Among the chief articles of commerce are cereals, lumber, hides, tea, coffee, and fruits. It was founded on Assumption day in 1536, hence its name, and in 1869 was occupied by a Brazilian army. Population, 1905, 60,259.

**ATACAMA** (ä-tä-kä'mä), a vast desert region on the west coast of South America, belonging to Chile. It is rich in gold, silver, iron, nickel, copper, lead, and cobalt mines, and there are deposits of guano on the coast. The district has an area of about 66,000 square miles. The occupation of this region has caused some contention between Chile and Bolivia, from which several wars have resulted. Formerly it belonged to Bolivia, but it was ceded to Chile in 1884. The area is about 28,500 square miles.

**ATCHAFALAYA** (äch-af-a-lí'a), the name of a river and bayou in Louisiana, serving as a secondary channel of the Mississippi. It is connected with the Mississippi near the mouth of the Red River, and after a course of 225 miles toward the south enters the Gulf of Mexico by Atchafalaya Bay, 120 miles west of the main outlet of the Mississippi. Some geographers assert that the Atchafalaya constitutes the old bed of the Red River, its name signifying lost river.

**ATCHISON** (äch'i-son), a city in Kansas, county seat of Atchison County, on the Missouri River, forty-eight miles north of Kansas City. It is on the Missouri Pacific, the Chicago, Burlington and Quincy, and other railroads, has steamboat connections with Mississippi River and Gulf ports, and enjoys a large com-

mercial trade. The manufactures include flour, machinery, hardware, clothing, tobacco products, and earthenware. It is the seat of the State Soldiers' Orphans' Home. Besides an excellent public school system, it has several colleges and private schools. Electric lights and street railways, waterworks, pavements, several libraries, and a public park are among the utilities. The city has a fine county courthouse and other substantial buildings. The first settlement in its vicinity was made in 1854 and it was incorporated in 1858. Population, 1904, 16,925.

**ATHABASCA** (äth'a-bäs-kä), formerly a district of Canada, but in 1905 divided and made a part of the two provinces of Alberta and Saskatchewan. See **Alberta, Saskatchewan**.

**ATHABASCA**, or **Elk**, a river in Canada, rises in the Rocky Mountains, near Mount Brown, and has a length of 630 miles. The general course is toward the northeast until it reaches Fort McMurray, where it receives the Clearwater River, and thence flows north and passes through the west end of Lake Athabasca. About 35 miles beyond Lake Athabasca, which is sometimes called the Rocher River, it unites with the Peace River to form the Slave River.

**ATHABASCA LAKE**, a large body of fresh water in the Dominion of Canada, situated in the northern part of Alberta and Saskatchewan. The length from southwest to northeast is 200 miles and the breadth is about 30 miles. Surrounding the lake is a timbered country, mostly of poplar, fir, and spruce. It receives the water from the Athabasca River and by that stream, or the Rocher River, discharges through the Slave River into Great Slave Lake.

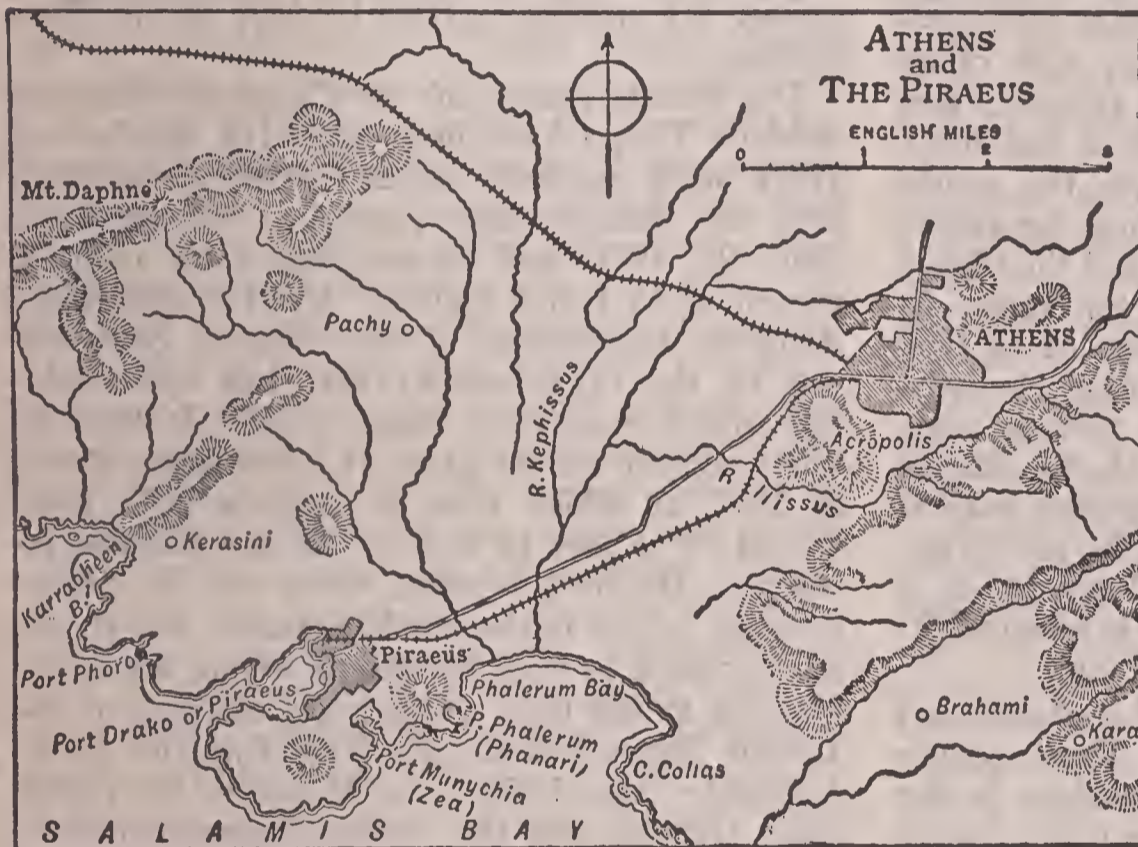
**ATHEISM** (ä'thê-iz'm), the doctrine that disbelieves or denies the existence of God. Among the Greeks and other ancient people atheism consisted of a denial, or nonrecognition, of the gods of the state. Some writers have doubted whether there ever were any atheists, since the doctrine of atheism is contrary to the instincts of man.

**ATHENS** (äth'ënz), a city in Georgia, county seat of Clark County, on the Oconee River, and on the Central of Georgia, the Southern, and the Seaboard Air Line railroads. It is surrounded by an agricultural and fruit-growing country and has a large trade in cotton and merchandise. The manufactures include flour, paper, ironware, cotton goods, tobacco products, and machinery. Besides having a fine public school system, it is the seat



of the Lucy Cobb Institute, the State Normal School, the University of Georgia, and the State College of Agriculture. Electric lights, street railways, pavements, several libraries, and a fine county courthouse are among the improvements. Athens was founded in 1800 as the seat of the State University. Population, 1900, 10,245.

**ATHENS**, the capital of ancient Attica, the center of Greek culture, now the capital of the kingdom of Greece. It is situated in the Plains of Attica, four miles from the Saronic Gulf, a branch of the Aegean Sea, and about an equal distance from the port town of Piraeus. The city is built around a central rocky height, called the Acropolis, an elevation about 300 feet high, and rising 600 feet above the Mediterranean. Around



it are grouped the Areopagus, or the Hill of Mars; the Manseion, or the Hill of the Muses; the hill of the Nymphs; and the Hill of Pnyx. The Plains of Attica are bounded by hills, through which flow the Ilissus and the Cephissus rivers. According to tradition the city was founded in 1550 B. C. by Cecrops, a mythical hero, and was originally named Cecropia, but the name was afterward changed to Athens in honor of the goddess Athena. King Theseus, a mythical king, was an incentive to the building of the ancient city, while the great Solon made it famous for its democratic government and led to the erection of many magnificent buildings, among them the Temple of Zeus, known as the Olympium, of which ruins still remain.

When Europe was overrun by the Persians,

the city was burnt, but, after the victories of Salamis and Plataea, Athenian ascendancy caused it to be rebuilt in great splendor. In the days of Themistocles were built the walls surrounding the Acropolis and many massive towers and gates, and the city was inclosed with impregnable walls. Its greatest glory was attained in the time of Pericles, when it was beautified by splendid architecture and sculpture. Important schools of history, philosophy, and poetry flourished in the time of Herodotus, Socrates, and Simonides. This period witnessed the construction of its beautiful monuments and public buildings, among them the Parthenon.

The decline of Athens began with the close of the Peloponnesian wars. At that period its walls were destroyed, many beautiful structures demolished, and, worst

of all, the spirit of Grecian ambition broken. True, Demosthenes and Lycurgus still defended the freedom of the city and constructed amphitheaters for the entertainment of thousands of people, but the spirit of her greatness was largely lost. When Athens became a part of Macedonia, it continued to be the seat of philosophy and rhetoric, and, when conquered by Rome in 146 B. C., it became the teacher of that great nation. It enjoyed periods of prosperity and depression successively on account of its conquest by the Romans, Goths, Christians, and Turks. Greece was freed from Turkish dominion in 1833,

since which time it has been a kingdom with its seat of government at Athens.

Modern Athens is alike prosperous in its industries and material growth, and in the development of the arts, sciences, and general education. The National University, founded in 1837, is attended by about 3,000 students, and is equipped with extensive laboratories and a library of 225,000 volumes. It is the seat of the National Museum, located in the Polytechnic School, and of schools for the study of antiquities under the direction of French, English, American, and German societies. Chief among the public buildings is the royal palace, constructed in the modern Greek style and decorated with fine paintings and frescoes. The city is traversed by electric street cars, both urban and interurban, and has railroad connec-



tion with the principal cities of Greece. Municipal systems of gas and electric plants and public waterworks, which include the ancient aqueduct of Hadrian, and other public facilities, are maintained. It is the financial center of the nation, the seat of its art and learning, and does not engage extensively in manufacturing enterprises. Those maintained are operated by private companies and make clothing, chemicals, musical instruments, earthenware, and spirituous liquors. Trade is chiefly in silk textiles, rugs, wearing apparel, and cereals used in domestic consumption. Population, 1906, 170,125.

**ATHLETICS** (ăth-lět'iks), the general name applied to a large variety of sports which are recognized as contests of physical skill, or are played for the purpose of developing physical strength. In a wider sense, the term embraces polo, baseball, basketball, lacrosse, and other games that are played extensively as sports and for profit. The term athletics in a narrower sense is applied more generally to the sports which hold a prominent place among the games played by students in the schools and the higher institutions of learning. Those who engage in athletics for pay are usually spoken of as *professionals*, while all others, including the athletes of schools and colleges, are termed *amateurs*. Indeed, it is the object of the educational institutions to encourage athletics only in the line played by *amateurs*, since the sports are intended especially for the development of a degree of physical strength which is essential in the educational growth of the student.

The games recommended for the educational institutions are very numerous. They include those that are fitted for the gymnasium in the winter and for the campus and the green sward in autumn and spring. Another distinction is made in regard to the sexes, the games for both male and female being numerous and well understood. In most institutions the various games are promoted by organizations, frequently including one or more complete teams. The most skillful team is constituted of the best players, who are selected after competitive tests have been made, and it devolves upon this team to play competitive games with the select teams of other schools and colleges. The members of the select team have the benefit of training by the coach, who strives to bring out the greatest possible skill with the least necessary expenditure of energy. In most cases suitable clothing or specially designed suits are worn in the competitive games. The suits depend upon the game to be played, but usually include a light leather shoe, tight stockings,

knee pants of light cloth, and a loose fitting shirt or waist.

The popular sports that belong essentially to athletics are classified as those of the *field* and those of the *track*. These terms have reference to a circular track and the inner field inclosed by the same. Among the *field events* are hurdling, pole vaulting, broad jumping, high jumping, hammer throwing, and discus throwing. The *track events* consist of sprinting, including sprints from fifty yards to 440 yards for short distances and from a half mile to two miles for long distances. The rules for playing are extensive and vary somewhat according to the age and experience of the players. Several competitive games are played each year by the unions and associations of school and college athletes. The national and intercollegiate games are usually played in May or in September.

The annual games of the Canadian Amateur Athletic Union have been played a number of years with marked success. This association held its championship games at Montreal on Sept. 21, 1907, and in the pole vault made a record of 11 feet 5 inches. The Intercollegiate Athletic Association of the United States is one of the organizations that has been holding annual games for many years. It held its thirty-second annual game at Cambridge, Mass., in 1907, at which time it made a pole vault record of 11 feet 11 inches. At the same meeting the 112-yard hurdles were run in fifteen seconds, which is the world's record, but it was not accepted as such because a strong wind was blowing at the time. Other associations of the United States include the New England Intercollegiate Association, the Western Intercollegiate Games, and the National Amateur Athletic Union.

**ATHOL** (ăth'öl), a town of Massachusetts, in Worcester County, 22 miles west of Fitchburg. It has railroad and suburban electric railway facilities, and is a manufacturing center of furniture, utensils, clothing, and cotton goods. A high school and several fine churches are among the public buildings. It was known as Pequig until 1762, when it was incorporated under its present name. Population, 1900, 7,061.

**ATHOS** (ăth'ös), a mountainous peninsula of Turkey in Europe, the most easterly of the three peninsulas projecting into the northwestern part of the Aegean Sea. It is from five to seven miles wide, thirty miles long, and at its extremity is Mount Athos or Holy Mountain, rising 6,350 feet above the sea. When Xerxes invaded Greece, he cut a channel across the north end of the peninsula to avoid the



dangers of sailing around Mount Athos. There are several famous monasteries at Mount Athos, some dating from the time of Constantine, and they are occupied by about 7,000 monks. The occupants engage largely in gardening, fishing, bee-keeping, and the manufacture of rosaries, amulets, crucifixes, images, and furniture. The monasteries have valuable libraries containing considerable treasures in literature and manuscripts. All the monasteries are associated with the Greek Church.

**ATITLAN** (ä-tē-tlän'), a lake of Central America, in Guatemala, probably formed by the crater of an ancient volcano. It is ten miles wide, twenty miles long, and of considerable depth. Though several small streams flow into it, there is no visible outlet to the sea. Near the lake is Mount Atitlan, an active volcano, 12,160 feet high.

**ATLANTA** (ät-län'tä), the capital of Georgia, county seat of Fulton County, familiarly called the "Gate City to the South." It is situated in the northwestern part of the State, about 100 miles northwest of Macon, and it is the focus of a network of railroads that furnish transportation facilities to many points north and south, including the Southern, the Seaboard Air Line, the Western and Atlantic, the Central of Georgia, and a number of others. The city is platted in the form of a circle, with an area of about 12 square miles, and is the largest and most important commercial center of the State. Many of the streets are paved with stone and asphaltum, and avenues of trees ornament the residential centers. Piedmont Park, the site of the Atlanta Exposition in 1895, is a beautiful and interesting tract of land. Several memorial buildings and monuments, including one erected to the memory of H. W. Grady, adorn public places. Electric street railways traverse the principal thoroughfares, and interurban lines furnish facilities to reach many points in the vicinity. Grant Park is popular as a place of recreation. Fort McPherson, four miles distant, is a government army post.

As an educational center Atlanta takes high rank, being the seat of numerous societies and educational institutions. Atlanta University, Atlanta Baptist College, Clark University, Gammon Theological Seminary, Morris Brown College, and a number of professional and business colleges are among the educational institutions. It is the seat of the Georgia School of Technology, a branch of the State University at Athens. A Carnegie library and the State library have collections of well-selected books and documents. The Grady Hospital, the Pres-

byterian Hospital, a Florence Crittenden home, an orphan asylum, and other charitable institutions are maintained. The State capitol, built of limestone and decorated with Georgia marble, cost about \$1,000,000. Other public buildings include the custom house, the county courthouse, the city hall, a Federal prison, a fine union passenger station, and many modern business blocks. The manufactures are extensive and consist chiefly of cotton goods cotton-seed oil and cake, earthenware, machinery, hardware, cigars, and farming implements. A large export trade is carried in live stock, especially horses and mules, and in cotton and raw and manufactured tobacco.

The first settlement on the site of Atlanta was made in 1836, but it was some time before many business establishments located here. In 1843 it was incorporated as Marthasville and two years later the name as changed to Atlanta. In 1861, at the beginning of the Civil War, the population was about 11,000. The Confederates fortified it strongly and held it until 1864, when it was captured by General Sherman and nearly destroyed by fire. Soon after the close of the war it began to rebuild, and its growth and development have been constant since that time. It was made the capital of the State in 1878. Conveniently located, having numerous substantial institutions, and being the center of a large trade, its future prosperity is assured. Population, 1910, 154,839.

**ATLANTIC** (ät-län'tik), a city in Iowa, county seat of Cass County, on the East Nishnabotna River, and on the Chicago, Rock Island and Pacific Railroad. It is surrounded by a fertile farming and dairying country, and has manufactures of canned goods, ironware, and machinery. Among the chief buildings are the county courthouse, the high school, and several churches. It has electric lights, sewerage, and waterworks. Atlantic was incorporated in 1869. Population, 1905, 5,180.

**ATLANTIC CABLE** (kă'b'1), a cable line laid from America to Great Britain. The project of providing means to communicate by cable connections with Europe was successfully completed in 1866, though two attempts had failed previously. The *Great Eastern* laid 1,200 miles in 1865, when the cable broke, but the next year connection was established. The cable line connects Heart's Content, Newfoundland, with Valentia, Ireland, a distance of 2,300 miles. Since then other lines have been laid to Europe, and there are numerous similar lines in different parts of the ocean. In 1908 there were twenty cables at the bottom of the Atlantic. It is now possible to effect rapid com-



munication with practically all important parts of the earth.

**ATLANTIC CITY**, a city of New Jersey, in Atlantic County, on the Atlantic seacoast, sixty miles southeast of Philadelphia. It is situated on the Pennsylvania and the Reading railroads, and has transportation by a network of electric lines. The city is located on Absecom Beach, an island about ten miles long and three-fourths of a mile wide, and is popular as a pleasure and health resort. The manufactures include clothing, tobacco products, machinery, earthenware, and canned fruits and fish. Electric lights, pavements, waterworks, and a public library are among the facilities. The prominent institutions include the Children's Seashore Home, the Atlantic City Hospital, and the Mercer Memorial Home for Invalid Women. The first settlement was made in 1780, but its prosperity dates from 1854, when the Camden and Atlantic Railroad was completed. During the summer it has a transient population of about 275,000, for which there are ample hotel and villa accommodations. Population, 1905, 37,539; in 1910, 46,150.

**ATLANTIC OCEAN**, the great expanse of sea between the western coasts of Europe and Africa and the eastern coasts of North and South America, and extending from the Arctic to the Antarctic Ocean. Its width between Norway and Greenland is 930 miles, between Brazil and Africa, 1,600, and from North Africa to Florida, 4,250, and its area aggregates about 30,000,000 square miles. The shape of its shore line is that of a long trough-like valley with nearly parallel sides. It has a broad connection with both polar oceans, and forms the only open channel for the intermingling of warm and cold currents. By recent soundings, it has been found that the Atlantic possesses a large submarine plateau, extending in mid-ocean parallel to the coasts of the continent, from the southern portion of Africa to Iceland; thus dividing the basin into eastern and western valleys. The western valley is the deeper, the average depth of the two being 18,000 and 13,000 feet respectively. From Newfoundland to Ireland extends a remarkable plateau across these valleys, known as the Telegraph Plateau, on which a number of cable lines are located. The general depth along this swell ranges from 10,000 to 13,000 feet.

The true bed of the Atlantic Ocean commences some distance from the eastern coast of North America. Its depth for a distance of seventy-five to one hundred miles is about 600 feet, but from this region it descends to great depths. A large submerged plateau connects

the British Isles with the continent of Europe, which passes through the North Sea, and extends for a considerable distance off the western and southern coasts. The greatest depth yet discovered in the Atlantic is north of Porto Rico, where it exceeds 27,300 feet. While the Atlantic is smaller than the Pacific Ocean, it is much stormier and vastly more important to trade, for the reason that the great commercial nations of the world occupy its shores. Thousands of ships sail upon it, and from its ports extend steamboat lines to all parts of the world. This has caused many improvements in the form of lighthouses to be made, and its shores and important points in mid-ocean have been carefully surveyed.

The Atlantic is divided into the North Atlantic and the South Atlantic by the Equator, the former containing in the neighborhood of 17,000,000 square miles, and the latter about 13,000,000. Nearly one-half of the water discharged by the rivers of the world flows into it. Through it flow many useful warm and cold currents, which have been carefully surveyed and are extensively utilized in commerce. They have much value in tempering the climate of various countries. The most important is the Gulf Stream. This makes a bold curve from the Gulf of Mexico, flows northward in high ocean, modifies the climate of Newfoundland, and then divides. From its division one current passes to the vicinity of Iceland and the British Isles, and the other returns to the tropical seas by the way of Spain and Africa. Thus, it has a favorable effect upon the former as a warming influence, and upon the latter as a moderating factor of the tropical climate prevailing along its western coast.

**ATLANTIS** (ăt-lăn'tis), an island mentioned by Plato as the home of a great nation, and which was submerged in the sea. It was said to have existed several thousand years before the time of Plato, in the Atlantic, west from the Strait of Gibraltar, and in size was larger than Libya and Asia Minor. It was the reputed home of a great nation that conquered western Europe and Africa, and, to relieve humanity, the gods sent an earthquake to submerge it in the sea. By some the legend has been accepted as true, and the shallowness of the ocean at that point is cited in proof, while others think it refers to an early discovery of America.

**ATLAS**, a chain of mountains in North Africa, between the Mediterranean and the Sahara Desert. They start near Cape Nun, on the Atlantic coast, and extend to Cape Bon, passing through Morocco, Algeria, and



Tunis, a distance of about 1,500 miles. There are two parallel ranges called the Little and the Great Atlas; the former is nearest the coast, and the latter borders on the desert. Mount Jehel Ayashi, in Morocco, attains a height of 14,600 feet above sea level and is the highest peak. Fine forests and vegetation common to Europe abound, the former including the oak, pine, ash, cork oak, and poplar. They yield large quantities of valuable minerals, including gold, silver, coal, copper, iron, lead, and antimony. In 1900 valuable petroleum wells were found in Algeria. In some of the valleys are fine cities, and there are several railroads crossing different sections.

**ATMOSPHERE** (ăt'mös-fēr), the invisible elastic envelope that surrounds the earth, but the term is applied to the gaseous envelope surrounding any heavenly body. The atmosphere consists of gaseous matter extending from thirty-five to 200 miles above the surface, and is of varying density, this property depending upon its height. The lower layers are more dense than the others because they bear the weight of those above them, and the density diminishes rapidly as we ascend. It presses uniformly in all directions, and for this reason its weight remained longer undiscovered. Torricelli, an Italian philosopher and a pupil of Galileo, discovered its weight by the use of an instrument called the barometer. That the atmosphere possesses weight can be proven successfully by filling a bottle with air, weighing it, then extracting the air by means of an air pump, and when weighed it will be sensibly lighter than at first.

The pressure of air at the level of the sea is 14.73 pounds per square inch, and the total weight of the atmosphere is  $11\frac{1}{2}$  trillions of pounds, or about  $\frac{1}{188,000,000}$  of the total weight of the earth. This enormous pressure is exerted on the human frame and all objects on earth's surface. The pressure sustained by a single individual is estimated at fourteen tons, but, as it is exerted equally and in all directions and permeates the whole body, no inconvenience is caused by it. The more striking phenomena, which are to a large extent dependent upon the atmosphere, include animal and vegetable life, disintegration of rocks, polar and terrestrial radiation, storms and weather, twilight, and the propagation of sound. The atmosphere contains, among other constituents, oxygen, nitrogen, argon, aqueous vapor, carbonic acid gas, and ozone. In general it contains more or less sulphuric acid gas and hydrogen. Nitric acid is often noticeable in the atmosphere after thunder storms. It also contains minute par-

ticles of organic and inorganic substances. See **Air**.

**ATOLLS** (ä-töls'). See **Coral**.

**ATOM** (ăt'üm), according to some philosophers, the primary part of molecules not further divisible. The atomists believe that atoms are unalterable in size and shape; that they cannot be cut nor scratched by the sharpest tools; neither can they be twisted, flexed, or bent by the most powerful forces, and are not affected by cold or heat. They reason that in each kind of elementary substance the atoms have the same weight and size, but that in different kinds of elementary substances the atoms are of different size and weight. Thus, all atoms of gold are of the same weight and size, no matter from what part of the earth the gold may come. In like manner, the atoms of iron are of the same weight and size, but the atoms of gold are not of the same weight and size as the atoms of iron. Among the chief writers of ancient times who held to this theory are Moschus of Sidon, Epicurus, Democritus, and Lucretius, and they believed that atoms possessing various properties and motions are found in all substances. Newton thought original matter to consist of impenetrable, inactive, and immutable particles.

**ATOMIC THEORY** (ä-töm'ik thē'ō-rÿ), the theory according to which all the elements in compound bodies combine in certain uniform proportions. According to this view it is assumed that all bodies are composed of ultimate, indivisible atoms, the weight of which varies with the different kinds of matter. The opposite of this theory is that bodies, particularly those having no apparent organization, such as water, are continuous and homogeneous, and may be divided and subdivided indefinitely. The atomists assert that after a definite number of subdivisions the parts can no longer be divided, as each of the primary parts constitutes an atom. The theory owes its origin to John Dalton (1766-1844), who published his "New System of Chemical Philosophy" in 1807. He held that the atoms of each element are incapable of being subdivided, and that each has a definite relative weight, which is as one compared to hydrogen. While some of his theories are not well established, many chemists have followed him in adopting the terms used by him; namely, atom and atomic weight, in preference to proportion, combining proportion, and equivalent.

**ATOMIC WEIGHTS**, the proportions by weight in which chemical elements unite. Chemists, after carefully weighing numerous compounds, have determined the weight of the dif-



ferent elements as compared with the weight of the atom of hydrogen, which is taken as 1. All the other elements are represented by a quantity equal to the minimum amount in which they unite with 1 of hydrogen. A committee of German chemists prepared the standard system of atomic weights now in general use, in which the atomic weight of hydrogen is 1 and that of oxygen 16. See **Chemistry**.

**ATONEMENT** (ă-tōn'ment), literally at-one-ment, the act of reconciling persons at variance with each other, or the reconciliation of God to men, and men to God. The term is also used to designate the means by which the reconciliation is accomplished. It is used fifty-eight times in the Old Testament, and all but five of the places where it is found occur in the Pentateuch.

**ATRATO** (ă-tră'tō), a river in Colombia, in South America, which rises near the Cordilleras and flows into the Gulf of Darien. Its course of about 400 miles is northward, and it is navigable about half that distance. Formerly the Atrato was considered in connection with the construction of a canal between the Atlantic and the Pacific, but surveys made in 1870 proved it unsuited and the project was abandoned.

**ATROPHY** (ăt'rō-fy), a morbid condition in plants and animals, causing a waste or decrease in size of a part or of the entire body. It causes interference in nutrition, hence the substance in the parts affected either decays or is wasted. Atrophy occurs normally in old age, when all of the organs undergo atrophic changes, but young life is affected by it through severe exposure, unwholesome food, impure air, and arsenic and other poisons.

**ATTACHMENT** (ăt-tăch'ment), a legal process issued by a court, under which the sheriff or a like officer is directed to seize a person or property. A writ of attachment is issued in connection with an action at law, and the person or property taken into custody is held until the proceedings are completed and final judgment is rendered, when disposition is made under an order of the court. Writs of this character were formerly issued against persons by most governments, but they have been discontinued in many countries, and writs to seize property are used chiefly as a means of protection against fraud, to prevent their removal before a debt or judgment can be satisfied.

**ATTAINDER** (ăt-tăn'dēr), a legal term used to designate a special act of a legislative body inflicting capital punishment, or declaring a forfeiture of civil rights, upon a person

for high crimes, without having been first convicted in a court of law. The person against whom such an act is passed is said to be attainted. As a result the person attainted forfeits his property and is debarred from inheriting from any one. These laws do not exist in highly civilized countries. The Constitution of the United States contains the following provision: "No bill of attainder shall be passed, and attainders of treason, in consequence of a judicial sentence, shall not work corruption of blood or forfeiture except during the life of the person attainted."

**ATTAR** (ăt'tēr), a name used in the East Indies to designate a perfume made from flowers. The name is generally applied to *attar* or *ottar of roses*, which is an oil extracted from the petals of roses. It is secured largely from the musk rose and the damask, and is very expensive owing to the difficulty of obtaining it. Fifty thousand roses yield only about ninety grains of attar. It is manufactured in Cashmere, Damascus, and Rumelia, where large rose farms are profitably cultivated. The oil is of various tints, usually yellow, green, or red, and liquifies at about 84°. An adulterated form is made by adding geranium, sandalwood, and rhodium. The pure oil is expensive, usually selling at about \$40 per ounce.

**ATTENTION** (ăt-těn'shŭn), the act of fixing the mind upon any one object or class of objects, or directing the energies of the mind to a definite purpose. It is voluntary or involuntary, and may be trained and its power of concentration increased by practice. Voluntary attention is controlled by the will and requires effort, while involuntary attention is without effort and predominates in young children. Memory depends in a large measure upon attention, and the power to recall at will our mental impressions and acquisitions is perhaps directly in proportion to the attention given to the subject at the time mental effort was put forth. The mind has imperfect control of its thoughts when the attention, while directed to some subject of study, was feeble, loose, or accidental, and formed with little volition. Since attention is the foundation of all knowledge, it requires careful training and exercise, else the mind will be wanting in the chief quality of a sound intellectual character.

Attention is dependent in a large measure upon the physical condition. When the body has been exhausted by labor, either bodily or mentally, or is weakened by disease, it is not possible to concentrate the attention upon an object of thought. An effort to exercise the attention under such conditions causes nervous-



ness. If trained rightly during childhood and youth, the power to fix the attention upon objects for a definite purpose becomes habitual, and this training, combined with healthful physical functions and the selection of worthy objects of thought, make easy the accomplishment of difficult tasks. Attention is dependent in a large measure upon interest.

**ATTICA** (ăt'tī-ka), a state of ancient Greece, including an area of 840 square miles, and lying east of the Saronic Gulf. The surface is diversified by several mountain ranges, which rise to heights approximating 4,600 feet, though the mountain slopes and intervening valleys possess considerable fertility. This region was cultivated to fruits and cereals in the time of Solon, and still yields considerable quantities of olives, figs, grapes, cereals, goats, sheep, and cattle. At present Attica and Boeotia form a state in the kingdom of Greece, which has an area of 2,475 square miles and a population of 313,069.

**ATTLEBORO** (ăt'tl-bŭr-rō), a town of Massachusetts, in Bristol County, thirty miles southwest of Boston, on the New York, New Haven and Hartford Railroad. It is an important manufacturing center, producing considerable quantities of textiles, buttons, braid, jewelry, clothing, and machinery. The public library has about 9,750 volumes. It contains an almshouse and the Attleboro Home Sanitarium. The city has an extensive system of electric railways, pavements, electric lights, and sewerage. The first settlement was made in 1669 and it was incorporated in 1694. Population, 1905, 12,702.

**AUBURN** (a'bŭrn), a city in Maine, county seat of Androscoggin County, on the Androscoggin River and on the Grand Trunk and the Maine Central railroads. The river supplies an abundance of water power for manufacturing purposes, and the surrounding country is generally fertile. The manufactures include boots and shoes, cotton and woolen goods, flour, earthenware, and machinery. Among the chief buildings are the county courthouse, the public library, and several schools and churches. Electric street railways, waterworks, and sewerage are among the public utilities. Lake Auburn, Lewiston Falls, and Poland Springs are scenic points near the city. The first settlement was made in 1786 and it was incorporated in 1842. Population, 1900, 12,951.

**AUBURN**, a city in New York, county seat of Cayuga County, on the outlet of Owasco Lake, and on the Lehigh Valley and the New York Central railroads. It is handsomely built, has extensive water power, and is the

seat of numerous factories. The chief products include threshing machines, harvesters, mowers, textile fabrics, earthenware, tobacco products, and machinery. The surrounding country is farming and dairying, and contains extensive orchards and vineyards. Auburn is the seat of a State prison, at which the *silent* system of discipline was first inaugurated, so named because the prisoners are not permitted to talk to each other while at work and at other times are confined in separate rooms. Other institutions located here include an asylum for the insane, an armory, and the Auburn Theological Seminary. Auburn was the home of William H. Seward and has a bronze statue of him. Gas and electric lights, street railways, waterworks, a public library, and a number of parks are among the conveniences. The first settlement was made in 1792, when the place was called Hardenburgh's Corners, from Capt. John L. Hardenburgh. In 1805 it became the county seat and was named Auburn from the village described in Goldsmith's "Deserted Village." Population, 1905, 31,423; in 1910, 34,668.

**AUCKLAND** (ak'land), an important city of New Zealand, in the province of Auckland, and formerly the capital of New Zealand. It is supplied with excellent railroad facilities, has regularly platted streets, and enjoys a considerable export and import trade. It has a number of fine school buildings and churches, and it is the seat of Saint John's College. A public library, sewerage, waterworks, and electric street railways are among its utilities. The manufactures include clothing, earthenware, machinery, and railroad cars. The city was founded in 1840, and its rapid growth dates from 1857, when valuable deposits of gold, copper, iron, and coal were discovered in the vicinity. Population, 1906, 37,736.

**AUCKLAND ISLANDS**, a group of volcanic islands lying about 180 miles south of New Zealand. The soil is generally fertile. They have extensive forests, productive fisheries, and a considerable trade. The entire group includes a large number of islands, but only three are of considerable extent. Auckland, the largest island, is thirty miles long and fifteen miles wide. These islands were discovered by Captain Briscoe in 1806, and are mainly important as a whaling station in the south seas.

**AUGER** (a'gēr), a tool used for boring holes larger than those bored by a gimlet. The auger is drawn into the wood by a screw at the point, above which, at each side, is a cutting lip and a spiral pod, the cutting lip to cut and the spiral groove to discharge the chips. At



the upper end is a handle placed crosswise by which the auger is turned with both hands. The smaller augers usually consist of bits that fit into a brace or bitstock, and have the advantage of being more easily handled.

**AUGSBURG** (owks'bōorg), a city of Germany, in Bavaria, at the confluence of the Lech and Wertach rivers, thirty-two miles northwest of Munich. It is the converging center of several important railroad lines and has a considerable commercial trade. Within the last decade it has grown rapidly as an industrial center. The manufactures include machinery, paper, jewelry, musical instruments, and clothing. Augsburg has long ranked as an important money market of Europe, and as the seat of extensive book-printing establishments. It has electric street railways, sewerage, stone and asphalt pavements, a large public library, and several fine parks. Among the chief buildings are the Church of Saint Anna, the memorial chapels of the Fugger family, the Church of the Holy Cross, the city hall, and the theater. Many of the streets are adorned with fine fountains and statues. The city is famous as the place where the Confession of Augsburg was concluded, which constitutes the confession of faith adopted by the Protestants on June 25, 1530. The first settlement was established on the site of Augsburg by Augustus in 12 B. C., when that Roman general conquered the Vindelicians. Population, 1906, 94,923.

**AUGSBURG CONFESSION**, the first Protestant confession of faith, containing the doctrinal definition of the Lutheran Church, and adopted at Augsburg, Germany, June 25, 1530. The confession was prepared by Melancthon and approved by Luther, and was read in a diet convened by the German princes and estates. It was written in Latin and German and read aloud before the diet in German, but both have probably been lost. In this document the belief of its supporters is set forth in a terse and dignified manner in twenty-one articles. This confession and the two catechisms written by Luther constitute the accepted confessional theology of the Lutheran Church.

**AUGUST** (a'gust), the eighth month of the Gregorian year, so named in honor of Emperor Augustus. In the Roman calendar it was the sixth month, hence was named *Sex-tilis*.

**AUGUSTA** (a-güs'tà), a city in Georgia, county seat of Richmond County, on the Savannah River, 135 miles northwest of Charleston, S. C. It is situated on the Central of Georgia, the Southern, and other railways, and has a large trade in cotton, cereals, and mer-

chandise. The streets are broad and well improved by pavements, sewerage, waterworks, electric lights, and avenues of shade trees. Transportation to urban and interurban points is by an extensive system of electric railways. Among the noteworthy institutions are the Medical College of Georgia, the Richmond Academy, the Masonic and Odd Fellows' halls, the Louise King Home, the Paine's Institute for Colored Students, and the Augusta Orphan Asylum. It has a number of parks, a Confederate soldiers' monument, and a monument dedicated to the Georgia signers of the Declaration of Independence. The public library contains 12,500 volumes. It has a fine courthouse and many large business buildings, such as the Cotton Exchange and the Georgia Railroad Bank. The Augusta Canal, a watercourse about nine miles long, supplies an abundance of water for city use and for manufacturing purposes. The chief manufactures are cotton and woolen goods, clothing, tobacco products, machinery, and earthenware. The city was platted under a royal charter in 1735, and is one of the oldest cities in the State. In the Revolutionary War it was captured by the British and held for two years, but was recaptured in 1781 by Gen. Henry Lee after a siege of thirteen days. Population, 1900, 39,441; in 1910, 41,040.

**AUGUSTA**, the capital of Maine, county seat of Kennebec County, at the head of tide water on the Kennebec River. It is on the Maine Central Railroad and has connection by steamer with Boston and Portland. The city is finely situated and improved by an abundance of shade trees, and the river is crossed by a handsome bridge. The river furnishes an abundance of water power, thus giving it considerable advantage for manufacturing purposes. The chief products include paper, cotton and woolen goods, furniture, clothing, and machinery. Electric street railways, waterworks, pavements, and sewerage are among the utilities. The capitol building is the most prominent structure and is built of granite. Other buildings include the county courthouse, the post office, the city hall, and the United States Arsenal. It is the seat of Saint Catherine's School, an institution for the education of young ladies. In 1831 it was made the capital of the State. Population, 1900, 11,683.

**AUK** (ak), the name of several sea birds, including a large number of species, of which the great auk and the little auk are the best known. The great auk is about three feet high when sitting in an upright position. It has short wings, which are almost useless in flight,



but they aid the bird to move with great rapidity in the water. At present it is found only in North America, but bones discovered in Den-



GREAT AUK.

mark and other regions of Europe indicate that it was formerly common to Western Europe. The little auk is about the size of a large pigeon, and is met with in great numbers in the Arctic seas, where it nests in crevices of the bare rocks. The razorbill is allied to the auk, and like the great auk frequents the crannies of rocks. The young razorbills feed from the crop of the parents even after they are able to move about quite freely. Auks yield feathers of much value for bedding, for which purpose they are hunted with considerable persistency, while their flesh and eggs are eaten by the Eskimos and other peoples of northern regions. These birds migrate in early winter from the land to the open sea, where they float on the water or perch on the drifting ice.

**AURORA**, a city of Illinois, in Kane County, on the Fox River, about forty miles west of Chicago. It is on the Illinois Central, the Chicago, Burlington and Quincy, and the Chicago and Northwestern railroads, and is the seat of important railroad shops. The manufactures include carriages and wagons, flour, woolen goods, cigars, earthenware, machinery, and farming implements. Among the notable buildings are the post office, the Carnegie library, the high school, and the Jennings Seminary. The streets are handsomely paved with brick and asphalt, and improved by avenues of shade trees, electric lights, waterworks, and an exten-

sive system of street railways. Population, 1900, 24,147; in 1910, 29,807.

**AURORA**, a city of Missouri, in Lawrence County, thirty-five miles southwest of Springfield, on the Kansas City, Fort Scott and Memphis and the Saint Louis and San Francisco railroads. The surrounding country is agricultural and fruit-growing, and has deposits of lead and zinc. It has a public library, waterworks, a fine high school, and a large trade in produce and merchandise. The manufactures include flour, cigars, clothing, and machinery. Population, 1900, 6,191.

**AURORA BOREALIS** (bō-rē-ā'līs), or **Northern Lights**, a phenomenon of great beauty in the northern hemisphere, corresponding to the phenomenon occurring in the southern hemisphere known as *Aurora Australis*, or **Southern Lights**, both being called **Polar Lights**. The lights are visible in autumn and winter, occurring at opposite times at the two poles, and are of utility in aiding to illumine the long nights. The shapes assumed by the lights are infinite in number and very transient, sometimes appearing of an ordinary flame color and sometimes assuming a greenish hue. The most frequent appearance is that of an arch of fire, from which great streamers flash towards the zenith, which range from a pale red or yellowish to a deep red color. Auroras are caused by the passage of electricity through the rarefied air of the upper regions of the atmosphere. This is proven by the fact that during the continuance of an extensive aurora telegraph wires give evidence of unusual disturbances in electrical action, and the magnetic needle is subject to frequent movements. It has been proven by tests that an effect similar to the aurora is produced by the passage of electric currents through rarefied gases.

**AUSCULTATION** (as-kŭl-tā'shŭn), the art of discovering diseases within the body by means of the sense of hearing. It involves a knowledge of the natural sounds produced within the body in health and disease, especially those of the thorax and abdomen. An instrument used in this art, to facilitate investigation, is called a stethoscope.

**AUSTERLITZ** (as'tēr-līts), a small town in Moravia, in the northwestern part of Austria, twelve miles east of Brünn. It is celebrated on account of Napoleon's victory over the Austrians and Russians on Dec. 2, 1805. After Napoleon occupied Vienna, his headquarters were fixed at Brünn, to which place the allied armies advanced. The French army numbered about 80,000, and in the battle lost 12,000 men; while the allied forces numbered



84,000, and sustained a loss of nearly 30,000 men in killed, wounded, and prisoners. This battle resulted in the peace of Pressburg, and a large part of Central Europe became subject to Napoleon. In 1906 Austerlitz had a population of 3,980.

**AUSTIN** (as'tin), a city in Minnesota, county seat of Mower County, on the Red Cedar River, about 100 miles south of Saint Paul. It is situated on the Chicago Great Western and the Chicago, Milwaukee and Saint Paul railroads, and is surrounded by a fertile farming country. The chief buildings include the county courthouse, the high school, the Carnegie library, and the Southern Minnesota Normal College. It has municipal waterworks and manufactures of flour, machinery, and farming implements. The first settlement was made in 1854 and it was incorporated in 1873. Population, 1905, 6,489.

**AUSTIN**, the capital of Texas, county seat of Travis County, on the Colorado River, about 200 miles northwest of Galveston. It is on the International and Great Northern, the Houston



STATE CAPITOL, AUSTIN.

and Texas Central, and the Austin and Northwestern railroads. The city is surrounded by a fertile farming region, which produces large quantities of cereals, fruit, and live stock, and is important as a market for produce and merchandise. It has electric lights, electric street railways, waterworks, sewerage, and pavements of stone and macadam. The State Capitol building, located on Capitol Hill and built of Texas marble, is one of the finest structures of the kind in America. Austin has a large number of State and county buildings, a fine public school system, numerous churches, and several educational and scientific associations. It is the seat of the Texas Military Institute, the Texas State University, a Roman Catholic academy, and several benevolent institutions. The manufactures embrace clothing, machinery,

tobacco products, vehicles, and farming implements. The city was named in honor of Stephen F. Austin (q. v.). It became the capital of the Texan Republic in 1839, and in 1850 was made the capital of the State. Population, 1900, 22,258; in 1910, 29,860.

**AUSTRALASIA** (as-tral-ā'shī-ā), a division of Oceanica, located southwest of Asia. It comprises the continent of Australia and the islands adjacent to it. Among the chief islands of Australasia are New Zealand, Tasmania, New Caledonia, the Solomon Islands, the New Hebrides, New Britain, New Ireland, Admiralty Islands, the Arru Islands, New Guinea, and many smaller islands and island groups. It comprises the largest of the three portions of Oceanica, the other divisions being Polynesia and Malaysia. The area of Australasia is 3,259,200 square miles, and the population is estimated at 5,275,000.

**AUSTRALIA** (as-trā'li-ā), the smallest of the six continents, located southeast of Asia and the East Indies. The eastern shore is washed by the Pacific, and the southern and western by the Indian Ocean. Its greatest length from east to west is nearly 2,500 miles, the greatest breadth from north to south is about 2,000 miles, and the area, including Tasmania, is 2,974,581 square miles. The coast line is quite regular, but many islands dot the adjacent waters, except toward the southwest, where the sea is open. The most important indentations include Queen's Channel and the Gulf of Carpentaria on the north, Spencer Gulf and the Great Australian Bight on the south, and Shark's Bay on the west. South is the island of Tasmania, separated from the continent by Bass Strait, and southeast is New Zealand. Torres Strait separates Australia from New Guinea and in the same vicinity, off the northern shore, are Arafura Sea, Timor Sea, and Coral Sea. North of it is the great island group that extends southwest of Asia, which includes New Guinea, Java, and Borneo, and many other islands and groups of islands dot the sea lying north. Toward the northeast is the Great Barrier Reef, a chain of coral islands and reefs extending a distance of 1,260 miles. The continent is divided by the tropic of Capricorn, though the greater portion lies south of that line, but it extends only to about 39° south latitude. Hence, the northern portion is located in the Torrid Zone and the southern part is in the South Temperate Zone.

**PHYSICAL FEATURES.** The interior of Australia is formed largely of sandy hillocks or plains, which are covered with coarse grass or brushwood. It is generally arid and hot, though at





RELIEF MAP OF AUSTRALIA.



different seasons occur heavy rains and hail storms, when shallow lakes form in the depressions, to which the water is carried by inland streams. As the waters from these lakes evaporate they become brackish or salty, some yielding considerable quantities of saline products. Along the eastern coast trend the Australian Alps, which are highest in the southeast, where Mount Kosciusko, about 7,000 feet high, forms the culminating peak of the Australian continent. In Victoria these mountains are known as the Australian Alps, or the Liverpool Range. Besides these mountains are various smaller chains and groups, most of which are in the interior and along the western shore. Low plains make up a large part of the surface along the southern and northern coasts.

The Murray, which rises on the west side of the Australian Alps, is the largest stream and has a basin of about 300,000 square miles. It receives the drainage from the Darling and the Murrumbidgee rivers, and discharges into the Indian Ocean, near Adelaide. In the north is the Victoria, in the west the Murchison, and in the interior is the Cooper, which flows into Lake Eyre, a salt-water lake that has no outlet to the sea. A large number of rivers in the interior discharge into salt lakes and are of no service as means of communication, but may be utilized for irrigation purposes. In the central part is Lake Amadeus, in the south are lakes Eyre, Gairdner, and Torrens, and in the western part is Lake Austin. Most of the interior lakes have no connection with the ocean and their waters are quite brackish and salty.

The climate is naturally hot and dry, but along the sea coast it is modified by healthful and pleasant sea breezes and rains, thus making large areas agreeable and productive. On the eastern and southern slopes the sea winds carry an abundance of moisture, and these regions are the most productive and densely populated. The temperature at Melbourne averages about 56°, at Sidney about 63°, and at Palmerston, in the northern part, about 80°. In the interior the mean annual temperature ranges from 60 to 80°, and the climate is characterized by great changes owing to excessively hot winds.

**VEGETATION.** The soil of Australia, though arid and sandy in the interior regions, is as a whole quite fertile, and yields an abundance of vegetation in all districts that have an adequate quantity of rainfall. Many distinctive types of plants thrive and range from the tropical luxuriance of the moist east and north coasts to the arid interior, where vegetation is scant and the species are peculiarly adapted

to endure excessive drought. Tree ferns, canes, palms, and bamboos thrive in the northeastern part, and here the forests contain many orchids and other parasitic plants. The bottle tree and the grass tree thrive here, and in the southeastern part, especially in Victoria, are the eucalyptus, acacia, fan palm, honeysuckle, and paper-bark tree. The gum-trees are very numerous and more than 150 species abound, and there are fine forests of the oak and other valuable woods. Not only are the forests of the eastern section beautiful, but both here and on the fertile plains are luxuriant growths of grasses and flower-bearing vegetation. The steppes of the interior take on summer verdure where rain is sufficient, and in the western part the country is alternated with forests and prairies, though large tracts of Western Australia are arid and vegetation is scant. Cereals, vegetables, and tropical fruits thrive abundantly.

**MINERALS.** Gold is the most important mineral and was discovered in 1823, but mining was not developed on an extensive scale until 1851, when prospectors and miners in large numbers came to the country. The most productive fields are in the mountains of Eastern Australia. Victoria produced about two-thirds of the output, though the productions of Queensland and New South Wales were considerable. Copper is mined in South Australia and other states, and silver is obtained in paying quantities both in Australia and in Tasmania. Other minerals more or less abundant are coal, mercury, iron, antimony, zinc, bismuth, diamonds, and manganese. Granite and building stone are abundant.

**ANIMALS.** The continent possesses no large animals, the largest being the kangaroo, of which a number of species abound. The *marsupialia* or pouch mammals, which include the kangaroo, are represented by 30 species, and the *monotremata*, or egg-laying mammals common to Australia, include the spiny ant-eater and the platypus or water mole. The last mentioned reproduces from eggs and is confined to Australia. Among the flesh-eating animals are the rat, the mouse, and the native cat, and the insect eaters include the bandicoots. The kangaroo, the rock wallaby, and the hare kangaroo are the chief grass eaters. It is thought that the *dingo*, or wild dog, though sometimes classed as a native of Australia, is a descendent from the domestic dog. Bats are very numerous and the rabbit, which has been naturalized from Europe, has become a pest because of its rapid increase. Most of the animals are small and the fur-bearing





# AUSTRALIA

Scale of Miles  
 0 100 200 400 800

Important towns are shown in heavy face type

Longitude 130° D - East 135° from E 140° Greenwich F 145° 150° G 155° H 160° 165°



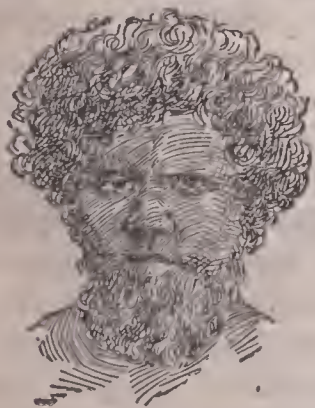




species are limited, but the continent is especially rich in birds of song and plumage. Here thrive the tue, emu, owl, parrot, brush turkey, crested pigeon, lion bird, oriole, jackass, cockatoo, crowned pigeon, parrakeet, and bird of paradise. The species of poisonous snakes are numerous, which is true of the lizards, frogs, and fish. Insect life is not well represented, though the species of butterflies, ants, bees, and beetles are quite numerous.

**GOVERNMENT.** The entire continent is a colonial possession of Great Britain. For the purpose of government it is divided into five states. The eastern section comprises the three states of Queensland, New South Wales, and Victoria; the central part is embraced in South Australia, which includes the Northern Territory; and the western part is the State of Western Australia. These five states, including Tasmania, are organized as the Commonwealth of Australia. See **Australia, Commonwealth of.**

**INHABITANTS.** The population of Australia, including Tasmania, in 1906, was 4,119,481. This number included about 60,000 natives and 40,-



AUSTRALIAN.



MELANESIAN.

000 Chinese. Fully one-third of the inhabitants are of foreign birth, of whom a large majority came from the United Kingdom and about 50,000 from Germany. The aborigines are the lowest of the human races as regards intelligence and are of the Negroid type, resembling those of Africa. They are indolent, but peaceful, and engage largely in hunting and fishing. Some regard them incapable of being civilized and educated, and there has been a steady decrease in number for the past forty years. In color they are dark brown or black, have straight or wavy hair, sometimes curly, and are of medium size and inferior muscular strength. The favorable climate has not required them to provide for heavy clothing or substantial shelter, hence they live in illy constructed huts and subsist on insects, reptiles, roots, and the native animals. Little, if any, development was made in their habits or modes of living since Australia has been occupied by Europeans, though some engage in light work

for short periods of time when they are in need or want. They are skillful with the boomerang and spear, are fond of dogs, and still employ wooden axes and stone hatchets in cutting wood and building their huts.

**HISTORY.** Australia was first discovered by Europeans about the middle of the 16th century, probably about 1531. In 1542 the Portuguese published an account of a number of explorations and about that time the continent became known to explorers of different nations. Manoel Godinho de Eredia, a Portuguese navigator, in 1601, set foot upon the continent and explored a part of its coast. The Dutch sent an expedition from Bantam, in Java, in 1605, and explored a part of the northern coast lying immediately south of New Guinea. In 1606 a Spanish expedition under Luys Vaez de Torres, from whom Torres Strait was named, sailed through the narrow neck of water between New Guinea and Australia. Several expeditions sailed under Dutch navigators from Java in 1616, and named the continent New Holland. They surveyed a large portion of the northwest coast, where they planted several settlements.

In 1770 Captain James Cook sailed by way of New Zealand and landed on the eastern coast of Australia, surveyed and explored a number of localities, and took possession for England. He named the region New South Wales. An English settlement was made at Botany Bay, near Sydney, in 1788, where a penal station was established for convicts transported from England by the government. Fully 150,000 convicts were taken to Australian stations, and about the same time settlers began to occupy the coasts and to press inland. The mountains were not crossed until 1813, when it was thought a great inland sea stretched far toward the west, and in 1847 the German explorer, Ludwig Leichhardt, started with a small company from Moreton Bay to cross the continent, but was not heard of again. Immigration and development began with the discovery of gold in 1851, and since that time there has been constant progress in the material industries and the growth of cities. The government was administered under the jurisdiction of the five colonies of Victoria, Queensland, New South Wales, South Australia, and Western Australia, until Jan. 1, 1901, when Tasmania joined them to form the Federal State known as the Commonwealth of Australia, which see.

**AUSTRALIA, Commonwealth of,** a colonial possession of Great Britain, consisting of Tasmania and the five federated states of Australia. The area, population, and natural re-



sources are treated in the article entitled Australia and additional information is given under Tasmania, which see.

**AGRICULTURE.** Both farming and stock raising began to be developed as early as settlements were made, but the latter enterprise received the larger share of attention. Agricultural products thrive abundantly where the rainfall is sufficient to germinate and mature crops, and in many sections of the interior arid lands have been redeemed for cultivation by irrigating ditches and canals which draw a supply of water from rivers and mountain streams, and in some localities artesian wells are utilized successfully. Victoria holds first rank in the number of acres under cultivation, but is followed closely in this respect by South Australia and New South Wales. Tasmania has a larger area of cultivated land than Western Australia, but is surpassed in the acres under cultivation by Queensland. Wheat is the most important cereal product and is grown on about half of the total acreage, and hay takes second rank in the value of the quantity produced. Other crops are corn, barley, oats, sugar cane, potatoes, and tropical and semi-tropical fruits. Development in fruit raising has been constant, especially in the cultivation of grapes, bananas, peaches, and apples. Coffee is grown successfully on the coast of Queensland, and development in silk culture has stimulated attention in growing the mulberry.

Sheep raising has received the larger attention, though it is by no means the only animal industry. In the number of head of sheep, Australia surpasses all of North America, having about one hundred million head, and the annual production of wool aggregates about five hundred million pounds. The favorable climate and the extensive area of grazing lands account for large interests in sheep growing, and the quality of both wool and mutton is of a high class. Cattle are grown profitably for beef and dairy products. Horses are reared both for domestic use and for exportation. Goats, mules, poultry, and bees yield good returns.

**MINING.** The discovery of gold in 1851 stimulated immigration, and from that time mining has continued to be an industry of much importance. The first mines were opened in New South Wales, but development was made soon after at Ballarat, Victoria, and in different parts of Queensland. The Coolgardie district of Western Australia and the fields of Tasmania were open more recently. Victoria had a larger output of gold up to 1899 than all the other

states combined, but the production is now greatest in Western Australia. The annual output of gold is about \$86,500,000 and of silver about \$16,150,000. Iron ore is abundant in the mountains and there are extensive deposits of bituminous coal, particularly in New South Wales. Tin and copper are mined profitably especially in Tasmania, and there is a small output of antimony, bismuth, lead, and diamonds.

**TRANSPORTATION.** As the commonwealth has no large lakes and few streams that can be navigated, transportation is dependent almost exclusively upon the construction of highways and the building of electric and steam railways. The government owns and operates most of the railroads of the continent and Tasmania, and less than 500 miles of lines are managed under private ownership. In 1908 the total railroad mileage was 15,500 miles, of which about 600 miles were in Tasmania. All the principal cities and many interurban points have electric lines, and macadamized highways have been constructed and are maintained largely by local authority. Several telegraph lines extend across the continent, both north and south, and cable lines connect the chief port cities with all countries of the world.

**COMMERCE.** The trade with foreign countries is very large, especially in raw materials. Manufacturing enterprises have not been developed as extensively as mining and agriculture, and are confined principally to products used in domestic consumption. They consist chiefly of textiles, utensils, clothing, machinery, and food products, hence large quantities of the commodities produced are exported and many supplies are obtained by importation. Though smaller in the number of inhabitants than Canada, it has a larger export and import trade. The duties collected are uniform throughout the commonwealth. Great Britain has the largest share of the foreign trade, about eighty per cent., and next in order are the United States, Germany, and France.

**EDUCATION.** The state of education is improving perceptibly, owing to a reasonable enforcement of the compulsory school attendance law in all the states. In 1860 sixteen per cent. of the people were illiterate, but at present illiteracy is placed at 8 per cent., each decade showing a satisfactory improvement in public instruction. Besides public schools and numerous academies and colleges, there are universities supported by the states at Adelaide, Sydney, Hobart, and Melbourne. The educational institutions are coeducational and are modeled after the English universities at Manchester



and Liverpool. English is the spoken language, and the social and industrial conditions of the regions fairly developed are quite similar to those of Canada and the United States. In religion there is no restriction, and numerically the Episcopal church is the strongest. Other denominations represented by large numbers are the Presbyterians, Roman Catholics, and Lutherans.

**GOVERNMENT.** The commonwealth is governed under a constitution which went into effect in 1901. This constitution delegates to the central government all power not reserved by the state, and is modeled upon that of the United States rather than upon the constitution of Canada, in that it does not provide for a strongly centralized state. The governor general is appointed by the sovereign of Great Britain, is assisted by a ministry made up of members of Parliament, and has the power to summon and dissolve Parliament, which is made up of two branches, a senate and house of representatives, and is required to meet every year. Each state has six senators, elected for six years. The membership in the house, chosen for three years, is twice as large as the number of senators, and any state cannot have less than five representatives in the lower house. The judicial department culminates in a high court of justice, to which appeals may be taken from the Federal court, from the interstate commission, and from the supreme court of the Federal states, and the acts of the highest court is subject to review by the British Privy Council, though only in questions pertaining to the constitutional powers of the different states or of the commonwealth.

Local government is vested in counties and municipalities, both politically and educationally, and the right of suffrage is in male citizens and may be extended, but not restricted, by the Federal Parliament. At present the house of representatives has a membership proportioned as follows: Western Australia, 5; Tasmania, 5; South Australia, 7; Queensland, 9; Victoria, 23; and New South Wales, 26.

Bombala, in New South Wales, was made the capital in 1903. Wellington, Adelaide, Sydney, Melbourne, and Hobart are the largest cities.

In 1906 the area and population were given as follows:

	AREA.	POPULATION.
Tasmania .....	26,215	180,156
West Australia .....	975,920	261,746
South Australia .....	903,690	383,829
Queensland .....	670,500	535,113
Victoria .....	87,884	1,231,940
New South Wales .....	310,372	1,526,697
Total .....	2,974,581	4,119,481

**AUSTRALIAN BALLOT** (as-trā'li-an), a ballot first used in elections held in New South Wales, in 1858, and subsequently in all the subdivisions of Australia. It has been modified more or less and adopted in many countries. In some form it is in use in nearly all the states and countries where the elective franchise is recognized. The main features are that ballots used in voting are printed at public expense, the different party tickets are printed on the ballots, and each voter is supplied with one copy when he presents himself at the polls to vote. There is a legal provision against



Map showing the proposed Transcontinental Railways of Australia.

electioneering near the polls, and secrecy in voting is guaranteed by prohibiting an elector, under suitable penalty, from exhibiting the ballot to any one after it is marked. Separate voting booths are provided in which the voter must by himself mark and prepare his own ballot, if he is capable to do so, otherwise it may be marked at his direction by two of the judges, who must belong to different parties, after which it is handed to the proper officer, by whom it is deposited in the ballot box. The system is universally popular, and has tended to preserve both the secrecy and sanctity of the ballot.



**AUSTRIA-HUNGARY** (a's'trĭ-à-hŭn'gà-rĭ), or **Austro-Hungarian Empire**, an extensive monarchy in Central Europe, bounded by Germany, Russia, Rumania, Servia, Turkey, Montenegro, the Adriatic Sea, Italy, and Switzerland. It embraces an area of 261,034 square miles, being larger than any other European country except Russia. The monarchy embraces two semi-independent countries, Austria and Hungary, each of which has a separate local government, but both are under the direction of a national parliament and an emperor.

**DESCRIPTION.** The surface of Austria-Hungary is characterized by three great mountain systems, which, in the northwestern part, assume elevations very similar to the mountainous regions of Switzerland. In the northern part trend the Carpathian and Moravian Mountains; in the southern part are the Transylvanian Alps, which form a part of the boundary with Rumania; and along the Adriatic shores are the Austrian Alps. The Carpathians are connected by the Moravian Mountains with the Bohemian Highlands, which embrace the Riesen-Gebirge, the Böhmerwald, and the Erzgebirge. The Austrian Alps extend from Switzerland to the Danube and embrace the Rhaetian, the Noric, and the Dinaric Alps, and their highest peak, Ortler Spitze, has an elevation of 12,800 feet above the sea. The Carpathian Mountains are less elevated, ranging from 3,000 to 8,700 feet and culminating in the Gerlsdorfer Spitze, which is 8,735 feet high. Fine scenery and numerous caverns and mineral springs abound in the highlands, making some sections the most picturesque regions of Europe.

The drainage is almost exclusively to the southeast by the Danube and its tributaries, which include the Drave, the Theiss or Tisza, and the Save rivers. In the northern part is the Moldau, a tributary of the Elbe, while the Dniester traverses part of Galicia, and the Vistula forms part of the boundary between Galicia and Russian Poland. Other streams include the Adige, the Inn, and the Raab. Although Austria-Hungary is classed as an interior country of Europe, it has about 500 miles of sea coast along the Adriatic. Lake Balaton, in Hungary, is the most important inland water, but numerous small lakes diversify and add beauty to the mountain scenery.

The uneven surface of the country causes it to have considerable diversity in climate. In the western part the rainfall is very abundant, about 100 inches annually, and in Moravia and Silesia it is not more than 25 inches, being limited on account of high altitudes causing precipitation before the moisture is carried to

that section by the clouds. However, there is sufficient rainfall in all parts for the successful cultivation of plants adapted to the different temperatures. At Vienna the mean average temperature is about 50°, and in the southern part of Dalmatia, at Ragusa, it is 62°.

**ANIMALS.** The native animals are like those found in most of central Europe, but the number and kind have been limited by the fact that the country has been populated for centuries. In the mountains, especially in the Alps, are a considerable number of ibex and chamois. Wolves, bears, lynxes, and other species are met with in considerable numbers. The fisheries of the Adriatic Sea and of the larger streams yield sturgeon and other commercial fish. Birds of song and plumage are abundant. The domesticated animals consist of those common to European countries. Horses and sheep are not reared as extensively as in former years, but cattle are grown in large numbers for beef and dairy products. Goats are reared for their flesh and skins, and swine are grown in all parts of the country, but receive special attention in Hungary. Bee-keeping and silk culture are important enterprises and yield large returns.

**AGRICULTURE.** Agriculture is the chief occupation, fully three-eighths of the people engaging in that enterprise. Hungary is noted for its production of cereals and exports large quantities to Switzerland and Germany. Oats, potatoes, rye, barley, and wheat are grown on a large acreage, and interest in the culture of corn, buckwheat, and millet is extensive. The sugar beet, tobacco, flax, and fruits are grown. Among the chief orchard products are grapes, oranges, apricots, chestnuts, almonds, apples, and figs. Rice is cultivated in Hungary, though not enough for domestic consumption.

**MINERALS.** Mining has been an important enterprise in some parts of the country for centuries, and there are traces of mines worked by the Celts and Romans. Almost every known mineral is found, and considerable deposits of mineral oil, precious stones, and useful earths exist in paying quantities. In Galicia, at Wieliczka, are the most famous salt mines in the world, and they are controlled by the government. Salt is also derived from evaporating sea water on the coasts of the Adriatic and the waters of salt springs. Gold is produced in larger quantities than by any country in Europe. Other mine products include silver, coal, iron ore, copper, lead, zinc, gypsum, antimony, and manganese.

**MANUFACTURING.** The last few decades have witnessed a marked advance in the manufactur-



ing enterprises of the empire. This industry has been encouraged by the government through a reduction of freight rates on state railroads in favor of manufacturers and by bounties paid to aid new enterprises. The clothing industry is developed to a high extent in the western part, which is true also of the manufacture of textiles, articles of food, building materials, and steel and iron. Bohemia holds high rank in the manufacture of glass. Bohemian art ware is seen in large quantities at international expositions and sold extensively in all civilized countries. Hungary has the largest milling enterprises of Europe, taking rank in the output of flour with Canada and the United States. Beet sugar, pottery, machinery, earthenware, firearms, and dairy products are among the important industrial products.

**COMMERCE.** The country has large commercial interests, the exports exceeding the imports. A merchant marine is aided and encouraged by the government, though the short coast line on the Adriatic prevents the empire from taking rank with the nations more fortunately situated. Only 15 per cent. of the entire foreign commerce is carried by water, the remainder going by land, either to be consumed in Europe or shipped to foreign countries from ports located outside of the monarchy. Wheat, fruit, flour, sugar, earthenware, leather, clothing, and minerals are the chief articles of export. Fully three-fourths of the trade is with Germany, and the nations coming next in order are Italy, Great Britain, Rumania, and Russia. The trade with American countries is not large.

**TRANSPORTATION.** Railroad building did not receive attention until 1837, when a short line was built in Austria. The government nationalized the railways in 1846, since which time most of the lines have been owned and operated as public property. In 1908 the total railroad mileage was 28,400 miles, exclusive of electric lines, which have been constructed on a large scale in the principal cities and through many sections of the country. Transportation by water is promoted from ports on the Adriatic and on the Danube, which is navigable by steamboat throughout the course and furnishes a direct outlet to the Black Sea. Communication by telephone and telegraph lines is ample.

**EDUCATION.** While education has received much encouragement, there are districts in which illiteracy still prevails to a considerable extent, some regions having as high as sixty per cent. The highest intellectual culture of the people prevails in the German provinces, where compulsory school attendance laws have long been in force, and all children from six

to twelve years inclusive are required to attend school. The system of schools is modeled after that of Germany, and embraces the *gymnasia*, the *realschulen*, and the higher institutions. The elementary schools take high rank, and the interweaving of practical education with the common school studies is an objective point. Articulated with the common schools is a system of academies and colleges, and there are various schools devoted to commerce, agriculture, music, and arts, besides a number of well-equipped universities. The empire has twelve excellent universities, situated, respectively, in the cities of Vienna, Gratz, Innsbruck, Budapest, Prague, Cracow, Lemberg, Agram, Czernowitz, and Klausenburg. These institutions embrace courses in theology, political economy, law, medicine, philosophy, engineering, and other lines of higher work. Roman Catholic is the state religion, but all forms of religious worship are permitted. The denominations taking rank numerically next to the Roman Catholics are the Orthodox Greek, Protestants, Armenians, and Jews.

**INHABITANTS.** The people are greatly diversified in races and languages, and in this respect the monarchy resembles Russia. About two-fifths are German, while the remainder are either of Germanic, Slavonic, Magyar, Latin, or Hebrew origin. In Hungary the Slavs and the Magyars predominate and the Slavic and Hungarian languages are spoken. German is the language of the Austrian provinces, where the people of German descent predominate. Vienna, the capital of Austria and of the dual monarchy, is one of the largest and finest cities of Europe. Other cities of importance include Budapest, the capital of Hungary, Trieste, Lemberg, Prague, Gratz, Brünn, Szegedin, Pressburg, Czernowitz, and Arad. In 1900 the population of the empire was 47,073,359, of which number 26,150,708 were in Austria; 19,254,559, in Hungary; and 1,568,092, in Bosnia and Herzegovina. The total population, in 1905, was 51,250,380.

**DEFENSE.** Austria-Hungary has long ranked as one of the great military powers, being classed among the most powerful modern nations of Europe. The military service was placed on a basis requiring universal service in 1889, and the armed forces comprise the navy, army, landwehr, and landsturm. All able-bodied citizens of the empire are required to serve in the army three years, beginning at the age of twenty, or in the navy four years, but they are not released after such service until they have had additional practice or training for a period ranging from three to twelve



years. The peace footing is 380,786 men and officers. There is a war footing of about 2,000,000 men, but in cases of emergency fully double that number of reasonably well-trained soldiers can be placed at the disposal of the monarch. The navy consists of about 140 vessels, including twenty armored battleships, and 170 torpedo boats. The military forces are equipped with the most modern arms, including the Mannlicher rifles and modern machine guns.

**GOVERNMENT.** The present dual government was adopted by the *Ausgleich* of 1867, under which the ruling sovereign is Emperor of Austria and King of Hungary, which may be considered two independent states, and the crown of both is hereditary in the house of Hapsburg. Legislation is vested in the Austrian and Hungarian diets, but two bodies known as the delegation control the ministries, each delegation consisting of sixty members. Twenty of the delegates are elected by the upper house and forty by the lower house, and in alternate years the delegations hold sessions in Vienna and Budapest. They represent the parliaments of the two countries and have legislative power relating to the army and navy, finance, foreign relations, diplomatic service, and other affairs of interest to both countries. Each country has an independent local parliament, in which the several provinces are represented according to population.

The divisions that constitute the lands of the Hungarian crown, besides Hungary, are Fiume, Croatia, Slavonia, and Transylvania. The crown lands of Austria, besides Austria proper, include Salzburg, Styria, Carinthia, Carniola, Tyrol, Vorarlberg, Bohemia, Moravia, Silesia, Galicia, Bukowina, Dalmatia, and the coast districts of Görz, Trieste, Istria, and Gradiska. The provinces of Bosnia and Herzegovina constitute imperial territory of the Austro-Hungarian empire. Francis Joseph I. is the reigning sovereign, whose official title is Emperor of Austria and King of Hungary. Financially the country is on a gold basis, though the krone, the standard coin, is not coined in that metal. The monetary system is on a decimal basis or scale of numeration.

The government of Austria, independent of Hungary, is an empire. Legislative power is vested in the *Reichsrat*, which consists of two branches, the *herrenhaus* and the *abgeordnetenhaus*. The emperor has concurrent legislative power with the *Reichsrat*, and concludes treaties, grants pardons, issues decrees, and may summon or dissolve the *Reichsrat*, but his decrees and acts must be countersigned by the prime minister, who is held responsible to par-

liament. Eight ministers, each presiding over a department, and two ministers at large, discharge the advisory functions of the executive department. The emperor appoints a governor for each province or department, which is divided into *districts* and *communes*. The supreme court of justice and cassation, located at Vienna, has supreme jurisdiction over the system of district, circuit, and inferior courts.

In Hungary the constitution is based on the Golden Bull of 1222 and succeeding statutes and decrees relative to the autonomy of that country. The king does not exercise so great an influence in the government as in that of Austria, and decrees, like in Austria, become valid after being countersigned by a responsible minister. Legislative authority is vested in the Parliament, which is composed of the two houses known as the table of magnates and the house of representatives. In the upper house, or table of magnates, the membership consists of the nobility, the royalty, and certain dignitaries of the churches, and in the lower house the members are elected by popular male suffrage. A minister president and nine ministers, each ruling a department, exercise executive power and are responsible to the Parliament. Local government is administered by the 63 *counties*, each having a governor, and the counties are divided into districts known as incorporated *towns*, *communes*, and *presidencies*. The judiciary branch of the government is modeled after that of Austria.

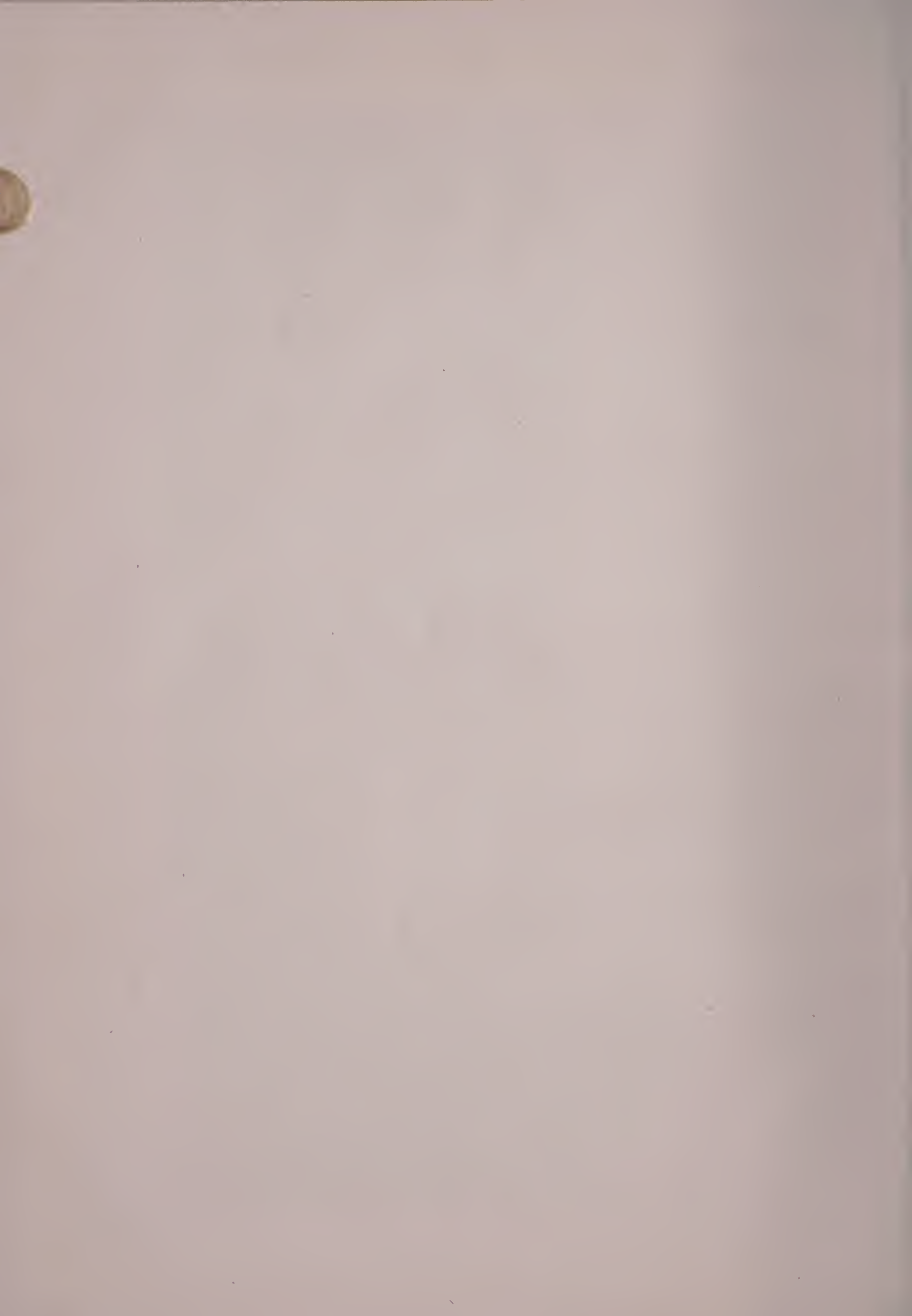
**HISTORY.** The history of the region now included in Austria-Hungary is more or less associated in its early phases with that of Rome and the empire of the West, and subsequently with the Germanic tribes that passed in successive waves from the regions farther north. Austria as a political power may be said to have taken its rise in 791, when Charlemagne took possession of the region between the Ens and the Raab, driving the Avars from that territory. The Hungarians invaded Germany in 900, when part of the region now included in the country became subject to that people, under whose control it remained fifty-five years, when it was again united with the German Empire under Otho I. From 932 till 1156 it was under control of the counts of Babenberg, became a duchy in the latter year, and received additional territory in 1192, when Vienna became its capital. In 1246 the male line of the house of Babenberg became extinct, and the German emperor, Frederick II., proclaimed the region hereditary property of the German sovereigns. It passed to the house of Hapsburg in 1282, whose original possessions were in Switzerland,





IN 1910 THE UNITED STATES PRODUCED \$250,000,000 WORTH OF AUTOMOBILES. THIS PICTURE WAS TAKEN  
AT AN AUTOMOBILE SHOW THAT YEAR.







and is still the ruling house of the empire. Rudolph of Hapsburg was one of the early sovereigns, was succeeded by his son Albert, who in 1301 obtained the Swabian Margraviate, and at his death in 1308 Austria had an area of 26,000 square miles. Albert V., son-in-law of Emperor Sigismund, is the next monarch of marked influence. He was complicated in the Hussite War, assisting Sigismund in that contest, became Emperor of Germany in 1438, and was succeeded in 1457 by Ladislaus, his posthumous son, and since then the Austrian monarchs are represented in an unbroken German line.

The subsequent history of Austria is more or less closely associated with that of Prussia until in 1866, when the latter country established its preponderance of power at the Battle of Sadowa. Subsequently Italy, which had been more or less under the influence of Austria, became an independent and united state, and Prussia became the head of the German Confederation in the North. Within the period of alliance between Austria and Prussia, the former was involved in many noted conflicts. It bore a prominent part in defending Christianity against the advances of the Turks from Constantinople, was an important battle ground in the Thirty Years' War, exercised a wide influence in the War of the Spanish Succession, and shared in the Napoleonic Wars. Among its most eminent sovereigns are Maximilian II., Maria Theresa, and Emperor Francis Joseph I. Francis II. of Austria was the first sovereign to take the title of Emperor of Austria, which he did as Francis I. in 1804, and it was within the period of his reign that the German provinces became united and sent a powerful army to join the Russian and British allies against Napoleon, thus causing the overthrow of the latter. He was succeeded at his death in 1835 by his son, who ascended the throne as Ferdinand I., and in 1848 succeeded in overthrowing the revolutionary movement led by the Hungarians under Kossuth. Ferdinand abdicated in favor of his nephew, Francis Joseph I., who joined the German states in 1864 in taking territory from Denmark, but two years later Austria and Prussia became permanently separated.

Since the *Ausgleich* of 1867, the government has given marked attention to the internal affairs of the empire, encouraging railroad building, the extension of educational arts, and the furthering of industrial and commercial enterprises. In 1878 the domain of Austria was enlarged by the addition of the provinces of Bosnia and Herzegovina, this resulting in con-

sequence of the war between Russia and Turkey. These provinces were placed under the crown by the Treaty of Berlin for administration and military occupation only, which remained their condition until 1908, when they were annexed as imperial territory by a proclamation of Francis Joseph I. Subsequently Austria entered the famous *Dreikaiserbund* with Germany and Russia, which pledged friendship and cooperation among the three great powers. Though materially progressive in furthering the industries and the educational arts, the government has experienced various difficulties regarding the use of a language as a universal tongue of the empire, though German is official and is most generally spoken. However, the Czech, Polish, and other constituents have insisted upon a recognition of their languages in the schools and in the general assemblies. The literature of Austria proper belongs almost exclusively to the German, but there is a considerable accumulation of valuable writings in the Polish, Czech, and Bohemian, the latter having its greatest representative in John Huss. See **Hungary**.

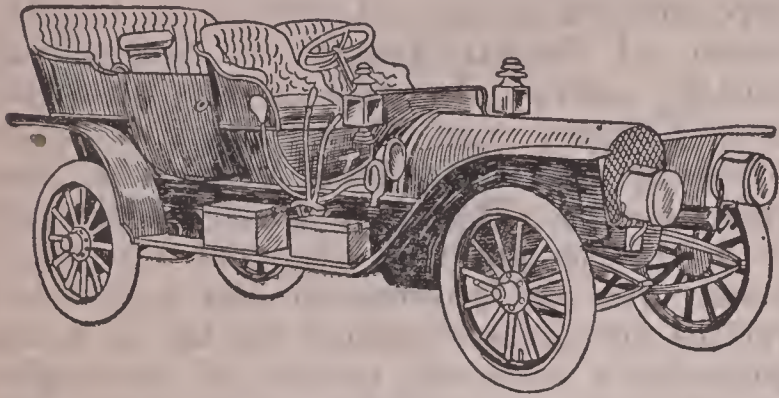
**AUTODAFÉ** (a'tô-dâ-fâ'), a public ceremony instituted at Seville in 1481, and used in connection with the inquisition in Portugal and Spain. It consisted of a sermon preached to those charged with crime, and at its close the names of those found guilty were announced, while those found not guilty were discharged. The guilty were soon after executed.

**AUTOMATON** (a-tôm'â-tôn), a self-acting machine, such as a clock or watch. The name is likewise applied to a figure made in imitation of an organic being, as a toy turtle with means to propel itself, or a machine performing actions like a human being. The construction of automata dates from a period far remote, before the Christian era, and some of the devices produced became noted. In 1851 a mechanism was exhibited at London which fluttered its wings and imitated the note of the bullfinch. Another product was in the human form and did writing and drawing by clockwork. The famous clock at Strassburg, Germany, is the most noted automaton in existence.

**AUTOMOBILE** (a-tô-mô'bîl), a vehicle propelled by electric power, gas, steam, or any other force stored or located within the machine. These mechanical structures may be divided into three general classes, including those used on roads for carrying passengers or goods, those designed for vehicles to be employed in place of carriages, and those in the form of bicycles or tricycles to increase the



speed and relieve the rider from the exertion accompanying the treading of pedals. The first automobiles were manufactured as early as 1860, but a high state of perfection was not



TOURING CAR (AUTOMOBILE).

reached until about 1898. While the early vehicles were too clumsy to insure great speed, those of recent manufacture serve a useful purpose by combining speed with utility.

Automobiles are made in a great variety of forms and differ vastly in size and capacity. This was demonstrated at the Saint Louis Purchase Exposition, where fully 500 styles of American and foreign manufacture were exhibited. The electric vehicles, in which current is supplied from a storage battery, continue to remain popular, owing to the movement being attended with less noise and the propelling force supplying power for longer distance than in any other form. However, gasoline vehicles are used most extensively, partly from the fact that electric power cannot be secured in all places and its expense is somewhat greater. Electric batteries of a high class are capable of propelling the machine a distance of 500 miles where reasonable precaution is used.

Much has been done in recent years to make the automobile more popular and extend its use both in pleasure-riding and for the more practical purposes in business. The industry of manufacturing has grown to such proportions that it has been possible to turn out a standard car which is superior in construction and lower in price. At present the most popular vehicle is a four-cylinder touring car of twenty-four to twenty-eight horse power, weighing from 2,000 to 2,200 pounds, or a thirty to thirty-five horse power, weighing from 2,200 to 2,400 pounds. The wheels are thirty-two to thirty-four inches in diameter, with large tires about four inches in diameter. It has a four-cylinder motor housed in a bonnet in front, and the power is transmitted by shaft-drive and bevel gears to a live rear axle. Almost perfect lubrication of the engines is obtained by a continuous circulation secured from a mechanical

forced-feed oiler, the oil passing through feed glasses carried in sight at the front of the machine on the dashboard. The cone clutch has given place to a multiple-disk clutch, whose disks run continually in oil, and the clutch takes hold without jar or jerk. By this simple arrangement it is possible to start a car from a standstill to a high speed without danger of breakage.

Automobiles are used extensively in cities for draying and as passenger omnibuses. In some places boulevards and automobile tracks are maintained, and a great many sight-seers prefer to use automobiles rather than teams in pleasure-riding and touring. The speed has been enormously increased until now a rate of fifty to sixty miles an hour is considered fair riding in long-distance races.

Several manufacturers brought out two-cylinder motor cars with twenty-five horse power, the touring car weighing 1,700 pounds. There is a manifest advantage in a two-cylinder motor car, since lighter weight and greater simplicity can be obtained. This model will gain favor as soon as the small range of speed and the difficulty of keeping the crank case tight can be overcome. Probably the two-cycle, four-cylinder, mechanically air-cooled type will be the popular structure for the future. However, a majority of cars still use water-cooling by means of a centrifugal circulating pump, even for the high-powered cars, but the air-cooled type is gaining ground and will likely prove the more desirable. Air-cooled motors of the two-cycle type, 200 horse power, are in use by railroad companies. Several manufacturers of farming implements have put out a large number of low-g geared automobiles for farm use, fitted to move harrows, plows, and other farm implements. It is claimed by the manufacturers that this new departure will displace the horse to a large extent in the course of time.

The sixth annual automobile race for the James Gordon Bennett cup took place in France, July 5, 1905. It was run over the Auvergne course, which describes a circle eighty-five and a half miles, the total distance in four rounds being 342 miles. R. B. Thery, of France, won the race in seven hours two minutes and forty-two seconds, making an average speed of 48.5 miles an hour. The fourth race for the Vanderbilt cup was won by George Robertson, representing an American machine, Oct. 24, 1908, on Long Island. The total distance was 258 miles and the winner made an average speed of 67.6 miles per hour. H. W. Fletcher made a notable record in the races at Ormond, Fla., running one hundred miles in one hour eighteen



minutes and twenty-four seconds. Records of this class are made in eighty to ninety horse power cars. They stand as representative in the matter of speed and were not materially surpassed up to 1909.

Long trips in motor cars have become popular, and much touring is done by those who otherwise would travel by railway in foreign and remote countries. It is not uncommon for tourists to cross the American continent from the Atlantic to the Pacific, or to drive automobiles long distances across plains and over mountains. Of such trips made in 1908 the run from New York City to Paris may be taken as the most important. Ten cars were entered for the trip, of which four were American and six of European manufacture, one German, two Italian, and three French. The route across the American continent was from New York to San Francisco, whence it was to be by steamboat to Valdez, Alaska, and thence northwest to Bering Strait. From Bering Strait the route was planned through Siberia by way of Saint Petersburg to Paris, but deep snow in Alaska and Eastern Siberia made it necessary to ship the machines by steamboat from the Pacific coast to Vladivostock. The German car reached Paris ahead of the others, but the decision was given in favor of the American car, as the German driver had been required by reason of a breakage to ship his car by rail some distance in California.

**AUTONOMY** (a-tŏn'ō-mŷ), the self-government of a city or state. The term probably originated in ancient Greece, in which country most of the cities were independent for general purposes.

**AUTOPLASTY** (a'ŧō-plās-tŷ), a surgical operation in which lesions are repaired by using tissues taken from another part of the body to supply deficiencies caused by disease or wounds. Operations of this kind are performed to restore the use of an organ or improve the appearance, and the parts taken may be from the same or some other individual. In many cases the skin is taken from the body of an individual to repair lesions resulting from scalds or burns, or in the case of hairlip. In India autoplasty was practiced in ancient times and it is referred to by Celsus, but in Europe and America the practice is comparatively recent.

**AUTUMN** (a'ŧŭm), the season of the year which follows summer, and frequently referred to as fall, referring to the fall of the leaves. In the northern hemisphere it extends from about Sept. 22 until Dec. 22, from the autumnal equinox to the winter solstice. In England it embraces the months of August, September, and

October, while in America the autumnal months are September, October and November.

**AUVERGNE** (ō-vārn'ŷ), formerly a province in Central France, now merged into Cantal, part of Haute-Loire and Puy-de-Dôme. The region is traversed by the Auvergne Mountains, a branch of the Cevennes Mountains, and their peaks are the highest of Central France. Among the most lofty summits are Puy-de-Dôme, 4,806 feet; Cantal, 6,095 feet; and Dore, 6,188 feet. Owing to peculiar volcanic and geologic formations, the region is one of scientific interest, and has been much studied by students. There are deposits of coal, copper, iron, and lead, and numerous mineral and thermal springs. The mountain slopes are covered with a fine growth of grass, while the valleys abound in fruits, cereals, and live stock.

**AVA** (ä'vā), the former capital of Burma, on the Irawadi River, opposite Mandalay, the present capital. It is surrounded by walls and has several Buddhist temples. Formerly it was a large city and commercial center, but it was destroyed by an earthquake in 1839. Population, 1901, 38,500.

**AVALANCHE** (äv'à-lānch), the name applied to masses of ice or snow that slide down the sides of mountains to lower levels. These masses differ somewhat in the nature of the falling material, this depending upon climatic conditions and the season of the year. Drift avalanches consist of dry or loose snow set in motion by the wind, and in falling or sliding accumulate larger masses in the descent, finally reaching the valley in clouds of dust-like snow. This class occurs in the cold seasons, and is attended by danger on account of a liability to destroy animals and buildings. Avalanches of a somewhat different character occur in the spring and at the seasons of melting snows. These cause the sod to be detached and carried with the snow down the mountain side, and in falling frequently create a draught of wind sufficiently strong to destroy buildings and even forest trees. Ice avalanches consist of ice masses that detach from glaciers in upper regions and slide with great force down the mountain-sides. The latter class are most common in the Alps of Europe, where much property and many lives have been lost on account of their damaging effects. A class of avalanches called snowslides occur in the Rocky Mountains, where they frequently form an obstruction to railroad trains. The term is also applied to landslides, which arise from quantities of earth becoming loosened near the upper part of an eminence and sliding to a lower elevation.

**AVE MARIA** (ä'vā mā-rē'à), meaning hail



Mary, a form of address used among Roman Catholics in addressing the Virgin Mary, as an expression of honor and when requesting her intercession. It is usually coupled with the recitation of the Lord's Prayer and is repeated three times each morning, noon, and evening at the ringing of the bells known as the Ave Maria or *Angelus Domini*. The term came into use from the salutation of Mary by the Archangel Gabriel, Luke i., 28, and the form of address was sanctioned by a papal edict in 1326. Pope Pius V. ordered the daily use of the whole prayer in 1658, consisting of the three parts: 1, "Hail Mary, full of grace, the Lord is with thee;" 2, "Blessed art thou, among women, and blessed is the fruit of thy womb;" 3, "Holy Mary, mother of God, pray for us sinners now and in the hour of our death."

**AVERAGE** (äv'ēr-āj), the mean proportion between two certain given quantities. To obtain the average the given number of quantities are added, and the sum is then divided by the number of quantities given. For instance, to find the average number of days in the months, add the days of the months, which, in a year not a leap-year, equal 365, then divide by twelve; the quotient is the average. In a similar way the averages of different quantities may be ascertained.

**AVERNUS** (ä-vēr'nūs), a small lake in Italy, about eight miles west of Naples, and now called Lago d'Averno. It occupies the crater of an extinct volcano, is a mile and a half in circumference, and about 190 feet deep. There is no natural outlet, but Agrippa made an artificial passage for its overflow into the Gulf of Baiae. Since then the passage has been closed up by volcanic action, and there is now no visible outlet. The scenery around the lake is wild and grand, and at various times sulphurous vapors arise, circumstances by which the people in ancient times were led to believe that Lake Avernus is the entrance to the infernal regions. It was dedicated to Proserpine, and, according to legend, Ulysses frequently visited there the ghosts of the dead. On the south side of the lake is a formation mentioned as the grotto of the sibyl, and near it are ruins of a temple dedicated to Apollo.

**AVESTA** (ä-věst'á), or **Zend-Avesta**, the sacred scriptures of the religion of Zoroaster, and in use by the Parsees as their Bible. The French scientist, Anquetil Duperron, translated it in 1771. This work in size is about one-tenth of our Bible, and at least portions of it date from remote antiquity. The Avesta represents the oldest faith of Iran and was the law of ancient Media and Persia. See **Parsees**.

**AVIARY** (ā'vī-ā-rŷ), an inclosure for breeding, rearing, and keeping birds. The first mention of aviaries is in connection with the ancient Persians, but later like structures were built in Greece and Rome, and in the 16th century similar inclosures were constructed in Western Europe. Excellent aviaries are now maintained in many of the zoölogical gardens of America and Europe, and in them may be seen beautiful birds of song and plumage from many climes.

**AVIGNON** (ä-vên-yôn'), a city of south-eastern France, on the Rhone River, capital of the department of Vaucluse. The city has extensive railroad facilities, is improved by gas and electric lights, pavements, and several fine parks, and is the seat of a number of schools. It has many fine churches, on account of which it is familiarly mentioned as the "City of Bells." These include the Notre Dame, a fine cathedral, which served as the residence of Pope Clement V. and six of his successors. The city was also the residence of Petrarch, and it was here that he formed the acquaintance of Laura, the lady whom he mentioned in several sonnets. In the 14th century the city had a population of fully 100,000, but it lost its importance through the fortunes of war. It has been a part of France since 1791. At present it has a considerable trade in silk, fruit, and manufactured articles. Population, 1906, 48,312.

**AVOIRDUPOIS** (äv-ēr-dū-poiz'), a standard of weights used for all articles of merchandise, except gems, medicines, and precious metals. The grain is the foundation of both the troy and avoirdupois systems. In avoirdupois weight the pound is divided into 16 ounces, the ounce into 16 drams, and the dram into 27 11-32 grains.

**AVON** (ā'vün), the name of several rivers in Europe, including one in France and several in the British Isles. The most important is the Avon River in England, which rises in Leicestershire, flows past Stratford, the birth-place of Shakespeare, and enters the Severn at Tewkesbury. It has a length of 100 miles, and its valley is noted for fertility.

**AVOSET** (äv'ō-sēt), or **Avocet**, the name of a bird belonging to the order of the *grallatores*, and represented by one species in America and one in Europe. The structure is quite similar to that of the snipe. The bill is long and feeble, the legs are long, the feet are webbed, and the plumage is variegated with black and white. These birds frequent low and marshy places, where they feed on worms, insects, mollusks, and aquatic animals. The avocet is a common bird in many parts of the United States and



Canada, but is met with most extensively in the regions of large marshes. The flesh is highly prized as food.



AVOSET.

**AX** (ăks), an instrument for cutting or chopping wood or timber, usually made with an iron head and a handle of wood. One edge is sharp for cutting. The ax is used with both hands, but a smaller instrument called a *hatchet* is intended for one hand. It has been in use from remote times, forming a useful implement for savage and civilized people. The first axes were made of flint rock, later of bronze, and finally of iron. In modern times axes came to be made of wrought iron with a cutting edge of steel, while some kinds have two cutting edges. The American Indians made hammers and hatchets of stone, the latter being popularly known as *tomahawks*. The *adz*, a tool used by carpenters for smoothing timber, has a chisel-shaped edge from four to five inches long.

**AXIOM** (ăks'i-um), a general statement which admits of no demonstration, and is taken for granted as a self-evident truth. Fundamental propositions and established principles underlie every science, and are to be taken by the student without proof as a basis for further argument. That he who admits a principle admits its consequences is an axiom in logic. Again, that the whole is greater than its parts is an axiom in geometry.

**AXIS** (ăks'is), a straight line, either real or imaginary, drawn through a body, around which that body may revolve. The term is applied in geometry to a line imagined drawn

through a plane figure, about which the parts of the figure or body are symmetrically arranged. In botany the term is applied to the central portion of the higher plant, on which are borne the appendages or lateral members. The root is termed the *descending axis*, and the stem the *ascending axis*.

**AYACUCHO** (ī-â-kōō'chō), a city of Peru, capital of a department of the same name, 240 miles southeast of Lima. It is located on a tributary of the Mantaro River, about 7,500 feet above the sea, and the surrounding country is agricultural. A fine church building, a university, and the government house are the chief public improvements. In 1824 it was the scene of a battle between the allied forces of Peru and Colombia and the Spaniards, in which the latter were defeated. Population, 1900, 22,000.

**AYE-AYE** (ăi'ăi), a small quadruped native to Madagascar, so named from its peculiar cry. It belongs to the lemur family, is about the size of a hare, and has a long bushy tail.



AYE-AYE.

The fingers are long, which it uses to secure the grub of wood borers, upon which it feeds, but it also eats fruits and the tender part of plants. During the daytime it sleeps and at night it goes out in search of food.

**AYR** (âr), a seaport of Scotland, in Ayrshire, at the mouth of the Ayr River. It is located about 35 miles west of Glasgow, with which it has connection by railway. The buildings include an academy, a public library, and several churches. The manufactures include carpets, boots and shoes, textiles, and earthenware. Having a good harbor on the Firth of Clyde, it exports coal and imports grain and iron ore. The cottage in which Robert Burns was born is about two miles south of Ayr, and near it are the Alloway Church and the Doon of Tam o'Shanter. Population, 1901, 28,624.

**AZALEA** (â-zâ'lê-â), a genus of plants of the heath family, many species of which are



cultivated in greenhouses and flower gardens for their beautiful and fragrant flowers. Fully 100 species have been described, though only



AZALEA.

a small proportion has been developed into cultivated plants. The flowers form in profuse umbelled clusters and in color are either purple, orange, white, or variegated. They thrive best in a sandy soil of peat or loam, and are well adapted to cultivation in shaded places. The azaleas are native to America and Eurasia; all the American species are deciduous.

**AZOIC.** See **Archaean.**

**AZORES** (ä-zörz'), an island group in the Atlantic Ocean, situated west of Portugal, and forming a part of that kingdom. The islands nearest Portugal are about 800 miles west from the coast, but the entire group is considered as belonging to Europe. These islands are of volcanic origin and are subject to earthquakes. Pico Alto, the highest volcanic summit, has a height of 7,540 feet. Pico, São Miguel, Santa Maria, and Terceira are the most important islands, and the entire group embraces an area of 1,005 square miles. The chief productions are tropical fruits, cereals, vegetables, and live stock. Vegetation partakes of luxuriant forms, the soil possesses fertility, and the climate is favorable to Europeans. The larger part of the inhabitants are Portuguese and Spaniards, most of whom are quite poor. The government has promoted the building of several railroad lines, and it has a number of canal and harbor improvements. Cabral discovered the Azores about 1431, claiming them in the name of Portugal. At that time they were entirely uninhabited by man, but plants, birds, and small quadrupeds were abundant. A species of hawks, called *açores* by the Portuguese, gave the name to the islands. Ponta Delgada is the capital and chief town, but Angra is the usual residence of the governor. Population, 268,590.

**AZOV** (ä-zöv'), or **Azof**, an inland sea of Southern Russia, forming a branch of the Black Sea, with which it is united by the Strait of Kertch. Though the sea is comparatively shal-

low, it is valuable for navigation by vessels of small draught, and yields an abundance of fish. Its greatest length is about 230 miles; breadth, 112 miles; and area, 14,000 square miles. The water is nearly fresh, owing to the large inflow from the Don River and several minor streams. In the Crimean War, in 1855, the Sea of Azov was the seat of great naval activity, which was directed with the view of cutting off the food supply and otherwise affecting Sebastopol.

**AZTECS** (äz'tëks), the name of the inhabitants of Mexico at the time of the Spanish invasion in 1513. Though the name is frequently applied to all the native inhabitants of Mexico at that period, it strictly belongs to only one of a number of tribes. According to tradition, the Aztecs came from a country which they named *Aztlan*, a region reputed to be situated northwest of Mexico, though its exact location has never been ascertained. The date of the exodus from *Aztlan* is fixed at 1164 A. D., and their arrival in the valley of Mexico is placed at 1216, when they succeeded the Toltecs, a superior race. In 1325 they founded the City of Mexico, naming it the City of Tenochtitlan from their chief Tenoch.

At the time of the Spanish invasion the City of Mexico offered considerable resistance to the Spaniards, owing largely to strong natural and artificial fortifications, and partly to the overwhelming numbers of the Aztecs. After successive assaults the city was occupied by the invading army under Cortez. At that time the people were given to war and idolatry, but they had obtained marked advancement in astrology and astronomy, taught the arts of reading and writing, and possessed considerable knowledge of architecture. They maintained many temples, which were built on substantial terraced pyramidal bases, numerous ruins of which still remain. The horse, ox, and other domestic animals were unknown to them, but, notwithstanding this disadvantage, they evidenced material advancement in agriculture, and cultivated large tracts of land in maize and agave. They possessed material skill in weaving, feather work, pottery, and metal work.

Much of the history of the Aztecs was recorded in hieroglyphics on the walls of temples and pyramids, and they not only prepared lunar calendars, but devised astronomical apparatus and designs of considerable value. However, they were given to superstition, and sacrificed human beings to their gods. Their legendary was quite extensive, containing numerous interesting details and accounts of heroes, teachers, and priests. The education of the young



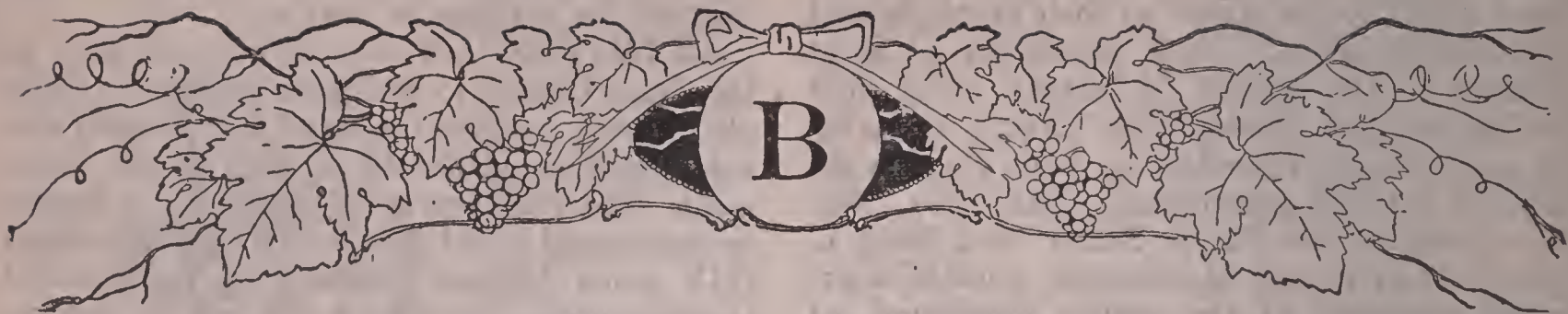
devolved on a priesthood, which they supported by tithes. Their last ruler, Montezuma, was reigning when the Spanish made their invasion under Cortez. He was imprisoned and afterward killed by the Aztecs in their revolt against Spanish dominion. These people are of great interest to the student of history, since their civilization and government, though springing up mysteriously, resembled in many respects the archaic oriental institutions. Bancroft's "Native Races of the Pacific States" and Mara L. Pratt's "Cortez and Montezuma" contain interesting accounts of the earlier inhabitants of Mexico.

**AZURITE** (ăzh'ŭ-rīt), a carbonate of copper, found as an ore of copper and as an ornamental stone. It is crystalline, deep blue in color, and not hard enough for jewelry. Deposits of it occur in Arizona, where it is found in limestone and is accompanied by other ores of copper, such as limonite and malachite. It oc-

curs in small quantities near Lyons, France, and in Siberia. The Siberian azurite is cut in slabs and used for table tops. Some grades are useful as a pigment and others are quite hard and suitable for settings in jewelry.

**AZYMITES** (ăz'ī-mītes), the name used by the Greek Church to designate the Roman Catholic Church, because the latter had decided that unleavened bread should be used in the sacrament. The controversy as to whether leavened or unleavened bread should be used began about 1045, when Michael Caerulairus, patriarch of Constantinople, designated the use of unleavened bread as a remnant of Judaism. To this the Latin Church retorted by calling the adherents of the Greek Church Pro-zymites and Fermentarians. The unleavened bread or wafer is still used by the Roman Catholic Church, while many of the Protestant churches use the leavened bread.





## B

## BAB-EL-MANDEB

**B**, the second letter and the first consonant in the English alphabet, and in that of most Indo-European languages. It is a sonant element of speech of the class known as labial mutes. In some languages it is interchangeable with *p*, especially when it occupies a terminal position in a word or syllable. It is produced mostly by the lips, and combines the utterance of voice and breath. In music *B* is the seventh note of the diatonic scale of *C*, in which connection it is termed the *leading note*, calling for the octave *C* to follow it.

**BAAL** (bā'al), or **Bel**, a Hebrew and general Semitic term which implies lord, and used to designate different divinities. It was the name of the principal god worshiped in the nations of Canaan and Phoenicia, with whom Ashtoreth ranked as the principal goddess. These people regarded Baal the god of the sun, ruler and life-giver to the universe, and opposed to Moloch, who ranked as the god of destruction. Worship was at first conducted on the mountain tops among the Midianites, Moabites, and other peoples of Western Asia. In Greece the practice of mountain worship was attached to Hercules. Baal was an important divinity among most Semitic peoples, even among the children of Israel, from whose midst his worship was ultimately banished under severe punishment. From the word *Baal* other words commonly used have originated, among them Baalgad, Jezebel, Hannibal, Asdrubel, and Belshazzar.

**BAALBEK** (bäl-běk'), an ancient city in Syria, forty miles northwest of Damascus, famous for its ruins of magnificent structures of antiquity. One of the chief temples was dedicated to the sun. In its construction blocks of stone twelve feet thick and sixty feet long were used, as is evident from some of the columns and walls that are still standing. In the time of Julius Caesar the city formed a Roman

possession. It was sacked by the Arabs in 748, pillaged by Timur in 1400, and completely destroyed by an earthquake in 1759. Some of the ruins are the most massive as well as extensive in the world, among them those of the temple of Jupiter, which is still larger than the Parthenon at Athens.

**BABBITT METAL** (băb'bit mět'al), a soft alloy made by melting together two parts of copper, six parts of tin, and four parts of antimony, and then adding six parts more of tin. A little powdered charcoal is used to prevent the metal from oxidizing. Babbitt metal was first made by Isaac Babbitt, a goldsmith in Boston, and is used to reduce friction, abrasion, and heat in the bearings of axles and journals.

**BABEL** (bā'běl), **Tower of**, a great tower mentioned in Genesis xi. It was situated in the land of Shinar, Mesopotamia, and was built by the descendants of Noah. The tower was to reach unto heaven, but the language of the builders was confused by God, so they could not understand each other, and the work was abandoned. The Babylonians and Greeks had a similar account of a great tower. It is said that when the giants sought to scale the heavens they were overthrown by Zeus. Several ancient writings make it probable that the Tower of Babel was located at Babylon, and that it was completed by Nebuchadnezzar, the great king. Tourists are referred to several ruins on the site of the ancient city; those most probably authentic are at a place called Amram, and form a mound 150 feet high, with a base over 3,000 feet long and 2,500 wide.

**BAB-EL-MANDEB** (băb-ěl-măn'děb), meaning *Gate of Tears*, a cape and strait in the southern extremity of Arabia. The strait is fifteen miles wide, and connects the Red Sea with the Arabian Sea and the Indian Ocean through the Gulf of Aden. The island of Perim divides the strait into two channels, the western



of, which is twelve and the eastern two miles wide.

**BABIRUSSA** (băb-ĭ-rōōs'să), or **Babyrussa**, a wild hog native to the islands of Buru and Celebes. It has slender legs, is almost without hair or bristles, and feeds upon fruits and plants instead of rooting in the ground. In the male the canine teeth grow upward and form tusks, sometimes from eight to ten inches in length, and curve backward like horns. The flesh is eaten by the natives.

**BABISTS** (băb'ĭsts), the name of a sect of Mohammedans founded in 1843 by Ali Mohammed ibn Redha. Babism teaches that Christ, Moses, and Mohammed were prophets and forerunners of the Bab, who is considered the greatest of the prophets. It recognizes the equality of the sexes in social matters, opposes polygamy, and permits the remarriage of the divorced women, though in spirit it opposes the granting of divorces. A civil war resulted from the agitation of the Babists, who secured many adherents, and the Bab was captured and shot at Tabriz in 1850. The total number of Babists is about two million.

**BABOON** (băb-ōōn'), the name applied to a division of apes and monkeys found in Asia and Africa. They are among the largest of this class of animals and possess great strength. Most species have long, abrupt muzzles, like a dog, short tails, deep eyes, large eyebrows, and strong teeth. They belong to the quadrupeds, run swiftly on all fours, and cannot maintain themselves with ease in an upright posture. They are fierce, ugly, cunning, and dangerous



BABIRUSSA.

when attacked. Their size is that of a large dog, but the *mandrill*, a species of baboon, is about the size of a man when standing erect. These animals live in colonies or herds, have recognized leaders, and carry on warfare against

kindred herds and against other wild animals. Their food consists of twigs, roots, fruits, and grasses, but they sometimes eat lizards, birds,



BABOON.

and similar small animals. The *common baboon* is found in large parts of Northern Africa, the *gelada* in Abyssinia, the *chacma* in Southern Africa, and the *black baboon* in Celebes. In many localities incessant war is waged against them on account of their ravages in the gardens, cultivated fields, and meadows.

**BABYLON** (băb'ĭ-lōn), the capital of the Babylonian Empire, on the Euphrates River, anciently one of the largest and most beautiful cities of the world. It was founded by Queen Semiramis, who spent many years and employed thousands of workmen in its improvement. Mention is made of it as a great city as early as 1500 B. C., but its importance dates from about 680 B. C., when it was reconquered by Sennacherib, and made one of the two capitals of Assyria. After the fall of Nineveh, in the time of Nebuchadnezzar, it was improved in magnificent style, and at that time attained its greatest glory. The city was built in the form of a square, each side of which was fifteen miles long. High and massive walls fortified it against its enemies, while in it were the most beautiful edifices, terraced structures, pleasure gardens, verdant parks, and the *hanging gardens*, one of the seven wonders of the ancient world. The celebrated Tower of Babel, or Temple of Belus, a remarkable structure of brick and stone, stood within the city, and was 625 feet high. The surrounding country was beautified by gardens, orchards, canals, and commercial highways. Both sacred and profane history make mention of this city as the



most beautiful and one of the greatest of remote antiquity.

Babylon was conquered by Cyrus, King of Persia, in 538 B. C., who entered it by the river channel, having previously turned the water from its course by a great canal. It then became a part of the Persian dominion, and with this conquest began a rapid decline. When Alexander the Great led his expedition into Asia, he found the city greatly damaged, but still beautiful. He undertook to rebuild it with 10,000 men, but after two months' labor gave up the enterprise. Subsequently, the city declined rapidly, crumbling away on account of successive wars. In its ruins were found many curious and valuable relics, among them divers cuneiform inscriptions and casts, some of them throwing much light upon ancient history. Most of the material, such as brick and stone, was used in building up the new City of Seleucia, which was founded by Seleucus, the successor of Alexander the Great.

**BABYLONIA** (băb-ĭ-lō'nĭ-ā), the name of an ancient country on the Lower Euphrates; the region occupied by it is now called Irak-Arabi. Ancient writings indicate that the empire was located south of Mesopotamia, west of Assyria, north of the Gulf of Persia, and east of the Desert of Arabia, but during its greatest prosperity it included Assyria, Mesopotamia, and practically all of Western Asia. In sacred history it is referred to as the land of the Chaldees, and also mentioned as Babel and Shinar. The region has ranked for ages as one of the most fertile districts in Southwestern Asia. Anciently its fertility depended, not alone upon nature, but a large number of irrigating canals and aqueducts were maintained to supply the soil in arid districts with moisture sufficient to insure production. From the Grecian historian, Herodotus, who made several visits to the site of this once great empire, we learn that it supplied its own people and one-third of the population of Persia with corn and other cereals. Its civilization is as ancient as the civilization of Egypt, perhaps, beginning with the year 4000 B. C., but historic records reveal nothing back of the year 2400 B. C.

**PEOPLE.** The inhabitants of Chaldea consisted of a mixture of Hamites, Semites, and other classes. Their languages and races were mixed at all times. One of their earliest leaders was a noted hunter named Nimrod, who organized separate tribes under a single government. Later Abraham, the first of the Israelite fathers, ascended the Euphrates and subsequently the Assyrians built great cities on the Middle Tigris. Some writers regard the Babylonians as a

branch of the Semitic stock and class the non-Semitic elements as primitive Aryan tribes. They assert that the inscriptions found on monuments prove beyond a doubt that the cuneiform writing was first used for a non-Semitic language. This language they term Sumerian and trace it to the Aryans, whom they regard the real fathers of Babylonian culture. Babylon, known to the Hebrews as Shinar, was the capital and largest city of Babylonia. It was the center of Babylonian culture and influence. Besides Babylon, the principal cities were Euech, Ur, Calneh, Nippur, and Sippara.

**HISTORY.** Little is known of the early history of the Babylonians, though they possessed many works in geography, history, astronomy, and poetry, and accumulated extensive libraries. The earliest writer of whom we have any information is Berosus, a priest, who lived in the time of Alexander the Great, and wrote a history of his country largely from the records of the Temple of Belus. While this work is lost, portions were quoted in other books, and from them we have secured considerable information of the early history and customs. According to this source of information, the Chaldean dynasty reigned from 2001 to 1543 B. C., the Arabian dynasty from 1543 to 1298, and the dynasty of forty-five Assyrian kings from 1298 to 772, and that the reign



OBELISK OF NIMROD.

of Pul extended from 772 to 747 B. C. From this history and the descriptions of Herodotus we learn that successive wars brought Babylon and Nineveh into close relationship. Pul reigned twenty-five years as Emperor of Assyria and Babylonia, and was known in the



former by the name of Tiglath-Pileser III. and in the latter by the name of Pul.

In 722 Assyrian sovereignty was thrown off under the leadership of Baladan II., but twelve years later Babylonia was again conquered. When the northern neighbor declined, Babylonia regained its power and rose to a height never before attained. Nebuchadnezzar was its greatest king. He reigned from 604 to 561 B. C., reconquered lost provinces, rebuilt canals, erected palaces and temples, constructed great aqueducts and lighthouses, and made Babylon, the capital, once more the greatest city of the nations. He conquered Jerusalem, carried the king and a large portion of his subjects into captivity, and later destroyed the Jewish capital. To gratify his Median wife and remind her of her mountain home, he built great towers, the hanging gardens, and beautiful parks, and ornamented them with rare trees, grasses, foliage, and flowers. After the death of this mighty king, the empire survived but twenty-four years, when Nabonidus and Belshazzar were conquered by Cyrus the Great, King of Persia, in 538. About two centuries later, in 328, it was made a part of the dominion of Alexander the Great, who undertook to rebuild the capital city, and subsequently was conquered by rulers of Syria, Parthia, Rome, and the caliphs of Bagdad. Later it fell under the dominion of the Turks and Tartars. The only remains that mark the once powerful empire are scattered tribes who descended from the ancient Babylonians and the ruins of its great cities.

**BABYLONISH CAPTIVITY** (băb-ĭ-lō'-nĭsh căp-tĭv'ĭ-tŷ), the deportation of a large portion of the leading inhabitants of Judah, under Nebuchadnezzar, in 588 B. C., after the fall of Jerusalem. The term is likewise applied to a prior captivity, in 597, when many Israelites were deported to Babylonia. While the principal part of the Jews were in captivity, Zedekiah became king over the remainder, but he was vanquished and the kingdom of Judah was brought to an end by the powerful Chaldeans. While in captivity, they were allowed religious freedom. At this time Ezekial, one of the great prophets, gave spiritual inspiration to the despondent people, and they were finally liberated when Cyrus overthrew the Babylonian Empire in 538 B. C.

**BACCALAUREATE** (băk-kă-lă'rê-ăt), the degree of bachelor of arts, which is the lowest of the academical degrees conferred by the institutions of higher learning. A baccalaureate sermon is a farewell discourse to a class of graduates, usually delivered the last Sunday before graduation.

**BACHELOR** (băch'ê-lěr), a male of marriageable age, but who is unmarried. When he passes the age at which most men are married, thirty years, he is called an old bachelor. In many countries a special tax is imposed upon male celibates, on the ground that every citizen should bring up legitimate children as a support of the State. In Greece and Rome bachelors were denied many of the privileges accorded citizens.—Bachelor of Science (B. S.), Bachelor of Arts (B. A.), and other similar terms are used to designate the completion of certain college or university courses of study.

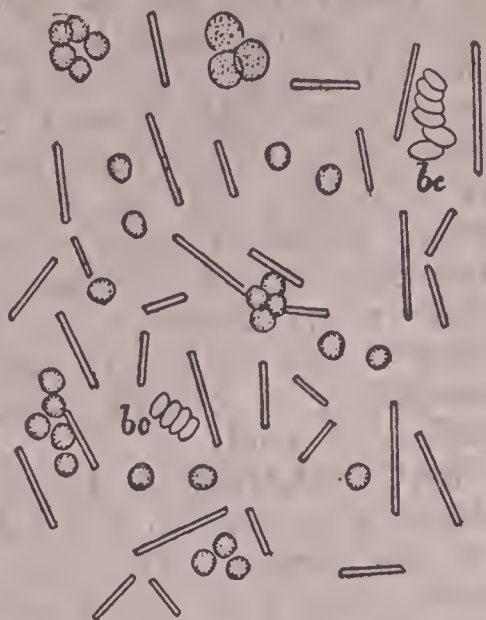
**BACKGAMMON** (băk'găm-ŭn), a game played with dice upon a board or table made for the purpose. The table has two compartments, each with twelve points, six points on each side, or twenty-four in all, and the points are colored alternately red and black. Two persons play the game, each of whom has a dice, which is thrown with the view of moving the "men" or checkers, of which there are fifteen for each player, onward or in such a manner as to bring his own men into his own inner table and to prevent his adversary from doing the same. The game requires skill and has long been a favorite pastime in England, where it is said to have originated.

**BACON** (bă'k'n), the name of a kind of cured pork, taken from the sides and back of the hog. It is cut in large pieces and salted in a dry condition, after which it is smoked. The best grade is derived from the part of the hog in which the fat is mixed with lean meat. Large quantities of bacon are prepared in packing houses and sold in markets or exported, and considerable is packed in sealed tin cans ready for domestic consumption. Bacon is either boiled or fried before being served. It is a favorite article of food, especially when fried with eggs.

**BACTERIOLOGY** (băk-tē-rĭ-ōl'ō-gŷ), the division of botany that treats of *bacteria*, which are minute vegetable organisms. Few sciences have more practical value to mankind, since a knowledge of it tends to promote the protection of the human body, as well as that of plants and animals. There are many species of bacteria, some harmless and others harmful to man, but all are of more or less value in the economy of nature. They are extremely minute organisms, consisting of single cells; either single spherical, rod-shaped, oval, corkscrewlike, or of aggregates of such cells. They multiply by transverse division and by spores, some species increasing so rapidly that a single bacillus will produce several million new organisms in twen-



ty-four hours. These forms of life are not only among the smallest, but also among the simplest. The spherical bacteria appear as mere specks of protoplasm under the microscope, in which it is impossible to detect either cell wall or nucleus. This class include the *micrococci*, many of which are colored, and some cause dreaded diseases in man and the lower animals.



Such diseases include erysipelas and acute croupous pneumonia. Measles, yellow fever, cerebro-spinal meningitis, typhoid fever, diphtheria, leprosy, consumption, and tetanus are other diseases due to different forms of bacteria.

*Bacterium* and *bacillus* are generic names of most of the straight-rod forms, *spirillum* is a long wavy form, and *vibrio* is a curved form. The form that causes the Asiatic cholera is shaped like the comma of punctuation, and is called *bacillus comma*. A form of bacillus about a third longer and more slender causes the disease known as consumption, and may be seen by examining the sputum of a consumptive. *Saprophytic bacilli* are organisms that live on dead organic matter. They are of great value in the economy of nature in that they resolve the tissues of dead matter into simple compounds, as water, ammonia, and carbonic acid, thus supplying these necessary substances for growing plants.

Bacteria are widely diffused in the air, water, soil, clothing, mucous membrane, and on the surface of bodies. The poisonous effect is due to the growth of bacteria, the poisons being known as *ptomaines*, or *saprophytic*, and *tox-albumins*, or *parasitic*. As an example of the former we have the poisoning caused by eating sausage and ice cream; and of the latter, the poisonous effect of the toxin to which diphtheria is due. The forms of bacteria which cause putrefaction are convenient in laboratory study, but different forms may be artificially cultivated.

For the study of the life history of these organisms, the bacillus of hay is commonly suggested. If a quantity of hay be moistened with water, it will become cloudy in a few days. The

microscope will reveal an innumerable number of bacilli swimming in a drop of the water, but after several days the solution will become clear and all evidences of life cease. However, it will be found that long threadlike forms have gathered in the scum, each thread consisting of a number of cells. The cell walls of these threads break after some time and sink to the bottom along with the spores that have developed. These spores remain at rest as long as they are not taken out of the solution in which they are formed. They now constitute a jellylike mass, which is called the *zoogloea* stage. In this spore form the mass will stand drying, and small particles may be carried as dust in the atmosphere, thus giving rise to infection.

Most forms of bacteria are destroyed by boiling a few minutes, but some kinds, as certain bacilli, in the spore form resist a temperature of 212° Fahr. several hours. Bacteriology as a study had its beginning in 1675 when important discoveries were announced by Anthony Leeuwenhoek (1632-1723), a native of Delft, Holland. However, it was not fully grounded as a science until 1881, when Dr. Koch (q. v.) gave the world important reports of discoveries regarding bacillus tuberculosis, the causal agent in the disease tuberculosis.

**BACTRIA** (băk'trĭ-ă), or **Bactriana**, the name of an ancient country of Asia, located between the Amu or Oxus River and the Hindu-Kush Mountains. It is supposed to have been identical with the modern province of Balkh, and is regarded the native country of the Aryan people. In the 3d century B. C. Bactria was a powerful kingdom, and was ruled by a dynasty of Greek origin. Buddhism obtained a strong foothold at the beginning of the Christian era. Subsequently it became subject to Bokhara and with it passed under the dominion of Russia in 1868.

**BADAJOS** (bă-dă-hōs'), a town in Spain, capital of a province of the same name, on the Guadiana River. It is near the boundary of Portugal, 130 miles east of Lisbon, with which it has connection by railway. An old cathedral, a Moorish castle, and several monasteries are among its buildings. The manufactures consist chiefly of delftware, woolens, and leather goods. Wellington captured it in 1812. Population, 1900, 30,899.

**BADEN** (bă'dĕn), a watering place in Austria, 15 miles southwest of Vienna. It is noted for the warm sulphur springs in its vicinity, whose temperature ranges from 72° to 97°. The town has a number of fine buildings and fashionable hotels, and near it is the royal hunt-



ing lodge known as Meierling. The springs were known in the time of the Romans and a number of coins and antiquities of Roman origin have been found in the vicinity. Population, 1906, 18,750.

**BADEN**, or **Baden-Baden**, a city of Germany, in the duchy of Baden, famous as a summer resort. It is situated eighteen miles southwest from Karlsruhe, on the hills of the Black Forest. Near it are some of the most noted and healthful thermal baths in Europe. These cause it to be visited by many thousands annually. The city is well known in history, having been founded by the Roman Hadrian in the 2d century, when it was known as *Civitas Aurelia Aquensis* (watering-place of Aurelius). Its springs were famous throughout the Middle Ages, and long attracted all classes who were in search of pleasure or health. The springs have a temperature of from 100° to 150°, and discharge about 4,500 cubic feet of water daily. The water is used for bathing, manufacturing, and shipping purposes. It is applied medicinally in cases of gout, skin diseases, rheumatism, and other ailments. The city has fine public promenades and gardens, and the highways are ornamented with flowers and foliage. From the heights near the city may be seen the waters of the Rhine. Population, 1905, 16,237.

**BADEN, Grand Duchy of**, a state in the southwestern part of Germany. It is bounded on the north by Bavaria and Hesse-Darmstadt, east by Wurttemberg and Bavaria, south by Switzerland, and west by Rhenish Bavaria, Alsace, and Lorraine. Toward the south of it flows the Rhine, which separates it from Switzerland. The area is 5,821, exclusive of Lake Constance, and in size it takes fourth rank among the states of Germany. It contains the Black Forest, or Schwarzwald, on the highlands of the southern part, and its northern portion is a plain. The drainage is to the North Sea by the Rhine, and to the Black Sea by the Danube. The soil is fertile, especially along the Rhine valley. Its highlands abound in valuable minerals, including iron, zinc, coal, nickel, salt, and limestone. Mineral and thermal springs are abundant at Baden and in the highlands.

Baden is governed under a constitution that dates from 1818, and by which the sovereignty is vested in the eldest of the male line. The grand duke and one-third of the inhabitants are Protestants; while two-fifths are Roman Catholics. Two universities are maintained at Freiburg and Heidelberg, with an attendance of 2,500 students, and the public school system is on a popular and progressive

basis. The state has extensive railroad lines, well built highways, many manufacturing cities, and large vineyards. The manufactures consist of woolen and silk goods, beet sugar, musical instruments, machinery, wine, soap, and earthenware. Large interests are vested in the manufacture of clocks, employing about 12,000 people. The government of the state is under a duke and a Parliament located at Karlsruhe; the latter consists of two departments, but is limited in its legislative powers by the constitution of the German Empire.

In early history Baden was inhabited by savage tribes classed with the Alemanni, who were subdued by the Romans under Hadrian. The controlling house now in power began in the 11th century. In 1815 Charles Ludwig joined the German Confederation, in which Baden held the seventh rank. In 1866 it sided with Austria against Prussia, but was united soon after with the North German States. When the Franco-Prussian War broke out, in 1870, Baden took an active part against France, and was restored to the German Empire on Nov. 15, 1871. Karlsruhe is the capital, and Mannheim is the chief commercial center. Population, 1905, 2,010,728.

**BADGE** (băj), a mark, sign, or token worn on the dress to show the relation of the wearer to the government, or to some society or organization. It is either conferred by the State or assumed by the individual for the purpose of distinction. The garter of the English knight was conferred by public authority, so also were the golden fleece of the Spanish grandee and the button of the Chinese mandarin. Societies, as the Good Templars, the Grand Army of the Republic, and civic societies, confer badges as marks of distinction. Many conventions, notably those of political parties, authorize badges as a symbol to distinguish delegates claiming seats.

**BADGER** (băj'ěr), a quadruped mammal common to America and Eurasia. It is clumsy and awkward in its movements. The legs are thick and short and the feet are straight, while the forefeet are armed with long claws. Among the typical species are the American, the European, and the balisaur, or sand badger, of India. The American badger is grizzled-gray with one or more white stripes on the face. It is about two feet long, including the tail, which is short. It burrows in the ground and spends the days in sleeping, but comes out at night to feed upon roots, small animals, and insects. Its fur is a valuable article of commerce and its flesh is eaten. This animal was once very abundant in Wisconsin, hence its



popular name—Badger State. The European badger resembles the American in size and



EUROPEAN BADGER.

color, but the balisaur is larger and resembles a small bear.

**BAD LANDS** (băd lăndz), a region of North America, situated principally in the upper drainage basin of the Missouri River. The section of country designated as bad lands is made up largely of sand and gravel, with here and there rocks and irregular horizontal strata of clay and limestone, and is peculiarly destitute of vegetation. The rainfall is scant, though small grasses are met with in some sections, and in others the vegetation consists largely of sage brush. Medora, N. D., is surrounded by bad lands, and from that point they extend north and south. Tracts of considerable size that may be classed as bad lands occur in the vicinity of the Black Hills, and in some sections of Texas, New Mexico, Arizona, Nebraska, and Colorado.

**BAFFIN BAY**, a gulf or sea on the northeast coast of North America, extending between British America and Greenland. It is about 800 miles long, has an average breadth of 280 miles, and a depth of about 7,000 feet. It is connected with the Atlantic Ocean by Davis Strait, and with the Arctic Ocean by Lancaster and Smith sounds. Through it pass currents to the south, but at least one is known to move northward around Cape Farewell. The tide waters rise about ten feet. Its shores are steep and lofty, and are inhabited by fur-bearing animals common to the northern climates, and thousands of gulls and sea-fowls. It was discovered in 1616 by William Baffin, after whom it was named. It is navigable only four months in the summer, owing to its waters being frozen. The bay is valuable for whale fishing, and the adjacent region is rich in minerals and fur-bearing animals.

**BAFFIN LAND**, an island west of Greenland, a colonial possession of Great Britain, and a part of the Canadian district of Franklin. The climate is severe, similar to that of Greenland, and the surface is mountainous. Along the coasts are a few settlements of Eskimos, but there are few inhabitants and the area is unknown.

**BAGATELLE** (băg-à-těl'), a game played on a cushion-rimmed table with a cue and spherical balls. It resembles billiards. The table is about seven feet long and three feet wide. Nine cups or sockets large enough to receive the balls are at the end, and the game consists of driving the balls into the openings.

**BAGDAD** (băg-dăd'), or Baghdad, the seat of government of a vilayet of the same name, in the southeastern part of Asiatic Turkey. It is situated on the banks of the Tigris River, which is crossed by several pontoon bridges. The city is surrounded by a wall forty feet high, with four gates, and is otherwise well fortified. It was founded about 762 A. D., and built of material taken from the ruins of Seleucia. The streets are mostly narrow and illy paved, but some of the bazaars are large depositories of Asiatic and European manufactures. Among the chief buildings are the citadel, the governor general's palace, and many mosques. Bagdad was enlarged in the 9th century by Harun-al-Rashid, who built a palace for himself, and a tomb for his favorite wife, Zobeide. He erected numerous edifices and bridges. In the 10th century it was ravaged by the Turks, and in the 14th century by Timour. Subsequently it passed over to Persia, and then back to the Turks, who have had it under sway since the 18th century. The inhabitants engage largely in trade and produce a variety of manufactures, such as silk, carpets, drugs, and ornaments. They consist chiefly of Turks, Arabs, Jews, Hindus, Afghans, Persians, and Armenians. The city is important on account of its location on the Tigris, which affords a highway for navigation to the sea and many interior points. It forms the principal telegraphic connection between Western Asia and British India. Its manufactures are developing under European stimuli, and it is the seat of a large trade in agricultural products and manufactured articles. Population, 150,275.

**BAGPIPE** (băg'pīp), a musical instrument of unknown antiquity. Up to the 18th century it was used in all the countries of Eurasia, and it is still popular in Scotland, France, Spain, Italy, and many countries of Asia. It consists of a leather bag, generally covered with cloth,



which is inflated by the player blowing with his mouth through a tube. Three or four pipes are connected with the bag, through which the wind is forced by pressing the bag under the arm. The player uses one of the pipes, called the *chanter*, which is supplied with finger holes, and serves for playing the tune. The three or four others, called *drones*, sound a continuous low tone. The instrument is still used extensively by Asiatic people, and is seen at all the great expositions where Turks and others make exhibits.

**BAHAMA** (bà-hā'mà), a group of islands in the West Indies, nearly 600 miles long, and located southeast of the coast of Florida. The total area is 5,450 square miles. The group includes nearly 700 islets and islands and over 2,000 coral reefs. Among the principal islands are Andros, New Providence, Grand Bahama, Great and Little Abaco, Crooked Island, Great Exuma, San Salvador, or Watling Island, Great Inague, and Harbor Island. About twenty of the islands are inhabited. The leading products include cotton, sugar, maize, cocoanuts, sponges, and a great variety of fruits. In recent years the culture of sisal fiber has been largely developed and is a growing industry. The exports from these islands aggregate about \$1,050,500 annually; the imports, \$1,725,525. Mail steamship service is maintained among the islands and with American and European ports. Many of the islands are noted for their fine climate and are visited by tourists and pleasure seekers. The history of the Bahamas dates from Oct. 12, 1492, when Columbus discovered them, the first land viewed by him in America. These islands now form a British colony. The government is administered by a local department under the direction of the English Parliament. Nassau, on New Providence, is the capital. In 1901 the entire group had a population of 53,735.

**BAHIA** (bà-ē'à), or **São Salvador**, the second city of Brazil, on the Bay of All Saints, and capital of the province of Bahia. It occupies a fine site, and has one of the most commodious harbors in the world. The principal streets are substantially paved with stone and asphalt, and the city has gas and electric lights, drainage, and waterworks. It is the seat of a university, an arsenal, and the palace of an archbishop. It has railroad connection with the interior, and submerged telegraphic communication with Europe. Intercommunication is provided by an extensive system of electric railways, with which suburban and interurban lines are connected. The manufactures include leather, tobacco, sugar, clothing, lumber prod-

ucts, and machinery. It has a large export trade in cotton, sugar, rice, live stock, minerals, and fruits. Bahia was founded in 1549 and was the capital of Brazil until 1763. Population, 1906, 230,120.

**BAHIA HONDA** (ôn'dà), a seaport of Cuba, in the province of Pinar del Rio, about 56 miles west of Havana. The harbor is about two miles distant and is one of the best in Cuba. It is five miles long by three miles wide, with an average depth of 28 feet. The surrounding country produces sugar cane and has copper and coal mines. Population, 1899, 1,278.

**BAIAE** (bī'ē), or **Baja**, an ancient town of Italy, located on a bay in Campania, 10 miles west of Naples. In the time of the Romans it was popular as a watering place and contained the villas of many wealthy citizens, who were fond of its pleasant climate and warm mineral springs. The society of Baiae was noted for its luxury and dissolution. Many ruins of Roman baths and temples are on the site of the town.

**BAIKAL** (bī-käl'), a large fresh water lake in Siberia, near the Chinese frontier, about 400 miles long and from ten to fifty miles wide; area, 14,000 square miles. The greatest depth is 4,500 feet. It is located among great mountain peaks, which yield valuable minerals. In the summer season large vessels sail upon it, and in winter it is crossed on the ice. Salmon, pike, sturgeon, and seals abound. Immediately south of the southern shore passes the great Trans-Siberian railway from Saint Petersburg to Vladivostock, and on its southwestern coast is the city of Irkutsk, the seat of a government of the same name. The Angara River, a tributary of the Yenisei, is the outlet of Lake Baikal.

**BAIREUTH** (bī-roit'), or **Bayreuth**, a city of Germany, in Bavaria, 40 miles northeast of Nuremberg. It is located on the Red Main River, has a railway connecting it with Munich, and its streets are straight and well improved. The chief buildings include an opera house, an art gallery, the town hall, and several churches. It was the residence of Richard Wagner, Franz Liszt, and Jean Paul Richter, who are buried in its grounds, and a fine monument of Richter stands in one of the principal streets. The city is famous for its Festival Theater, erected with the assistance of Louis II. of Bavaria, and in it are performed classical plays and musical selections from Wagner. Baireuth has manufactures of textiles, machinery, sewing machines, and musical instruments, and is a market for produce and earthenware. Population, 1905, 31,903.



**BAKER CITY**, a city in Oregon, county seat of Baker County, on the Powder River, and on the railway of the Oregon Railroad and Navigation Company. The chief buildings include the Masonic temple, the high school, the county courthouse, and a natatorium. The city has waterworks, sewerage, and a considerable trade. The surrounding country is fertile, producing fruits, cereals, and live stock. It is surrounded by a region that contains large interest in gold mining, and has manufactures of brick, lumber products, machinery, and spirituous liquors. It was settled in 1860 and incorporated in 1872. Population, 1900, 6,663.

**BAKING**, the art of preparing food in a chamber or oven. It differs slightly from broiling and roasting. For domestic use the heat is usually supplied by burning wood or coal, but gas, steam, and heated water are used to a large extent. The oven for baking is closed, but should be well ventilated. The term is sometimes applied to the hardening of porcelain and brick, when subjected to heat, but burning is more commonly applied.

**BAKING POWDER**, a substitute for yeast used in baking. It consists of tartaric acid, bicarbonate of soda, and potato or rice flour. The flour is added to keep the powder dry, but the ingredients are first dried separately and afterward mixed. When baking powder is added to flour, in making bread or biscuits, the carbonic acid gas is liberated by the action of the water used in the process, and this gives it the requisite lightness by puffing or blowing up the doughy mass. Bicarbonate of ammonia is sometimes used instead of bicarbonate of soda, which is objected to as injurious to the health. In some cases alum is similarly substituted. Both are objectionable adulterations.

**BAKU** (bä-kōō'), a port city of Russia, in the government of Baku, on the western shore of the Caspian Sea. The city is strongly fortified, has a fine harbor, and is the terminus of the Trans-Caucasian Railway. Most of the buildings are low and flat, but there are a number of fine schools and churches, several government structures, and extensive dock and harbor improvements. The exports include salt, opium, cotton, live stock, silk, and saffron. The manufactures embrace machinery, ships, ironware, pottery, clothing, tobacco products, and salt. Baku is one of the most noted centers of trade in petroleum and naphtha in the world. About 500 petroleum wells are in its vicinity, most of which are eight or nine miles north of the city. The annual production of crude petroleum aggregates 9,225,000 tons. Some of the wells have been flowing fully two thousand

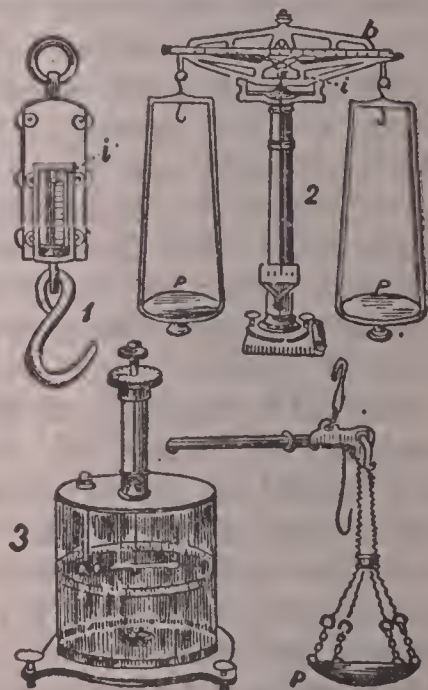
years, but the larger ones are the result of deep borings made within recent times and are pumped by machinery. The waste is used for fuel in manufacturing enterprises and to generate steam on railways and vessels. A pipe line 600 miles long conveys oil from Baku to the Black Sea. Some of the wells emit inflammable gases, and have been the objects of pilgrimages of the Guebers or Fire Worshipers. Population, 1900, 179,133.

**BALAKLAVA** (bäl-ä-klä'vā), a small port on the Black Sea, in the southwestern part of the Crimea, Russia, near Sebastopol. It was the headquarters of the British during the Crimean War, and from which they undertook the construction of a railroad to Sebastopol, a distance of about six miles. The harbor affords secure anchorage for the largest ships. It is a natural fort, the entrance being so narrow that only one vessel can pass into it at a time. The Russians made an attack upon it Oct. 25, 1854, but were repulsed. The famous charge of the light brigade of 600 men under Lord Cardigan took place at this time. They cut their way with great bravery to the Russian guns, and afterward cut their way back again. In the charge all but 150 perished. Tennyson's "Charge of the Light Brigade" was written in commemoration of this daring, but misdirected deed.

**BALANCE** (bäl'ance), an instrument used to ascertain the relative weight or masses of

bodies. There are various forms, but the most common are *hydrostatic balances*, *torsion balances*, and *steelyards*. The hydrostatic balances are used to ascertain the specific gravity of water; torsion balances, to ascertain the intensity of very small forces; and steelyards, for weighing both small and large articles. *Spring balances* are used to weigh articles in which a high degree of exactness is not required. They are constructed of a device whereby a spring is drawn out or compressed to register the weight.

**BALANCE OF POWER**, an expression



BALANCES.

1. Spring balance. 2. Chemical balance. 3. Coulomb's torsion balance. 4. Antique Roman balance from Pompeii. *b*, beam; *i*, indicator; *p*, pan.



used to indicate the condition under which a party in a Legislature or Congress has sufficient votes to secure the passage of a measure by casting them in favor of either one of two or more parties. The term is used in diplomacy among nations to indicate a condition whereby the influence of one or more may be cast so as to overcome the influence of other powers by a preponderance of strength. Thus, some of the European states cast their influence against Spain, then against France, and subsequently against Russia, whereby the balance of power was sufficient to secure certain concessions or to establish and maintain conditions of independence for other governments. Among the notable instances in which the balance of power was maintained in Europe may be cited the coalition formed against Napoleon I., in 1814, the concerted action to check the ambition of Russia in the Crimean War, and the conclusion of the Treaty of Berlin, in 1878, to maintain the autonomy of the Balkan States.

**BALATON** (bǎ'lō-tōn), or **Platten**, a lake in Hungary, located 55 miles southwest of Budapest. It is seven miles wide and fifty miles long, and has an area of about 450 square miles. A number of small streams flow into it, and the outflow is through the Sio River, the Kapos River, and the Kapos Canal into the Danube. Many edible species of fish are common to the lake.

**BALEARIC ISLANDS** (bāl-ē-ār'ik), a group of islands in the Mediterranean Sea, off the east coast of Spain. They include Majorca, Minorca, Iviza, Formentera, Cabrera, and several others. The total area is 1,860 square miles. Majorca is much the largest of the islands; its area is 1,430 square miles. Palma, on Palma Bay, in the southwestern part of Majorca, is a fine city, the largest in the islands, and has a population of 63,937. These islands were visited by the Greeks before the rise of Roman power. They were long subject to Carthage, and in 123 B. C. became part of the Roman Empire. James I., King of Aragon, held them in 1220-34, and in 1375 they became united to Spain. They are a Spanish possession at the present time and constitute a province of that kingdom. The soil is productive and yields large quantities of cereals and tropical fruits, especially olives, bananas, and grapes. Population, 1900, 311,649.

**BALI** (bā'lè), an island in the East Indies, located east of Java, and a colonial possession of the Netherlands. It has an area of 2,060 square miles. The surface is mountainous and volcanic, but the coast and valleys are fertile and the climate is healthful. Among the

chief products are sugar, rice, tobacco, cotton, indigo, and fruit. The natives are Malayan and adhere to the Brahman religion. Population, 680,000.

**BALKAN** (bāl-kän'), anciently called *Hæmus*, a range of mountains in Eastern Europe, which includes the Montenegro, Herzegovina, and Dinaric Alps, but the name is commonly applied only to the mountains extending through Bulgaria. The elevations are from about 4,000 to nearly 10,000 feet. Tchar-dagh, in the western part, is the highest peak; elevation, 9,700 feet. The mountains are crossed by highways and several railroads, and yield minerals, lumber, and vegetation. They form the watershed between the Lower Danube and the streams flowing into the Aegean Sea.

**BALKAN FREE STATES**, a term applied to the independent states of Rumania, Servia, and Bulgaria (including Eastern Rumelia), located on the Balkan peninsula, a region of Europe lying between the Black and Adriatic seas. It is sometimes extended to include parts of Turkey, parts of Austria, and Montenegro.

**BALKH** (bälk), a town in Afghanistan, on the Balkh River. It is surrounded by a fertile country and has considerable trade in produce, carpets, and shawls. Timur destroyed the larger part of its buildings and it was plundered in 1825. It has not been improved to any extent since that time. Anciently the site was occupied by the city of Bactra. Population, about 12,000.

**BALKHASH** (bäl-käsh'), or **Balkash**, a large lake in Siberia; the fourth in size of the lakes in Russian Asia. In breadth it varies from six miles to fifty miles; length, 330 miles; and area, 8,500 square miles. The lake is 780 feet above sea level, is salty, and has no outlet. A navigable stream, the Ili River, and several others, flow into it. The lake is quite shallow, ranging from 30 to 80 feet in depth, and its fisheries are not important.

**BALL** (bäl), a game in which a spherical body is thrown, rolled, or struck with a mallet. As an outdoor exercise it is a very healthful and popular amusement, and it is extensively played for financial profit and to test skill. The different games of ball include baseball, football, cricket, basketball, polo, golf, lawn tennis, etc. Mention is made in the "Odyssey" of games played with balls by both sexes, and ball playing was popular in the gymnasia of Greece and at the baths of Rome. In the 16th century the game became fashionable in the courts of Europe. Lacrosse is a game originated by the Indians of North America. Cricket is much played by the English, and baseball is the most popular game in the United States.



**BALLAD** (băl'lad), a poem much briefer and less elaborate in composition than an epic. Ballads were written by nations whose life was simple and in which learning was not so far advanced as to facilitate more elaborate poems. Before the revival of letters native ballads were highly appreciated, even by persons of culture and rank, and the bard was held in esteem in the home and at social entertainments. Some of the ballads that are best known include Scott's "Minstrelsy of the Scottish Border," Goldsmith's "Edwin and Angelina," "Little Guest of Robin Hood," and "Chevy Chase." The "Nibelungenlied" is a famous German ballad.

**BALLARAT** (băl-lă-răt'), a city of Australia, in the State of Victoria, and next to Melbourne the largest city in that subdivision of the Australian Commonwealth. It is located 90 miles northwest of Melbourne, has good railroad connections with other cities, and is in the center of a productive gold field. The largest gold nugget ever discovered was found near this city in 1858, and was valued at \$50,000. Mining is now carried on in the quartz deposits. The auriferous reefs are worked with profit at a depth of 1,000 feet, and large smelting institutions are utilized to carry on the industry. The city is the seat of extensive commercial interests and is enjoying an era of prosperous growth. It has stone and asphalt pavements, electric street railways, waterworks, two colleges, a fine city hall, and a large public library. Among the manufactures are machinery, clothing, earthenware, flour, and leather goods. It was incorporated as a city in 1870. Population, 1906, 48,565.

**BALLAST** (băl'last), a heavy substance used in weighting ships when the cargo is too light to sail safely with spread canvas. The amount of ballast depends upon the size of the ship, its construction, and the cargo carried. Ballast, as used in construction work, applies to gravel, rock, or any material with which highways and railroads are made solid and durable. All first-class railroads and highways in thickly populated countries are improved by a dressing and finishing of ballast.

**BALLET** (băl'lă), a dramatic representation consisting of dancing and pantomime with music. It originated in ancient times, possibly among the Greeks, who looked with favor upon dancers that expressed action and passions by rhythm applied to gesture. In 1580 ballet dancing became popular in France, where it was encouraged by Catherine de' Medici. In modern times the ballet came to be used as an interlude in theatrical performances, intended

to please the eye rather than impress mentally. Classical operas, such as "Faust" and "Tannhauser," employ the ballet much the same as it was used in former times.

**BALLOON** (băl-lōon'), a machine designed for the navigation of the air. The name was derived from a French word meaning ball, because the early balloons were round in shape. The construction of such a machine was first suggested by the flight of birds and the rising of soap bubbles into the air, which led to the construction of two classes of airships, one propelled upward by mechanical contrivances and the other by rarefied gases. Balloons propelled upward by means of gases were the first of several devices for aerial navigation with which it was possible to secure definite and satisfactory results. They depend upon the principle that a body lighter than air will rise with a force proportional to the difference between the weight of the air it displaces and its own weight. The gas employed is usually hydrogen, which is about fourteen times lighter than air, but coal gas is also used, which is about three times lighter than air. Balloonists who ascend into the atmosphere merely for exhibition purposes commonly confine heated air in the balloon bag, a portable quantity of which will carry them from 3,000 to 10,000 feet. During the time of inflating the balloon, it is fastened to the ground with ropes, and, when a sufficient amount of heated air has been confined within, it is loosened and ascends just as a cork rises in water.

The first deliberate scheme to navigate the air of which we have definite record was made in 1670 by Francis Lana, a Jesuit, who proposed to raise a vessel by metallic globes, containing vacuum inside, but it is asserted that the Chinese made successful ascents at Peking as early as 1306. However, the scheme proposed by Lana was not practical, because metallic tubes that would raise a vessel could not be made strong enough to resist the pressure of the surrounding air, or, if made strong enough, they would be too heavy to rise. The type of balloon which has been most serviceable to make long flights was invented in 1782 by Stephen Montgolfier and his brother Joseph, paper-makers of Lyons, France. They gave a successful public exhibition June 5, 1783, with a balloon filled with air rarefied by means of a fire lighted in the car. Later M. Charles, professor of physics in Paris, succeeded in successfully substituting hydrogen gas for rarefied air, by means of which an ascent of 3,000 feet was made, the balloon passing over Paris and landing safely. The next year M. Blanchard made an ascent



and carried with him a parachute to assist in making an escape in case of accident. He crossed the English Channel from Dover to Guiennes, and in 1802 M. Garnerin made the same exploit and landed safely in London by means of a parachute. Two years later M. Gay-Lussac made an ascent from Paris to a height of 23,000 feet, and demonstrated beyond a question that aërial navigation is practical.

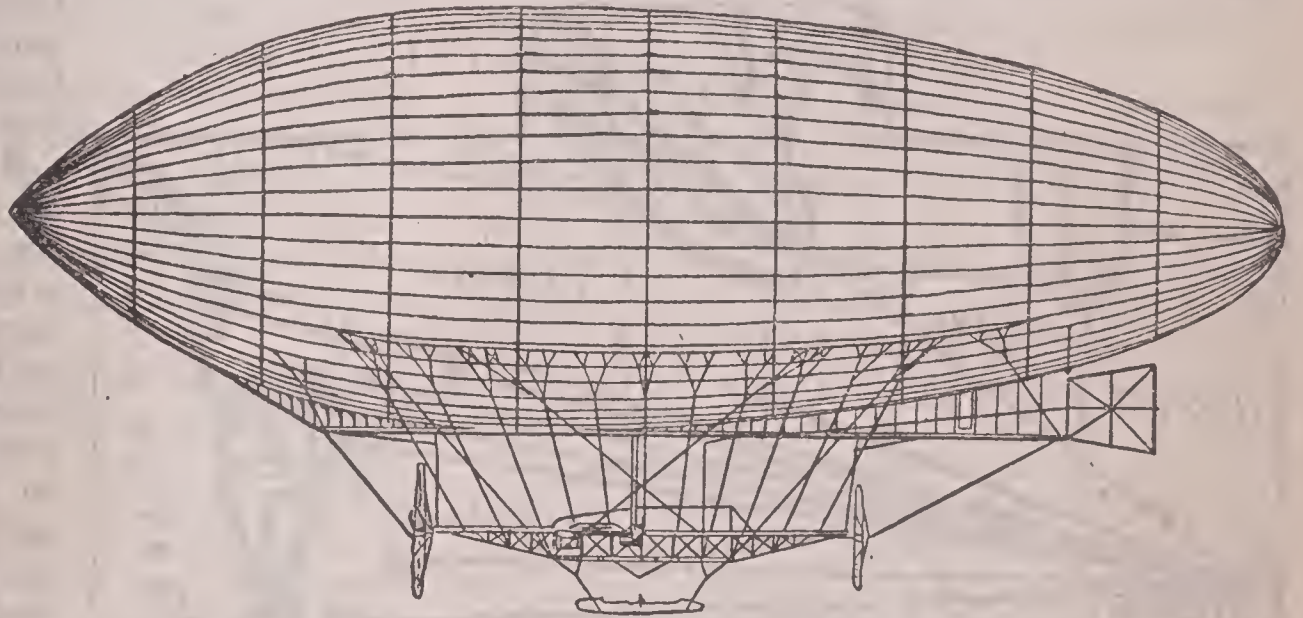
The reader will observe that France takes undisputed precedence of all other countries in the early history of balloons. These machines have been so perfected that ascent and descent is entirely under the control of the guide, when the conditions of the atmosphere are favorable, but their movement through the air depends entirely upon the impetus of currents in the atmosphere. However, the type known as the *dirigible balloon*, which combines the common balloon with the flying machine, possesses the requisites necessary for the aëronaut to guide it successfully. This machine may be said to date from 1900, when Count Zeppelin, a German cavalry officer, traveled a distance of three and a half miles in his dirigible balloon. By 1908 he had improved his machine so he was able to travel at the rate of forty miles per hour.

Balloons are made of long bands of silk sewed together, and rendered air tight by coats of varnish, put on at different times. They are filled with coal or hydrogen gas to render them enough lighter than air so there is a material difference between the weight of the bag and an equal body of air displaced by it. A safety valve is placed at the top, under the control of the aëronaut. Below the bag, suspended by means of a network of ropes, is a wicker-work boat or car in which the aëronaut sits. The boat or car is light, and in it are supplies necessary for the safety of persons making the trip upward; these consist, among others, of a long rope to aid in descending, and sand bags, which give weight, and in case of danger are thrown overboard to lighten the balloon, if necessary. A balloon about forty-eight feet long and thirty-five feet wide and

thick will carry three persons, and with its appliances weighs about 300 pounds.

The highest ascent made by a gas balloon was that of Glaisher and Coxwell in 1862, from England. They ascended to a height of nearly six miles, about 29,000 feet, and landed safely. Aside from ordinary dangers in aërial navigation, nature seems to have planned other barriers against it. The higher altitudes are extremely cold. In the ascent mentioned above Coxwell became insensible; his hands were frozen and he became numb from exposure while in a low temperature. Besides, the air in the higher altitudes is greatly rarefied, and at a height of about six miles is incapable of sustaining human life.

Many national and international associations are maintained to develop skill and interest in ballooning. The International Balloon Congress, one of the most noted organizations of



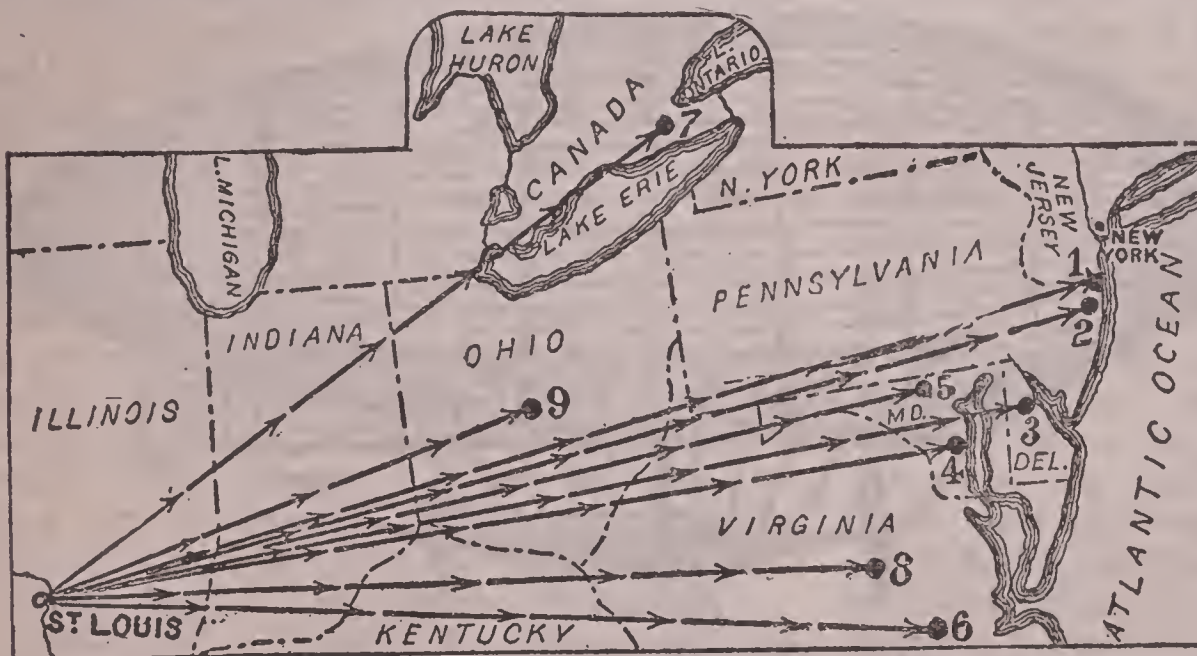
THE WELLMAN POLAR AIRSHIP.

(Length, 164 feet; greatest diameter, 52.5 feet; volume, 224,244 cubic feet.)

this class, has held several important meetings at Brussels and in other cities of Europe. In 1907 the second competition for the Gordon Bennett Cup was held at Saint Louis. The contestants included one British, two French, three American, and three German balloons. The cup and a cash prize were won by the German balloon *Pommern*, which flew to Asbury Park, N. J., and covered a distance of 901 miles in 39 hours and 55 minutes. The balloons in this contest were not dirigible. The largest dirigible balloon on record is the one built in 1908 for Walter Wellman, who planned to use it in an attempt to reach the North Pole. It was constructed partly of bamboo, with a frame of steel, and was fitted with two screw propellers and three gasoline motors. Although the balloon worked successfully, the trip to the North Pole was not undertaken within the year.



In military service balloons have become highly efficient. During the siege of Paris by the German army, the celebrated French deputy, Gambetta, on Oct. 7, 1870, escaped from the city in a balloon, and utilized his freedom in organizing a large army in the provinces with the intention of compelling the Germans to raise the siege. It is estimated that during this siege fully 2,500,000 letters were sent from the city to people outside by means of balloons. Some of these were captured, others landed safely, and one was found as far northeast as Central Norway. Large numbers contained carrier pigeons, that were utilized by friends to send answers back to those in the city. In the war between China and Japan in 1894-95 the Japanese made remarkable success in the use of balloons. At daytime they took extended observations of the opposing army, and at night carried electric arc lights far up into the air, from which the light was reflected into



RACE FOR THE GORDON BENNETT CUP IN 1907.

1, The Pommern; 2, L'Isle de France; 3, the Düsseldorf; 4, the Saint Louis; 5, the America; 6, the Abereron; 7, the United States; 8, the Anjon; 9, the Letus II.

the enemy's camp by means of powerful reflectors. By these means they were able to observe the location and movements of the enemy, and harass the opposing army by directing missiles against it at night. In the Anglo-Boer War of 1900-01 the balloon was made serviceable in many respects. It is now regarded as useful in war as the most powerful arms and the most skillful spies. See **Aëronautics; Flying Machines.**

**BALLOON FISH**, a kind of fish native to the tropical seas. They are peculiar for their power to inflate themselves with air, which they do to evade pursuit, and when in that condition float on the surface of the water with their back down. The flesh is not eaten.

**BALLOT** (bäl'lüt), a term derived from the

French, signifying a little ball used in voting. In ancient Greece balls made of stone or metal were used to express verdicts. This custom still maintains in some countries for limited purposes, and generally in civic societies on the admission of applicants to membership. In Greece the practice was called the *dic-cast*, while it is now generally termed *balloting*. In civic societies a given number of black balls thrown in will defeat the candidate, who is then said to be *blackballed*. Various forms of ballots of paper, wood, and stone have been used for centuries. The common ballot now used in governmental affairs is of paper, and its honesty and secrecy is protected by the law. See **Australian Ballot.**

**BALL'S BLUFF** (bälz blüf), a steep bank on the Potomac River, in Loudoun County, Virginia. It was the scene of a battle between the Union forces and the Confederates on Oct. 21, 1861, when a small Federal army was surrounded and defeated. The latter lost heavily, and their leader, Colonel E. D. Baker, was slain.

**BALM** (bäm), a plant of the mint family, noted for its fragrance. It is perennial, has ovate and crenate leaves, and is used in medicine as a stimulant and aromatic. The oil of balm, derived from this plant, is an essential oil. Several species are found in Eurasia, especially along the Mediterranean, and some varieties have been naturalized in England and America. The catmint, or catnip, resembles the balm

but does not belong to the same class. The Moldavia balm is used for flavoring in Germany and the bastard balm is cultivated in England for its fragrance, which the leaves retain a long time after being dried.

**BALM OF GILEAD** (gäl'ë-üd), the resinous substance derived from a tree native to Arabia Felix. It is referred to in the Old Testament and is still sold extensively in Arabia and other Asiatic countries, where it is obtained by making incisions in a small tree. At first it is white, but afterward turns to a golden yellow color and resembles honey in consistency. By boiling the fruit and the wood an inferior quality is obtained. It is irritating to the skin and has a bitter taste. The odor is highly fragrant.



**BALMORAL CASTLE** (bäl-mör'al), the autumnal residence of the royal family of England, situated 45 miles west of Aberdeen, Scotland. It occupies an elevated site 920 feet above the sea, a natural platform that slopes gently to the Dee River, and is surrounded by beautiful mountain scenery. The estate contains about 40,000 acres, purchased in 1852 by Prince Albert, and on it is the magnificent castle built at his own expense at a cost of \$500,000. It is constructed of granite in the Scotch baronial style of architecture. Edward VII. made a number of important changes in its furnishings and decorations.

**BALSAM** (bal'sam), an aromatic, resinous substance secured from plants containing volatile oil and resin. Many substances sold in the market are known as balsam, but the balsams of Peru and Tulu are most generally used in medicine. The former is obtained from a tree native to tropical America and the latter from the forests of Tulu, on the Magdalena River. The balsam of copaiba is a yellowish liquid with a bitter taste, with a more or less viscid consistency, and is the product of trees found in South America and the West Indies. Another product of this class, the balm of Gilead (q. v.), is imported from Arabia. These products are generally used in the arts, for medicine, and in making perfumery.

\* **BALSAM**, a flowering plant of India, but naturalized in all the continents. It has been cultivated for more than three centuries for its beautiful flowers, some of which are double and are known as *camellia*. The plant grows from one to two feet in height and branches freely. Many varieties of colored flowers have been secured by propagation.



FLOWERING BALSAM.

**BALTIC** (bal'tik), **Battle of the**, a naval contest on the Baltic Sea, April 2, 1801, between the English under Sir Hyde Parker and Lord Nelson and the Danish fleet, in which the latter was defeated.

**BALTIC PROVINCES**, a section of Rus-

sia bordering on the Baltic Sea, and including the three governments of Courland, Esthonia, and Livonia. The area is 36,560 square miles, much of which is fertile and is used for agriculture and stock raising. Letts and Esths make up the bulk of the people, and the burghers and nobility are chiefly Germans. Formerly Courland was a dependency of Poland and Esthonia and Livonia belonged to Sweden. Peter the Great annexed Courland in 1795 and the remainder was previously acquired by conquest from Sweden. The people are largely Protestant and not in strict harmony with the policy of the Russian government, which has been seeking to dictate in the use of the Russian language in the schools and the adoption of the Greek faith. These provinces revolted and declared a republic at the time of the Russo-Japanese War, in 1904, but the movement was suppressed partly by military force and partly by granting minor political and social reforms. Riga is the chief city and the seat of administration. Population, 1906, 2,576,900.

**BALTIC SEA**, the inland sea that washes the shores of Denmark, Sweden, Russia, and Germany, and communicates with the North Sea by the Cattegat, the Sound, and the Great and Little Belt. The length is about 800 miles; breadth, 100 to 200 miles; depth, forty to 140 fathoms; and area, including the Gulfs of Bothnia and Finland, 184,497 square miles. The islands within the sea have an area of about 12,000 square miles. In the northern part is the Gulf of Bothnia, which is separated from the southern portion by a chain of islands, and in the eastern part are the Gulfs of Finland and Riga. It receives the inflow from 250 rivers, which renders its waters almost fresh, and increases its tendency to freezing in the winter season, thus impeding navigation from three to five months of the year. The largest rivers that flow into it are the Niemen, Duna, Oder, Neva, Vistula, Narva, and Trave. It has a large trade, both with ports in Europe and in other continents. The leading harbors are at Stockholm, Memel, Danzig, Riga, Cronstadt, Kiel, Stettin, Copenhagen, and Helsingfors. It is connected with the North Sea by the Kaiser Wilhelm Canal (q. v.) and other canals furnish communication with divers trade centers. Navigation is dangerous on account of breakers at numerous islands, sudden changes of wind, and violent storms. Valuable amber is cast ashore by waves in Prussia and Courland. There are extensive salmon, trout, and herring fisheries. The southern coast of Sweden is gradually sinking and the upper coast rising, the rate of change being estimated at about



three feet in a century. The name Baltic was derived, from the island Baltia, but it is called East Sea by the Germans.

**BALTIMORE** (băl'ti-môr), the largest city of Maryland, county seat of Baltimore County, on the Patapsco River, fourteen miles above Chesapeake Bay. It is at the head of tide water navigation, 42 miles northwest of Washington, D. C., and is the focus of important steam railway and electric interurban lines. Among the railroads entering the city are the Pennsylvania, the Baltimore and Ohio, the Wabash, and the Western Maryland railways. Rapid and extensive intercommunication is afforded by a vast system of electric lines.

The principal streets running east and west are Lexington and Baltimore, and Charles is the main thoroughfare running north and south. A small stream called Jones's Fall divides the city into two nearly equal parts. Near the Patapsco River, from which the ground rises gradually toward the north, are the largest wholesale and manufacturing establishments, and much of the shipping is done from docks on a branch of the river which extends well into the heart of the city. At the northern limit of the harbor is Pratt Street, from which the wholesale district extends toward the north, and is bounded by Paca, Light, and Baltimore streets. The retail shopping district is toward the west, and the fashionable residential quarter is toward the north. In numbering the houses the decimal plan is used, the numbers extending east and west from Charles Street and north and south from Baltimore Street.

**POINTS OF INTEREST.** Druid Hill Park is one of the finest public grounds in America and contains Druid Lake. This park is ornamented with fine walks, statuary, and beautiful avenues of trees. It is situated in the northwestern part of the city and contains 671 acres. Clifton Park is in the northeastern part, and near the river, in the eastern part of the city, is Patterson Park. Carroll Park, Wyman Park, and several others add beauty to the city.

Baltimore is called the Monumental City because of its fine Washington Monument, erected about 1820, and located at the intersection of Washington and Mount Vernon streets. It is 164 feet high and the marble shaft is surmounted by a colossal statue of Washington. Battle Monument, in Monument Square, was erected in 1815 to commemorate those who fell in 1812, while defending the city against the British. In Mount Vernon Place are statues of Chief Justice Taney and George Peabody. A monument to the memory of Columbus, a statue of Sir William Wallace, and the Ridgely and

Willey monuments are among a number of others that merit special mention. Green Mountain Cemetery contains the graves of Johns Hopkins, John McDonogh, and other illustrious men, and is noted for its beautiful trees and fine statuary. The National Cemetery contains the graves of many Union soldiers and Westminster is the burial place of Edgar Allen Poe.

**INSTITUTIONS.** The city is noted as an educational center and as the seat of many benevolent and scientific societies. Its system of public schools has courses ranging from the primary to the collegiate branches, and instruction in kindergarten work and manual training has been provided for amply. George Peabody endowed the Peabody Institute, which has a library of 140,000 volumes and a conservatory of music. Johns Hopkins Hospital is a charitable institution. The Saint Paul's Orphan Asylum, the Saint Joseph's Hospital, the Hebrew Orphan Asylum, the Maryland University Hospital, the Baltimore Orphan Asylum, and the State Asylum for the Insane are among the leading charitable institutions. The professional schools include the Maryland College of Pharmacy, the medical and law departments of the University of Maryland, the Women's Medical College, the Baltimore College of Dental Surgery, and a number of others. Baltimore is the seat of the famous Johns Hopkins University, one of the most noted institutions of higher learning in America, which is attended by a large number of students and has a library of about 200,000 volumes. The Enoch Pratt free library has about the same number of volumes and many pamphlets and manuscripts.

**BUILDINGS.** Solidity and convenience are combined in the architecture of Baltimore, which has been greatly improved since the disastrous fire in 1904. Its business buildings are notably well constructed, both from the standpoint of durability and appearance. The post office, the city hall, the city jail, and the United States courthouse are among the chief structures erected by the city and the Federal government. The last mentioned is a massive granite structure in the Renaissance style, and its interior is decorated with mural paintings and busts of prominent men. Near the intersection of Saratoga and Charles streets is the Masonic Temple. Johns Hopkins Hospital, the Enoch Pratt free library, and the Peabody Institute have substantial quarters. Among the noted churches are the Roman Catholic Cathedral, the Grace Episcopal Church, the Mount Vernon Methodist Church, the First Presbyterian Church, the Eutaw Place Syna-



gogue, and the Unitarian Church. Baltimore is the seat of a Roman Catholic archbishop and a Protestant Episcopal bishop.

**INDUSTRIES.** Ample railroad facilities and a favorable location for transportation by water have made Baltimore a great center of manu-



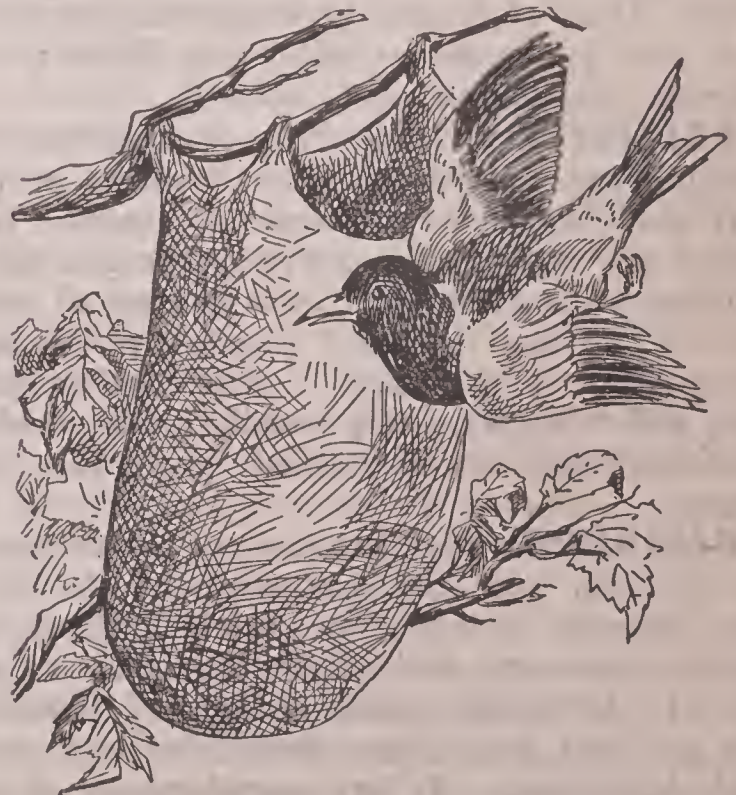
CITY HALL, BALTIMORE.

facturing and commercial enterprises. • The harbor is amply deep for the largest seagoing vessels, and regular communication is afforded by the principal lines with Bremen, London, and other foreign ports. As an export city it takes high rank and ships more corn to foreign countries than any other port of America. Flour, tobacco, coal, and cotton are among the chief export articles, while large quantities of iron ore, sugar, fruit, and general merchandise are imported. In manufacturing there is scarcely an industry that is unrepresented. Oyster packing and fruit canning are represented by large investments. Machinery, boots, and shoes, textiles, clothing, and fertilizers are among the products that are manufactured on the largest scale. Shipbuilding is developing steadily as an industry, and the extensive fisheries of Chesapeake Bay have made Baltimore a shipping center of fresh and canned oysters.

**HISTORY.** Baltimore was founded in 1729 and named in honor of Lord Baltimore (q. v.), proprietor of the colony of Maryland. In 1796 it was incorporated as a city. The harbor was greatly improved in 1780, when it became a port of entry, and since then its commerce has progressed steadily. In the War of 1812 it was held in a state of blockade, but a gallant

defense at Fort McHenry and other fortifications prevented its capture. It was at the time of the bombardment of Fort McHenry, in 1814, that Francis Scott Key, inspired by the bravery of the Americans, although detained on board a British vessel, wrote the well-known song "The Star Spangled Banner." The first electric telegraph line in the United States was built from Baltimore to Washington in 1844. The city was occupied by the Federals at the time of the Civil War, when its industrial life became prostrated, but since then it has grown steadily in every material enterprise. A destructive fire in 1904 consumed buildings and property valued at about \$80,000,000, but the district visited by the conflagration was rebuilt on a substantial scale within two years. In population the city takes rank as the sixth in the United States, being exceeded in this respect by Boston, Saint Louis, Philadelphia, Chicago, and New York. Population, 1900, 508,957; in 1910, 558,485.

**BALTIMORE ORIOLE** (ō'rī-ōl), a common bird in America, allied to the starlings. It is more properly called *Baltimore bird*, since there are only suborioles in America. It is about seven inches long and has pointed wings, a sharp bill, and a rounded head. The plumage is beautiful; the head and upper parts are black mixed with bright orange and yellow. It was named from Lord Baltimore's livery, or coat of



BALTIMORE ORIOLE.

arms, as its colors agreed with that of the bird. The nest is built pouchlike of grass and twigs interlaced like threads and is suspended from the branches. It feeds on beetles, caterpillars, and insects. The Baltimore oriole is noted for bravery in defending its young and



for its pleasant and clear song. See illustration on preceding page.

**BALUCHISTAN** (bā-lōo-chīs-tān'), or **Beluchistan**, a country in Asia, bounded on the north by Afghanistan, east by India, south by the Arabian Sea, and west by Persia. The area is 131,855 square miles. It has a mountainous surface and contains some sandy deserts, with intervals of productive and fertile regions. The highlands belong to the plateau of Iran, which extends into Baluchistan from Persia. It has a coast line of 600 miles on the Arabian Sea, which affords few harbors. A large part of the country is arid and requires irrigation to make agriculture profitable, but the rivers are few and too short to supply much water for that purpose. The principal products are cotton, indigo, tobacco, cattle, hides, wool, and tropical fruits. Minerals are found in the mountain districts, the most important of which are copper, lead, saltpeter, coal, and petroleum. Large numbers of animals, especially camels, graze upon its plains. The country has several railroads, but depends largely upon the camel for transportation. The inhabitants consist chiefly of Baluchis, a native race of Aryan people, who speak an Iranic dialect and adhere to the Islam faith, professing the Sunnite creed. Since 1877 the country has been under the government of Great Britain for military and strategical purposes, but it is administered nominally by the Khan of Kelat. Quetta, in the northeastern part, is the largest city, and Kelat is the capital. Population, 1901, 914,551.

**BALUSTER** (bāl'ūs-tēr), or **Banister**, in architecture, the name of small shafts or pillars used to support a cornice or coping. Balusters are employed in stairways as guards, in bridges as parapets, and for a number of other uses. The material used in construction may be wood, cement, metal, or stone, and in form they differ largely, being usually ornamented in workmanship and beautified by polish and paint.

**BAMBERG** (bām'bērg), a city of Germany, in Bavaria, near the confluence of the Main and Regnitz rivers. The chief buildings include a cathedral in the Byzantine style, the palace of the former prince bishops of Bamberg, the city hall, and many educational and charitable institutions. It has manufactures of cotton and silk textiles, gloves, musical instruments, and machinery. The municipal improvements consist of waterworks, electric street railways, and pavements of stone, macadam, and asphalt. Bamberg dates as a city from 973. Population, 1905, 45,483.

**BAMBOO** (bām-bōō'), a giant grass or reed

native to tropical America, Africa, and Asia. Many species have been described, ranging from the smaller forms to those which attain a height of 80 to 100 feet. They have a root-stock which is jointed under the ground and throws out numerous stems, and in the larger species the main stem or trunk is often twelve inches thick. Although the stems are jointed and very hard, they are both light and elastic. These plants are widely distributed, ranging from the marshes and swamps near the level of the sea to altitudes of 12,000 feet, and they grow both in wet and dry soil. They can be propagated from the young shoots or from the seeds, which resemble rice. The seeds and young shoots are eaten, while the stalks are used for building purposes, fences, water pipes, masts for boats, walking sticks, ladders, in the manufacture of paper, and for many other purposes. Some of the finest cottages in Southern Asia are constructed wholly of bamboo. In America we frequently see it in fans, fish-poles, and walking sticks.

**BANANA** (bā-nā'nā), a plant of the plantain family, which somewhat resembles the palm tree. It was first found in the East Indies,



BAMBOO.

a, section of the stem at node.



BANANA.

but has been brought to and is successfully cultivated in all tropical and semitropical climates. The trunk is not like that of a tree, since it



consists of the closely compacted sheaths of the fallen leaves. It often grows to a height of twenty-five feet, but dies down each year, and is replaced the next season by new sprouts, of which two or three are allowed to bear. The leaves are ten feet long and three feet wide, and are of a beautiful emerald green. The fruit is from four to twelve inches long, and grows in bunches often weighing seventy-five pounds. It is one of the most important foods known and is used extensively, being transported in large quantities to the northern markets. The bunches are picked green and ripen in transportation or in stores. Land will produce about twenty-five times more food if planted in bananas than if sown to wheat. Besides being valuable as a food plant, the fibers of its stalks are used in weaving cloth, an indelible ink is made from the juices of the skin, and the leaves are employed to cover the roofs of houses.

**BANANA**, a seaport city of the Congo Free State, on a small peninsula of the same name, at the mouth of the Congo River. It is not important as a commercial center, having been displaced by Matadi, a town on the mainland, from which a railroad line extends to Leopoldville. The inhabitants are chiefly natives and not more than 125 white people reside in Banana.

**BANCA** (bän'kä), or **Banka**, an island in the East Indies, separated from Sumatra by the Banca Strait. It has an area of 4,446 square miles. The climate is moist and the surface is level. Tin is the most important product and is mined by the government. The annual exportation is about 4,500 tons. Fruit is grown extensively and salt and rice are the chief imports. The island is a colonial possession of the Netherlands. Population, 1906, 106,242.

**BANDAGE** (bänd'āj), a band or wrapper used by surgeons to retain dressing or bind the injured parts of wounds. Strips of muslin are used to make the common form of bandages, and in some cases linen, flannel, or cheese cloth serves the same purpose. Bandages are applied to the fingers or limbs spirally, each turn lapping partly over the last, but many forms are needed to fit special cases of different kinds. In applying the bandages much care must be exercised lest the pressure obstructs the circulation, causing gangrene or blood poison.

**BANDA ISLES** (bän'dä), a group of islands in the East Indies, about fifty miles south of Ceram, a colonial possession of the Netherlands. The group includes about ten

small islands of volcanic origin, of which Banda Neira and Banda Lontar are the largest. Gulong Api, the highest peak, has an elevation of 2,250 feet above the sea. Banda, the capital, has a good harbor. Nutmeg and fruits are the chief products. The total area is about seventeen square miles. Population, 8,000.

**BANDICOOT** (bän'dī-kōōt), a species of rat native to Ceylon and India. It is the largest representative of the rat family, measuring about one foot in length. The tail is long and very thick at the base, and the color is



BANDICOOT.

black above and gray beneath. It subsists on rice and other cereals and is fond of vegetables. The flesh is eaten by the natives. The bandicoot of Australia and Tasmania is a marsupial. It resembles a rabbit and is a pest in the wheat fields and gardens.

**BANDIT** (bän'dīt), a person who has become outlawed, wages war against civilized society, and resorts to robbery. Banditti are common in Albania, owing to the incompetence of the Turkish government to suppress large bands who have become outlawed. These bands frequently take travelers captive and hold them for a ransom.

**BANEBERRY** (bän'bēr-rÿ), a common plant of America and Europe. It is a species of crowfoot and has a terminal cluster of flowers, and the fruit is a red or white berry, which is poisonous. Several species are common to the woods of North America.

**BANFF** (bänf), a town of Canada, in Southwestern Alberta, on the Bow River. It is located on the transeontinental line of the Canadian Pacific Railroad, and is surrounded by fine mountain scenery. In the vicinity are hot sulphur springs. The springs have made the region famous and are visited both for health and pleasure. A fine hotel, a sanitarium, and a number of other buildings are noteworthy. Population, 325.

**BANGALORE** (bän-gā-lōr'), a city of India, in the state of Mysore, 175 miles west



of Madras. It is located on an elevation 3,000 feet above sea level, and has a remarkably healthful climate. The streets are well improved and beautified with trees and parkings. Among the chief buildings are the high school, the military cantonment, and several temples. It has electric and steam railway facilities. Silk textiles, carpets, clothing, earthenware, and machinery are the chief manufactures. Bangalore dates from 1537. It was stormed and captured by the British under Lord Cornwallis in 1791. Population, 1901, 159,046.

**BANGKOK** (bǎng-kǒk'), the capital of Siam, located on the Menam River, about twenty miles from the sea. The river is navigable to the city for vessels, but their passage at its mouth is somewhat impeded by silt deposits, which render it only six feet deep at ebb tides, but at flood tides the water is fully fourteen feet. The city is the seat of vast commercial interests and carries on extensive manufactures. It is connected with other cities of Southern Asia by telegraph and railway lines, and is one of the largest cities of Southern Asia. Its population is mixed largely with all classes common to Asia, but the Chinese constitute fully one-half of the inhabitants and control the largest part of the trade. Most of the city is built over the water of the river. Many of the houses are constructed of bamboo and are connected by bridges, thus presenting a peculiar contrast to the architecture of Europe. On account of the site of the city being flat, many buildings located on the land are on piers about six feet above the ground. The palace of the king is surrounded by a high wall and with it are enclosed a number of temples, public offices, and a theater. Within the walls are the royal harem and the residences of many servants and attendants. Transportation within the city is by a line of omnibuses and a system of electric railways. The municipality has waterworks and electric lighting. Its modern prosperity dates from 1766, when it became the capital. Population, 1905, 585,380.

**BANGOR**, the county seat of Penobscot County, Maine, on the Penobscot River, and on the Maine Central and other railroads. On the opposite side of the river is the town of Brewer, with which it is connected by a bridge. The river is navigable for the largest vessels. Among the chief buildings are the county courthouse, the public library, the custom house, and the Bangor Theological Seminary. The manufactures include boots and shoes, clothing, flour, trunks and valises, and ships. It has a large trade in ice and is one of the lead-

ing lumber depots in the world. Gas and electric lights, pavements, waterworks, sewerage, and electric street railways are among the improvements. The vicinity was first settled in 1769, when it became known as Kenduskeag Plantation, and it was incorporated as Bangor in 1791. Population, 1900, 21,850.

**BANGWEOLO** (bǎng-wě-ō'la), or **Bemba**, a large lake in Africa, in the northern part of Rhodesia. The length from north to south is 150 miles and the width is about 75 miles. It has an elevation of 4,000 feet above the sea. The Chambezi flows into it from the east, and it discharges a part of the year by the Luapula. Several small islands within the lake are inhabited by natives. The lake was discovered by Livingstone in 1868 and was visited by Stanley in 1876.

**BANJO** (bǎn'jō), a musical instrument with three strings, having a head similar to a tambourine and resembling a guitar. It is played by striking or twitching the strings with the fingers of the right hand. Joel Walker Sweeney, an American musician, is the inventor, who learned to play on the rude instruments used on the southern plantations and patterned largely from them. He was born in 1813, and died at Appomattox, Va., in 1860. His reputation as a banjo player extended to Europe, where he performed many times before Queen Victoria.

**BANKING** (bǎnk'ing), the occupation or business that relates to the care, custody, and handling of money. Banks are of very great antiquity. Babylonian tablets bearing distinct records of transactions in banking in the time of Nebuchadnezzar are in the Metropolitan Museum of Art in New York City. Modern banking had its origin with the money dealers of Florence, who attained high repute as receivers and lenders of money in the 14th century. The name *bank* is from the Italian *banco*, a bench, from the practice of the Jews in Lombardy, who had benches in the market places while in the business of exchanging money. The bench of the banker was broken by the populace when the banker failed, and from this we have the word *bankrupt*. Goldsmiths undertook the business of borrowing and lending money at an early date, largely because people desired to pawn their jewelry with them as security, although banking has no direct connection with their art. With the diversification of industries, which is one of the characteristics of higher society, banking became an independent institution.

**EUROPEAN.** Among the early banks of Europe are the Bank of Barcelona, founded in 1401; the Bank at Genoa, for centuries one of



the most stable banks of Europe, organized in 1407; and the Bank of Amsterdam, founded in 1609, a great storehouse for bullion in the 17th century. The last-mentioned bank issued receipts for the bullion and coin deposited, and these circulated as money. The Bank of Venice was the first national bank founded in Europe. The Bank of England was established in 1694, as the fourth important national bank, and is acknowledged to be one of the strongest financial institutions in the world. It was organized as a joint-stock association with a capital of £1,200,000. In return for loaning its entire capital to the government, it received a monopoly of the corporate banking in England and the right to issue notes for circulation as currency. In 1908 it had eleven branches, a capital and reserve of £18,125,000, a circulation of £30,250,000, and deposits of £48,750,000. The Bank of France was founded in 1800 and ranks next in repute to the Bank of England. It has a capital and reserve of 90,000,000 francs and the sole right to issue paper currency in France. The Imperial Bank of Germany, established in 1875, has a capital of \$28,575,000, but it is not the only bank of issue in the German Empire, this function being vested in a total of eight banks, whose authorized issue is \$91,630,000. Besides, the government itself issues a large amount of currency in the form of small notes for the convenience of the public. The National Bank of Belgium is modeled after the Bank of France.

AMERICAN. The Bank of North America was established in 1782 at Philadelphia, and was the first *bank of issue* founded in America. However, the first bank of issue in the United States was organized in 1791, under a plan proposed by Alexander Hamilton, with a capital of \$10,000,000. This bank was discontinued as a bank of issue in 1811, and five years later Congress granted a twenty years' charter to a new United States bank, with a capital of \$35,000,000, but on the expiration of that term refused to grant a renewal. About that time State banks were established and continued to do business a number of years, but they proved unsatisfactory and unstable. Under this plan the several states had different systems of banking, which caused inconvenience in exchanging money when passing from one State to another. This tended to increase the rate of interest, rendered currency subject to excessive discount, and caused numerous panics. However, they continued to do business until 1866, when a tax of ten per cent. was imposed upon their notes, which caused them to surrender their charters.

At the recommendation of Secretary Chase, a national banking system was established in 1863, under which the paper currency became uniform in all the states. The plan provides that a portion of the banking capital must be invested in government bonds. These bonds are deposited with the treasurer at Washington, upon which paper currency to the full amount of the face value is issued to the bank making the deposit, and this currency is put into circulation. The plan is so formulated that the bonded indebtedness of the country becomes the basis of this class of banking. These bonds deposited with the United States are security, whereby the currency is guaranteed and its value is maintained at parity with gold.

CLASSES OF BANKS. Several classes of banks are maintained in most countries, depending upon the charter under which they operate, or the nature of the business which they transact. While all banks receive deposits, only a comparatively few are banks of issue or circulation; that is, they do not issue paper currency for general circulation. A small rate of interest is paid on *time* deposits, but, when the deposits are made *subject to check* by the depositor, usually no interest is paid. All banks loan money from their own funds and from the deposits. The loans are largely for short periods, but sometimes for a year or more, when mortgages or deeds of trust are taken as security for the loans. Banks effect exchanges between their depositors and others, a department of banking which has grown into importance. The individual who wishes to send money to some other city usually buys a draft and transmits that instead of the currency, and it is received in other money centers as equivalent to the cash. It is estimated that not more than from twelve to fifteen per cent. of the entire business transacted through banks in Canada and the United States is effected by the payment of currency.

Clearing houses are associations of banking houses to aid in the settlement of balances between given banks. In this way much time is saved in making exchanges, and it is not necessary to make an actual count of the money. Savings banks are institutions in which small sums of money are deposited from time to time, as they accumulate in the hands of persons limited to moderate earnings. The depositors are supplied with a small deposit book in which they are given credit for each deposit, and receive a moderate rate of interest on these deposits, together with a small additional contingent. The money received on deposit, and a portion of the capital, are



loaned to trustworthy borrowers at a rate of interest determined by the market value, and the greater part of the earnings is set aside for the depositors. Banks of loan and discount buy credit paper, usually at a discount, and do a loan business. Private banking institutions are conducted by individuals, or an association of individuals, who do a general banking business. The business of banking is regulated by laws, which provide that the books be examined by competent accountants, and frequent statements are published to convey to the public information as to the stability of the enterprise. The laws and the condition of business requirements have made banking and banks secure, and render them absolutely necessary to promote successfully modern commercial enterprises.

**VOLUME OF BUSINESS.** In 1908 there were 23,937 banks in the United States, which number included 6,429 national banks. The total capital was \$1,783,226,179, and the individual deposits aggregated \$13,654,535,348. In June of the same year the banks of Canada had a paid-up capital of \$98,750,850, a circulation of \$76,850,400, and deposits of \$745,682,680. The government of Canada has had charge of a system of post office savings banks since 1868, which had 1,080 offices in 1908, while the total number of incorporated banks was 37 and the number of branches, 1,640. See **Clearing House.**

**BANKRUPTCY** (bānk'rūpt-sỹ), a term equivalent to insolvency, and generally applied to the financial condition of one who has failed in business. In general, a bankrupt or insolvent is one who is unable to pay *all* his debts. Bankruptcy laws have been enacted in most countries for the protection of both the debtors and the creditors. These provide for the fair distribution of the property remaining after bankruptcy among the creditors of the bankrupt. In some instances bankruptcy laws provide for a release from all debts remaining after applying the property in payment. The object of this is to release a bankrupt and offer to him an incentive to devote himself to business again. From 1867 to 1878 a national bankruptcy law was in force in the United States, while another was enacted in 1898. It applies to all individuals, but not to corporations. Both in England and the United States proceedings in bankruptcy may be instituted by the debtor or by creditors.

**BANNER** (bān'nēr), a flag or standard carried at the head of a band, either in a general parade or for military purposes. It may be national, state, local, or private. Its use is to indicate the line of march, or the rallying point

in war, in case of defeat. Banners are made of good grade of cloth, with one side attached to a pole.

**BANNOCKBURN** (bān-nōk-bûrn'), a village in Scotland, two miles southeast of Stirling, on the Bannock Rivulet. It is famous for a decisive battle, in 1314, between King Robert Bruce of Scotland with 30,000 men and Edward II. of England with 100,000. The latter was defeated with a loss of 30,000 men.

**BANTAM FOWL** (bān'tam), a small domestic fowl that derived its name from Bantam, in Java. A well bred bantam does not weigh over a pound when full grown.

**BANX RING** (bānx'rīng), an insectivorous animal native to India and the East Indies. It has an elongated muzzle and a bushy tail. It is active and spry and spends much of its time in climbing the limbs of trees, resembling in this respect the lemurs and squirrels.

**BANYAN** (bān'yān), or **Banian**, a tree native to the East Indies, Ceylon, and Australasia, and remarkable for its branches and



BANYAN TREE.

roots. Every branch of the main tree throws out its own roots, which become parent trees and throw out other branches. The wood is light and of little value, but the tree yields lac and the bark possesses a tonic property useful in treating diabetes. This tree lives many years and often covers large areas. One in India furnished shelter for 7,000 men, while another found in Australia covered nearly seven acres. A tree in India, known by the name *cubbeer burr*, has 350 large trunks and over 3,000 smaller ones. In these trees dwell large numbers of birds and monkeys, which are fond of their fruit, a kind of fig. The tree is held sacred by the Brahmans.



**BAOBAB** (bā'ō-bāb), a tree native to tropical Africa, and met with in Senegal, Abyssinia, and the region of the African lakes. The trunk grows to a height of from 60 to 70 feet, and the growth of its limbs press outward about the same distance, making the diameter in many cases 150 feet. In the larger trees the roots are sometimes over 100 feet in length. The leaves are large and abundant and of a dark green color, and the large flower is white and has beautiful snowy petals. The fruit is a soft pulpy but dry substance, about the size of a quart flask, inclosed in a long dull-green woody pod. Between the seeds is a pulp which tastes like cream of tartar, and is used by the natives to give flavor to their porridge. The wood is soft and light, and when decay sets in the woodish structure becomes porous and finally falls to pieces. Cloth and rope are made of the fiber, and the juice of the fruit is used as a drink, but the wood is not particularly valuable. It was discovered by Michael Adanson and is sometimes called *adansonia*. Livingstone reported that one of the trees seen by him was at least 1,400 years old.

**BAPTISM** (bāp'tiz'm), a name derived from a Greek word which means to dip or wash, and is applied to a rite of many churches. The rite of baptism is administered by immersing in water, or by sprinkling or pouring water upon the person, and signifies purification or spiritual burial and resurrection with Christ or a union with Christ as our Savior and Lord. Early in the history of the Christian Church it was held that the two outward essentials of baptism are the use of water and the words of Christ as given in Matt. xxviii, 19. It is probable that immersion was the exclusive form used in the primitive church, which later became a trine immersion in respect to the Trinity. At that time sprinkling or clinical baptism, as it was called, was confined to the sick and aged. The Greek Catholic and a number of Protestant denominations practice immersion, while the Roman Catholic and most Protestants sprinkle or pour the water upon the head.

**BAPTISTS** (bāp'tists), one of the most numerous divisions of the Protestant church, whose origin in America is traced to Roger Williams, who embraced the Baptist faith in 1639. The creed is a modified form of Calvinism and the government is a pure democracy, in which all members have a right to vote on important church matters. They hold that infant baptism is not authorized, and that the ordinance of baptism should be administered by immersion. Most Baptist churches

have a baptistry, either as a separate building or as an annex, in which the rites of baptism are administered. The number of Baptists in Canada is placed at 112,264. In the United States there are not less than thirteen separate organizations known by the name of Baptists. They have about 46,000 churches, valued at \$83,500,000, and a membership of not less than 4,450,000. They possess 175 educational institutions in America, the property of which is valued at \$25,000,000.

**BAPTIST YOUNG PEOPLE'S UNION**, a society organized under the direction of the Baptist church, and intended as a federation for young people. The object is to develop Christian character, to encourage the study of the Bible, and to bring together its members for the purpose of stimulating interest and building up membership in church and missionary work. *The Baptist Union*, a weekly publication, is the official organ, and the headquarters are in Chicago. This society has about 500,000 members.

**BARABOO** (bār'ā-bōō), the county seat of Sauk County, Wisconsin, thirty-five miles northwest of Madison, on the Baraboo River, and on the Chicago and Northwestern Railroad. It is surrounded by an iron, fruit, and grain producing country. The chief buildings include the high school, the county courthouse, and several fine churches. It has manufactures of machinery, dairy products, and linen and woolen goods. Waterworks, electric lights, and sewerage are among the improvements. Baraboo was incorporated in 1882. Population, 1905, 5,853.

**BARBADOS** (bār-bā'dōs), an island in the West Indies, of which it is the most easterly. It is twenty-one miles long and fourteen wide, and has an area of 166 square miles. It contains Mount Hillaby, 1,125 feet above the sea, and is surrounded by coral reefs. The soil is exceedingly fertile and produces tobacco, cotton, sugar cane, cereals, and tropical fruits. Among the exports are molasses, rum, sugar, and fruits. The imports include flour, rice, meat, clothing, and machinery. The little island, smaller than five congressional townships, is densely populated, and has considerable commerce. It was settled by the British in 1625 and is still a possession of Great Britain. Bridgetown is the capital and largest city. Population, 1906, 196,287.

**BARBARIAN** (bār-bā'rī-an), a term originated by the ancient Greeks, who called all foreigners and those unable to speak their language barbarians. According to Plato there were but two classes in the human family, the



Greeks and the barbarians. The term was not used originally in reproach, but after the Persian invasion it implied hostility to the Greeks and their civilization. After the Roman conquest of Greece, the word *barbarian* was used in reference to all nations except the Greeks and Romans.

**BARBARY** (bär'ba-rĭ), a name sometimes applied to the northern portion of Africa, which includes Fez, Morocco, Tunis, Barca, Fezzan, and Algeria. The name was taken from the original inhabitants known as Berbers, who were conquered by the Arabs in the reign of the caliphs. The country was prosperous in the time of the Carthaginians, and, next to Egypt, it became the richest Roman province. In ancient times the district included Numidia, Mauritania, and Cyrenaica. It became infested with pirates in the 15th century, and was finally civilized after the conquest of Algeria by the French. At present it is inhabited by Berbers, Turks, Bedouins, Jews, Negroes, and French.

**BARBARY APE**, or **Magot**, a small tailless ape found in Northern Africa. It walks on four feet and is skillful in passing from tree to tree. The color is greenish-gray and in size it is not much larger than a cat. It is capable of being trained to perform tricks.

**BARBECUE** (bär'bĕ-kū), a term derived from the natives of the West Indies, now applied to the practice of roasting an ox or other large animal at a social entertainment on a large scale. In the southern part of the United States the name has reference to a jollification, especially to a political jubilee.

**BARBEL** (bär'bĕl), a fish of the carp family, of which species are found in the fresh waters of America and Europe. The common barbel of England is a game fish, but its flesh is coarse, and it measures from two to three feet in length. The binny or barbel in the Nile weighs about 60 pounds and is esteemed for food. Several species closely resemble the American sucker, but all have soft barbels growing from the snout and upper jaw, hence the name.

**BARBER** (bär'bĕr), a person whose business is to shave, trim, and cut hair. Formerly surgery was combined with the craft. In the time of Henry VII. laws defined the duties of barbers, and forbade higher surgical operations than bloodletting and tooth pulling. Barber shops were noted as news centers in classic times and they are still notorious for gossip. In many countries, as in some of the states of the United States, the practice of the barbers' art is limited by law to persons skilled by train-

ing, who are required to hold a certificate of qualification. A spirally decorated pole has long been the principal sign of barbers' shops.

**BARBERRY** (bär'bĕr-rĭ), a class of shrubs native to the temperate zones. Many of the species are evergreen, and some yield a sour berry which is useful in making jelly and preserves. The bark yields medicine and the roots are of value in preparing a yellow dye. The common barberry of Europe has been naturalized in Canada and the United States. It is thorny, has serrated leaves, and bears yellow flowers. Several species are native to North America.

**BARBER'S ITCH**, a disease of the bearded parts of the face, caused by a parasitic fungus. Postular eruptions of the face are sometimes confused with this disease, but they are really the result of close and too frequent shaving. In the true barber's itch, sometimes called ringworm in the beard, parasitic scales or sporules cover the infected beard, giving it the appearance of having been covered with a whitish powder. It may be cured by careful treatment. The affected part should be kept clean and bathed frequently with cold water, and the parasite may be killed by applying lotions of different kinds, such as opium, carbolic acid in glycerine, and ointments of sulphur and nitrate of mercury.

**BARBUDA** (bär-bōō'dà), one of the Lesser Antilles, in the West Indies, 20 miles north of Antigua. It is of coral formation and has an area of 60 square miles. The surface is level and partly covered with forests, and cattle raising is the chief occupation. The island is a British possession. Population, 600.

**BARCA** (bär'kà), a district located between Egypt and the Gulf of Sidra, belonging to the Turkish Empire. It is bounded on the north by the Mediterranean and south by the Libyan Desert. The surface is hilly and mountainous, being traversed by highlands which reach an altitude of 3,310 feet. Agriculture and cattle raising are the chief industries. The exports are cattle, grain, ivory, and ostrich feathers. It was known to the Greeks as Pentapolis and contained five large Greek cities. The inhabitants consist mostly of nomadic Arabs and Berbers. Bengazi is the seat of government and the largest city. Population, 300,250.

**BARCELONA** (bär-sĕ-lō'nà), a city in Venezuela, capital of a state of the same name, 150 miles east of Caracas. It is situated on the Neveri River, three miles from its entrance into the Atlantic Ocean, and has railroad facilities and a good harbor. In the vicinity are coal and salt mines. Considerable trade is



carried on in coal and fruit. A government house, the theater, and a number of educational institutions are located here. The first settlement was made at Barcelona in 1638, and in 1881 it became the capital of Bermúdez, which has been divided to form the two states of Sucre and Barcelona. Population, 12,785.

**BARCELONA**, formerly the capital of the kingdom of Catalonia, and now an important city in a province of the same name. It is the principal seaport on the Mediterranean, has railroad connection with the chief towns of the Iberian Peninsula, and next to Madrid is the most flourishing city of Spain. It consists of two parts, the new and the old. The former is modern and is platted on a regular plan, while the latter is irregular and ancient. A fine promenade extends from the Columbus monument to the Plaza de Cataluña. The cathedral occupies an elevated site that was formerly the location of a Roman temple and a Moorish mosque. It has manufactures of cannon, paper, machinery, woolen and silk goods, chemicals, wines, and clothing. It is an important city of commerce and has a large import and export trade. Gas and electric lights, pavements, waterworks, and street railways are among the improvements. It is the seat of a museum, an arsenal, a public library, a university, and other public institutions. The city was under the government of a line of counts until the 12th century, but in 1137 it became a part of the kingdom of Aragon. In 1640 it became French territory, but was made a part of Spain in 1652, and was retaken by the French in 1697. The Peace of Ryswick, in the same year, restored it to Spain. Population, 1905, 534,250.

**BARD** (bärd), a poet who celebrated in verse and song the exploits of heroes and chiefs. Mention was made in Roman writings of the bards of Gaul two hundred years before the advent of Christ, but these singers disappeared early among the people of the continent. The bards of the insular Celts continued important as social factors throughout the Middle Ages, probably because they maintained a form of organization. The Welsh bards are especially noted for their writings on a variety of subjects, including secular and religious themes. It is related that the Scottish bards were skilled in singing their productions to the accompaniment of the harp. Gray's "The Bard" is based upon the persecution of the Welsh bards by Edward I. of England, who looked upon them as promoters of sedition. In modern times the term is used as a synonym of poet.

**BAREILLY** (bä-rä'lë), or **Bareli**, a city in

the Northwest Provinces of India, 151 miles east of Delhi. It is located on the Juá River, and has manufactures of carpets, cutlery, perfumery, and earthenware. The trade is chiefly in grain, sugar, and cotton. In 1857 it was the scene of a Sepoy mutiny, but the following year was recaptured by Lord Clyde. Population, 1901, 131,208.

**BARGE** (bärj), a double-decked passenger or freight boat that has no motive power of its own. It is attached to a towboat and used for conveying freight and passengers to shore from large vessels, or for pleasure excursions.

**BAR HARBOR**, a noted summer resort in Mount Desert Island, off the coast of Maine, 45 miles southeast of Bangor. It is beautified by evergreen groves, mountain scenery, and highland lakes. The island has an area of 98 square miles and is famous as a resort for tourists. Bar Harbor has steamboat connections with the mainland and numerous hotels and villas. Population, 1900, 1,888.

**BARI** (bä'rë), a city in Italy, capital of a province of the same name, on the Adriatic Sea. It has a good harbor and railroad facilities, and is the seat of a brisk trade in almonds, cotton, cereals, fruit, and woolen goods. The chief manufactures are musical instruments, chemicals, soap, and furniture. It is the seat of an archbishop and has a number of fine ecclesiastical buildings, including the priory of Saint Nicholas. Anciently it was known as Barium and was a flourishing city in 200 B. C. Population, 1901, 77,478.

**BARIUM** (bä'rī-üm), a metal resembling strontium, found in nature in the form of sulphate, carbonate, and silicate. It is an alkaline earthy metal, fuses at a low temperature, and oxidizes readily. Baryta is an oxide of barium, an alkaline earth, and is sometimes called *heavy earth*. It is a virulent poison and is used in making white paint, such as *Hamburg white*. The chloride of barium is used to prevent boiler incrustations and the nitrate is employed to test sulphuric acid and soluble phosphates. Both are used in making fireworks.

**BARK** (bärk), the outer covering of trees and plants, called *cortex* by botanists. The term, in a more limited sense, can be applied only to trees and shrubs of certain classes. In general it is found only on exogenous plants, while endogenous plants are destitute of true bark. The bark consists of several layers, as the inner or *bast*, which transmits the plant food; the intermediate or *green zone*, which fits the food for absorption, and the outer or corky layer, which protects the more tender inner layers. It contains valuable ingredients,



such as gum and tannin, and also yields cork, fibres, and properties valuable in tanning. In nautics, a bark is a three-masted vessel with riggings on the fore and main masts like those of a ship.

**BARK BEETLE** (bē't'l), a small insect which is very injurious to trees. A number of species have been described, most of which are native to America and Eurasia. The female deposits her eggs in or under the bark, usually between the bark and the wood, and the young dig a series of burrows which cause decay. The trees are either killed outright or the value of the wood is injured. In 1783 the pine forests of Germany were invaded by great swarms of these insects. They are frequently destructive to orchards.

**BARKER'S MILL** (bärk'ërz mīl), a machine invented in the 17th century, and used to produce rotary motion. It consists of an upright tube held in place by a frame, and at the lower end are two horizontal arms, on opposite sides of which are two small openings. The water is poured into the vertical tube and flows out of the small opening, causing the apparatus to revolve in the direction opposed to that of the water emitted. Devices to distribute water in sprinkling lawns and for making demonstrations in laboratories employ modified forms of this apparatus.

**BARLETTA** (bär-lët'tà), a city of Italy, located on an island in the Adriatic, and connected by a bridge with the mainland. It is about 35 miles northwest of Bari, with which it is connected by steam railway and electric lines. The streets are paved substantially with stone and asphalt. The city is surrounded by walls of stone. It contains a cathedral in the Byzantine style, a castle built by Charles V., and several fine statues and monuments. The export trade is largely in grain and fruits, and the manufactures consist of earthenware and cotton and woolen goods. Cannae, where the Romans were defeated by Hannibal in 216 B. C., is nine miles west of Barletta. Population, 1901, 42,022.

**BARLEY** (bär'lÿ), a valuable cereal plant, which is said to be more widely distributed than any other grain. It was an important food product in the early times of the Assyrians and Hebrews, and was used in the manufacture of beer by the Egyptians. It is now used mainly as feed for domestic animals, for making barley-meal bread, and in the manufacture of beer, porter, and whisky. The production is extensive in the Temperate Zone, where it yields from ten to fifty bushels per acre, the quality and quantity depending upon cultivation and

richness of the soil. The heads of most species are bearded and contain two, four, or six rows of seeds. It colors easily, especially if harvested in damp weather. The best quality of barley is obtained in a moderately dry climate. Canada produces large quantities of a fine grade, especially the Provinces of Manitoba, Alberta, and Saskatchewan, the first mentioned leading with an annual yield of about 15,500,000 bushels. The production of the United States has been about 175,500,000 bushels per year since 1908. California, Minnesota, South Dakota, and Wisconsin are the leading barley producing states.



HEADS OF BARLEY.

**BARMECIDE'S FEAST** (bär'mê-sīd), an "Arabian Nights" tale, in which it is related that a member of the Barmecide family set empty dishes before a beggar and invited him to partake of imaginary dainties. The beggar took the joke good-naturedly and pretended to eat and drink. Becoming intoxicated on imaginary wine, he cuffed the ears of the host. This so pleased the latter that the beggar was served with a bounteous meal.

**BARMEN** (bär'men), a city of Germany, in Rhenish Prussia, on the Wupper River, about 25 miles northeast of Cologne. The chief buildings include the city hall, the municipal theater, a gymnasium, a public library, and numerous hospitals and educational institutions. Barmen has six railroads and a network of electric railways. It is one of the most important manufacturing cities of Germany, and produces the principal part of the ribbons made in Europe. Its fabrics, laces, thread, cotton, silk, and woolen goods are transported to all parts of the world. Other manufactures include musical instruments, buttons, machinery, and metal ware. The city has all modern municipal facilities, such as public parks, sewerage, stone and asphalt paving, electric lights, and central heating. In 1815, after the Napoleonic wars, it was annexed to Prussia, since which time it



has grown rapidly in commerce and wealth. Population, 1905, 156,080.

**BARNACLE** (bār'nà-k'l), a marine animal of the lower order, generally called a *cirriped*. Many species are common to all the oceans, differing in the manner of life and the method by which the adult is attached to some object. Among the best known are the *acorn barnacle* and the *goose barnacle*. The latter is so named because the ancients supposed that it produces the *barnacle goose*, a wild goose of the north-western part of Europe. It is enveloped by a



GOOSE BARNACLES.

mantle and shell, possesses a long, flexible stock or peduncle provided with muscles, by which it fastens itself to floating objects, such as submerged timber or the bottom of ships. Its food consists of small marine animal life, which it secures from the water by its tentacles. The acorn barnacle, which has no stalk, is enveloped by a shell formed in the shape of an acorn, but composed of numerous valves. Some species were eaten by the ancients and are still esteemed as food by the Chinese. Darwin made a more extensive study of barnacles than of any other group of animals.

**BARNACLE GOOSE.** See **Barnacle**.

**BARNBURNERS** (bārn'būrn-ērs), a name given to the followers of Martin Van Buren at the time the Democratic party in New York was split into two factions. The name was derived from the case of the farmer who burned his barn to kill the rats, to which the party was likened, owing to the eagerness of some of the leaders to secure reforms. Their opponents were called the hunkers. In 1848 the Barnburners generally voted with the Free Soilers, making possible the election of the Whig candidate, Zachary Taylor.

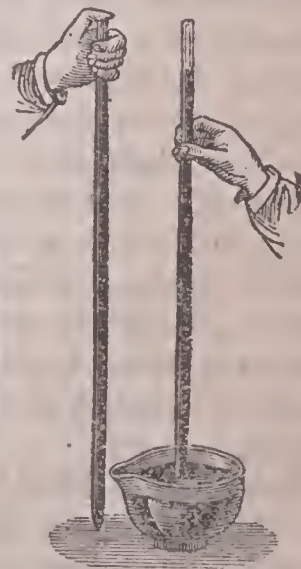
**BARODA** (bā-rō'dā), a city of India, 230

miles north of Bombay, with which it is connected by railway. It occupies a prominent site on the Vishvomitri River, which is crossed by several stone and steel bridges. The chief buildings include an ancient palace, the Anglican church, the Baroda College, a public library, and the Dufferin hospital. It has a large trade in grain, merchandise, and live stock. The district of Baroda, of which it is the capital, has been tributary to the British since 1802. Many modern improvements, such as waterworks and electric lights and street railways, have been built since European occupation began. Population, 1901, 103,790.

**BAROMETER** (bā-rōm'ē-tēr), an instrument used in measuring atmospheric pressure. Owing to the even pressure of air on all sides of an object, many centuries elapsed before it was demonstrated that air possesses weight. The discovery was announced by Torricelli, an Italian, in 1643. By the use of the *Torricelli tube*, which is essentially the same as a barometer, he discovered that the pressure or weight of the atmosphere supports a column of mercury thirty inches high. The same experiment was repeated by Pascal in 1645. In 1656 Perrier discovered that the height of the mercury varies with the weather; when the air is moist it is lighter than when dry, and, therefore, the mercury rises in the dry air and falls when it becomes more humid. This fact discovered, it became possible to note the state of the atmosphere as to the quantity of moisture contained in it, and to determine the altitude of a given locality above the level of the sea, for the rea-



ANEROID BAROMETER.



LIQUID BAROMETER.

son that the pressure of the atmosphere is greatest at the level of the sea and gradually decreases toward the higher altitudes. Hence, in low altitudes mercury rises in the tube, and it gradually falls as the barometer is carried upward from the level of the sea.

The barometer is constructed according to well established rules. A glass tube about



thirty-three inches long, closed at one end, is filled with mercury. After closing the open end with a finger, the tube is reversed and dipped below the surface of the mercury in a vessel. When the finger is removed from the opening, a column of mercury remains in the tube, being sustained there by the pressure of the atmosphere. This column is about thirty inches high near the level of the sea; in high elevations it is much lower. The weight of the mercurial column is equal, in all cases, to that of a column of air equal in weight, extending from the level of the vessel to the top of the atmosphere. As above stated, the mercury rises or falls in proportion to the pressure of the atmosphere, which is varied by altitude and moisture. Thus, the mercury rises with increased pressure and falls when pressure is diminished. At the top of Mont Blanc, about 5,243 yards high, mercury falls to sixteen and one-half inches. In 1875 two Frenchmen, Sivel and Corce-Spinelli, lost their lives from asphyxia while ascending in a balloon; at the height of 9,370 yards the mercury fell to ten inches. This was due to the fact that the higher the ascent the less air remains overhead. For this reason, the less the air presses down, the less power it has to sustain a column of mercury. In the *aneroid barometer* no liquid is used; it depends for its operation on the pressure exerted by the air upon its surface.

Much study has been given to weather forecasts based on the condition of the atmosphere as indicated by the barometer. A number of governments and yachting clubs make careful observations with the barometer. They are guided largely by its registrations. A rapid rise of the barometer indicates unsettled weather; a gradual rise indicates settled weather; a rapid fall indicates stormy weather. Besides these rules are a number of others dependent largely upon location and the direction of the winds. It is certain that many lives and much property have been saved by careful observations of coming storms indicated by barometric action.

**BARQUISIMETO** (bär-kē-sê-mâ'tô), a city in Venezuela, capital of the state of Lara, on the Barquisimeto River. It is surrounded by a fertile plain and has a good trade in cereals and live stock. A cathedral, the government palace, and a college are among the public buildings. The first settlement made in its vicinity by the Spaniards dates from 1522, hence it takes rank with the oldest cities in America. In 1812 it was destroyed by an earthquake, but was soon rebuilt, and became the capital of a state of the same name in

1830: The state of Lara is part of the former state of Barquisimeto. Population, 1903, 41,360.

**BARRANQUILLA** (bär-rän-kêl'yà), a seaport in Colombia, on the Magdalena River, fifteen miles from the Caribbean Sea. It is connected with Sabinilla, its port on the Caribbean, with a railroad. Formerly only the smaller boats could navigate the Magdalena at this point, but it has been improved by dredging and now admits the larger vessels. The city has a large trade in produce and is improved with modern public utilities. Population, 1905, 40,115.

**BARRE** (bär'rê), a city in Washington County, Vermont, about six miles southeast of Montpelier, on the Vermont Central and the Montpelier and Wells River railroads. The manufactures consist chiefly of monuments and building materials made of Barre granite, which is quarried extensively in the vicinity. Among the principal buildings are the public library, the Goddard Seminary, and the high school. The first settlement was made in the vicinity in 1788 and it was incorporated in 1894. Population, 1900, 8,448.

**BARREL** (bär'rêl), a vessel formed of *staves* and surrounded by *hoops*. The staves are fitted carefully and held together tightly by the hoops, and at the two ends of the barrel are circular boards called the *heads*, which are fitted in grooves. Most barrels bulge in the middle, in which the staves are wider in the middle than at the ends, but some are larger at the lower end. A *bunghole* is provided for the purpose of allowing the inflow and outflow of liquids.

Many articles of commerce are sold in barrels, but the market value is based upon the quantity in pounds. Thus, a barrel of flour contains 196 and a barrel of pork 200 pounds. The barrel, in wine measure, contains 31½ gallons, and the imperial barrel of England contains 36½ gallons of beer. A barrel of butter consists of 224 pounds.

**BARRIE** (bär'rî), a town in Ontario, capital of Simcoe County, fifty-six miles northwest of Toronto. It is nicely situated on Lake Simcoe, a beautiful sheet of water about thirty miles long and twenty-six wide, and the surrounding country is fertile. It is the seat of a collegiate institute and several churches and schools. The manufactures embrace leather, woolen goods, flour, and machinery. Steamboats run on the lake from the town, which is popular as a summer resort. Population, 1901, 5,919.

**BARRIER REEF** (bär'rî-êr rêf), a coral



reef extending from ten to one hundred miles off the northeast coast of Australia, 1,265 miles in length. The reef is precipitous and rises from great depths. The trip from Sidney to Torres Strait is usually made by the inner route, where the sea is twelve fathoms deep. The passage is narrow, but it is less dangerous than the outer route. A vast region is covered by the Barrier Reef, about 100,000 square miles, and the surrounding waters yield pearls and trepang.

**BARROW** (bär'rô), the name given to mounds of earth constructed anciently for burial and monumental purposes. Many found in Great Britain are supposed to belong to the period of the Roman invasion. Eurasia, Northern Africa, and the Mississippi valley of North America are especially rich with these evidences of former populations. Many are long, others are in the form of a bell or cone, and some are broad barrows. Homer's "Iliad" mentions similar artificial mounds in connection with the obsequies of Achilles and Hector. See **Mound Builders**.

**BARROW**, a river of Ireland, rises in Queen's County, on the northeastern slope of the Slieve Bloom Mountains. After a course of 120 miles it unites with the Suir River and flows through Waterford Harbor into the sea. It is navigable twenty-five miles from its mouth, as far as New Ross.

**BARROW STRAIT**, a narrow channel extending from Lancaster Sound and connecting Baffin Bay with Melville Sound. It was so named from Sir John Barrow, a British traveler, though Parry discovered it in 1819.

**BARTER** (bär'tēr), the term used in economics to express the exchange of one commodity for another, as contrasted with the sale of commodities for money. In primitive times barter was extensive, each individual exchanging the surplus of his own products for such surplus products of others as he himself might desire. Instead of paying money for clothing or food, the primitive man traded a pig for a sheep, or several commodities for one of greater value than either. This system was conducted in the primitive states of all communities, and still prevails more or less among savage people. The terms *barter* and *sale* are used at present as interchangeable by many courts.

**BARTHOLOMEW FAIR**, an exhibition held under a charter issued by Henry I. at West Smithfield, London, from 1133 till 1855, on Saint Bartholomew's day, Aug. 24th. It was long a center of amusement and games, but began to lose its trade after 1685.

**BARTHOLOMEW, Massacre of Saint,**

the name applied to a slaughter of French Protestants on the night of Saint Bartholomew's day, Aug. 24, 1572, with the sanction of Charles IX., influenced by his mother, Catherine de Médici. She was the regent of her son Charles during his minority, and a long war raged between the Catholics and Huguenots. With the pretense of friendship, she made overtures to the Huguenots, which resulted in a peace treaty. She married her daughter Margaret to Prince Henry of Navarre, later Henry IV., who was leader of the Huguenots, and appointed Admiral Coligny, an influential Huguenot, to an important position in the kingdom. Admiral Coligny was invited to the court of the king and honored as a father. The admiral was wounded by a shot on Aug. 22, and the king hastened to his relief and promised punishment to the offender, but later his mother induced him to believe that the admiral desired to take his life. A council was held, and Aug. 24 was fixed for the night of the execution. Accordingly, Admiral Coligny was murdered, and a bell from the royal palace at midnight gave the signal for the commencement of the massacre. The bloody slaughter was promptly commenced and carried to all parts of France. It is said that the two Huguenot princes, Condé and Henry of Navarre, saved their lives by denying their religion, but this is not admitted by good authorities. According to Sully, 70,000 Huguenots, including women and children, were murdered. However, the object designed was not accomplished, and the king was required to grant liberty of conscience soon after to all citizens of France.

**BARYTA** (ba-ri'ta). See **Barium**.

**BASALT** (bâ-salt'), an igneous rock belonging to the trap-rock variety, frequently columnar in structure. Its origin is due to great pressure on the interior of the earth, in remote geological ages, forcing melted rock through fissures of other rock formations. On cooling, the mass formed what is known as *dikes*. These vary in width from several inches to three or four yards. They are much harder than the rock through which they were forced, and usually extend above the general surface, owing to the fact that they are less subject to corrosion. Many attain a height of five to 160 feet. The columns are generally in the forms of a pentagon, hexagon, or octagon. They are found in various parts of the continents, and are most numerous near the borders of mountainous districts. There are columns of basalt at the Giant's Causeway in the northern part of Ireland, in Scotland, at Fingal's Cave, and various parts of the Island



of Staffa. On the northwestern coast of Lake Superior are examples of basalt. The Columbia River, in Washington, has extensive cliffs formed of basaltic columns.

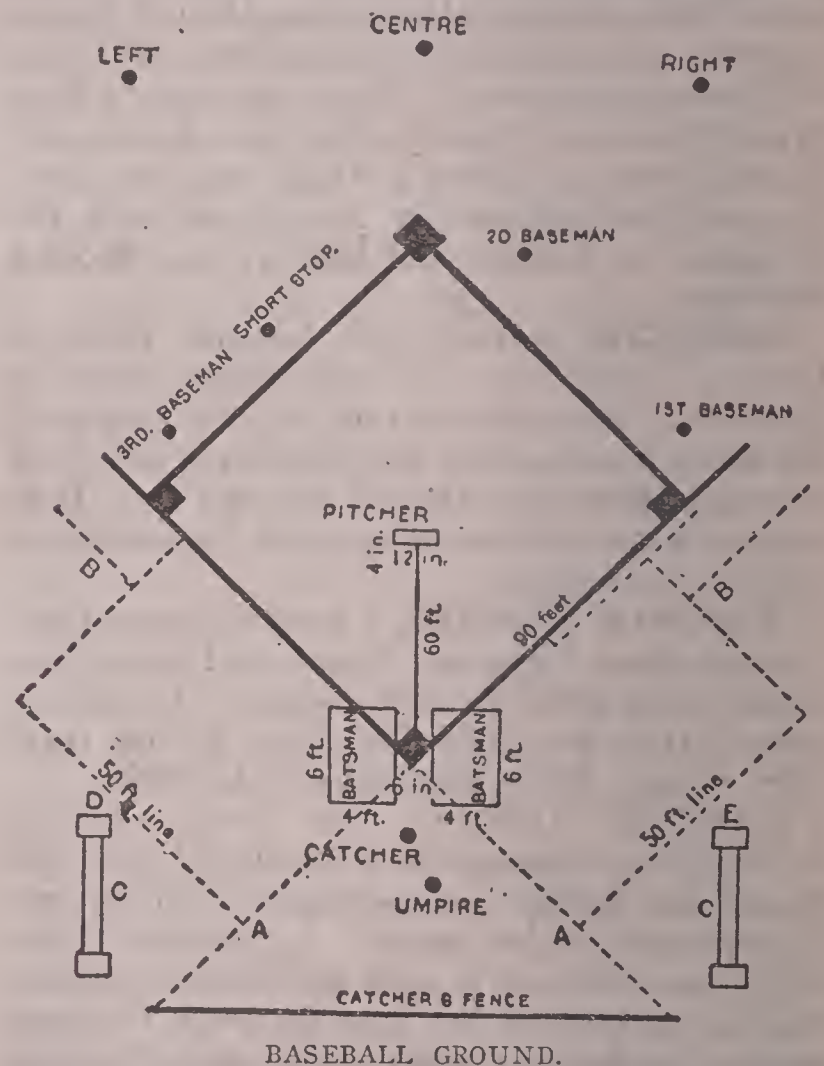
**BASE** (bās), a term used in chemistry to describe a substance which has the power to unite with an acid and with it form a salt. Water is formed in the process and the metal takes the place of the hydrogen of the acid. A base may be either an oxide or a hydroxide, lime or calcium oxide being an example of the former and potassium hydroxide of the latter. The salt potassium nitrate, or saltpeter, is formed when potassium hydroxide acts upon nitric acid, while the salt sodium sulphate results from the uniting of sodium hydroxide and sulphuric acid. Bases may be either oxygen, as those mentioned above, or they may contain sulphur, iodine, chlorine, bromine, and fluorine. The alkaloids, or organic bases, found in many plants, contain nitrogen. They are considered as substitution compounds of ammonia.

**BASEBALL** (bās'bal), an athletic game regarded national in America. The simpler game known as *town ball* was played in the United States until 1857, when baseball began to be played by amateurs. It continued to attract little attention until 1871, when professional organizations were instituted. Soon after it was introduced into England and other countries. In 1884 the National Association of Baseball Players was organized, and this was succeeded two years later by the National League of Professional Clubs.

The game has been brought to a high standard by the development of professional skill, the adoption of standard rules, and the cultivation of a public interest sufficient to cause attendance in large numbers at public exhibits. Many high schools, colleges, and universities have clubs and give much time and attention to the development of professional skill. The larger number of the clubs of the National League and of the American League devote most of their time, in the playing season, to public exhibits and from gate receipts secure handsome incomes. In 1874 several clubs visited England and Ireland, where they played fourteen exhibition games. One of the most noted tours was made in 1888-89, when the Chicago club and a team gathered promiscuously, known as the All-American, made a tour of the world. They visited and played at Honolulu, Sidney, Auckland, Melbourne, Colombo, in Ceylon, at the Pyramids of Egypt, Rome, Naples, Paris, London, and many other great cities of the world.

The game is played with a ball and bat.

The ball weighs about five ounces avordupois, and is about nine inches in circumference. The bat is made entirely of wood, but may have twine wound around the handle, and cannot exceed forty-two inches in length. There are nine players on a side, who play on a diamond-shaped piece of ground ninety feet on each side, the corners being bases. The field is taken by one side, and the other side has a man at the bat. The field side has a pitcher located inside the ground, near the center in front of the batsman; he throws the ball to the batsman, who has a position on the home base, and who makes an effort to drive it with the bat out of the reach of the fielders and to such a distance as to enable him to run around the bases and



*AA*, Reservation for batsman, catcher, and umpire; *BB*, for captain and assistant; *CC*, benches for players; *D*, visiting players' bat-rack; *E*, home players' bat-rack.

make a score. If he fails to drive the ball far enough to make a complete round, he stops at one of the bases and is followed by another batsman. If he is touched by the ball before reaching a base, he is out, and, when three of his side are out, the side at the bat takes the field. A game includes nine innings, and the side making the highest score wins.

The games played by the professional clubs are attended by newspaper reporters and telegraph operators are located at instruments near at hand, who send the news of the progress



made to all parts of the country. Many times bulletin boards are posted in conspicuous places at the games and in many cities far remote, at which interested spectators may learn of the progress and results. It is not unusual for the national and international games to be attended by 15,000 to 40,000 spectators, as was the case at the great games played between the teams of Chicago and New York in 1908. While the game is easily understood, much practice is required to become skilled in its arts. Elaborate rules have been provided for the guidance of individual players and associations. These are changed or amended by national representative conventions from time to time, and are consulted as a guide in all the amateur and professional games.

**BASEL** (bä'zəl), or **Bâle**, a city and canton of Switzerland. The canton has an area of 177 square miles and a population of 195,017. It borders on Alsace and the inhabitants are German. The city of Basel is one of the largest in Switzerland, situated forty-three miles north of Berne, on both sides of the Rhine, and the two parts are connected by a number of bridges. It occupies a fine site about 800 feet above the level of the sea. The two parts into which it is divided by the river are known as Grossbasel and Kleinbasel. It is the seat of a cathedral founded in 1010, which contains the tombs of Erasmus and other distinguished persons. It has a fine university founded in 1459. The university library contains 232,000 volumes and many pamphlets. With it are affiliated an institute of natural sciences and the botanical gardens. Among the noted buildings are the museum, the Bible Institute, the city hall, and the Church of Saint Elizabeth. The manufactures include silk, ribbons, machinery, leather, paper, spirituous liquors, clothing, and aniline dyes. It has a large and growing commerce. A network of railroads connect it with other cities, and the Rhine furnishes water navigation. It is considered the wealthiest city of Switzerland. Gas and electric lights, street railways, waterworks, and excellent schools are among the modern improvements. Basel was a Roman military post in the 4th century, when it was known as Basilia. In the 10th century it became a free city, when it was ruled by its bishop and chief nobility, and it was joined to the Swiss Confederation in 1501. Population, 1907, 131,687.

**BASEL, Council of**, the last of the three great ecclesiastical councils convened in the 15th century, held at Basel, Switzerland, in 1431-49. The first of these councils was held at Pisa, Italy, in 1409, and the second at Constance, Switzerland, in 1414-18. The council of Basel

was called by Pope Martin V., who died shortly after its convocation, and was succeeded by Eugenius IV. Its objects were to deliberate with the intention of extirpating heresies and to discontinue wars among Christian princes. However, the council got into disputes with the Pope, deposed him, and elected Felix V. in his stead. At the death of Eugenius IV., Nicholas V. succeeded to the pontificate, who brought about a reconciliation which resulted in the abdication of Felix V. and the official sanction of the decrees of the council of Basel. Final adjournment was agreed upon May 4, 1449.

**BASE LINE**, in surveying, a line measured with precision and used as the basis for government surveys, from which townships are numbered. Ranges are numbered east and west of prime meridians.

**BASIL** (băz'īl), a plant native to the warmer temperate parts of the Northern Hemisphere. It is an annual and has a fine odor. The leaves are long and the flowers appear in whorls of six. It is cultivated for seasoning and for its medicinal virtues. The *sweet basil* is native to the East Indies. It is grown extensively in Europe.

**BASILIAN MANUSCRIPTS**, the name of two valuable Greek manuscripts in the library at Basel, Switzerland. One is a copy of the whole new testament, except the Apocalypse, written in the characters of the 10th century. The other is in uncial characters, written at Constantinople in the 8th century, and contains the Gospels, except Luke iii, 4-15, and xxiv, 47-53.

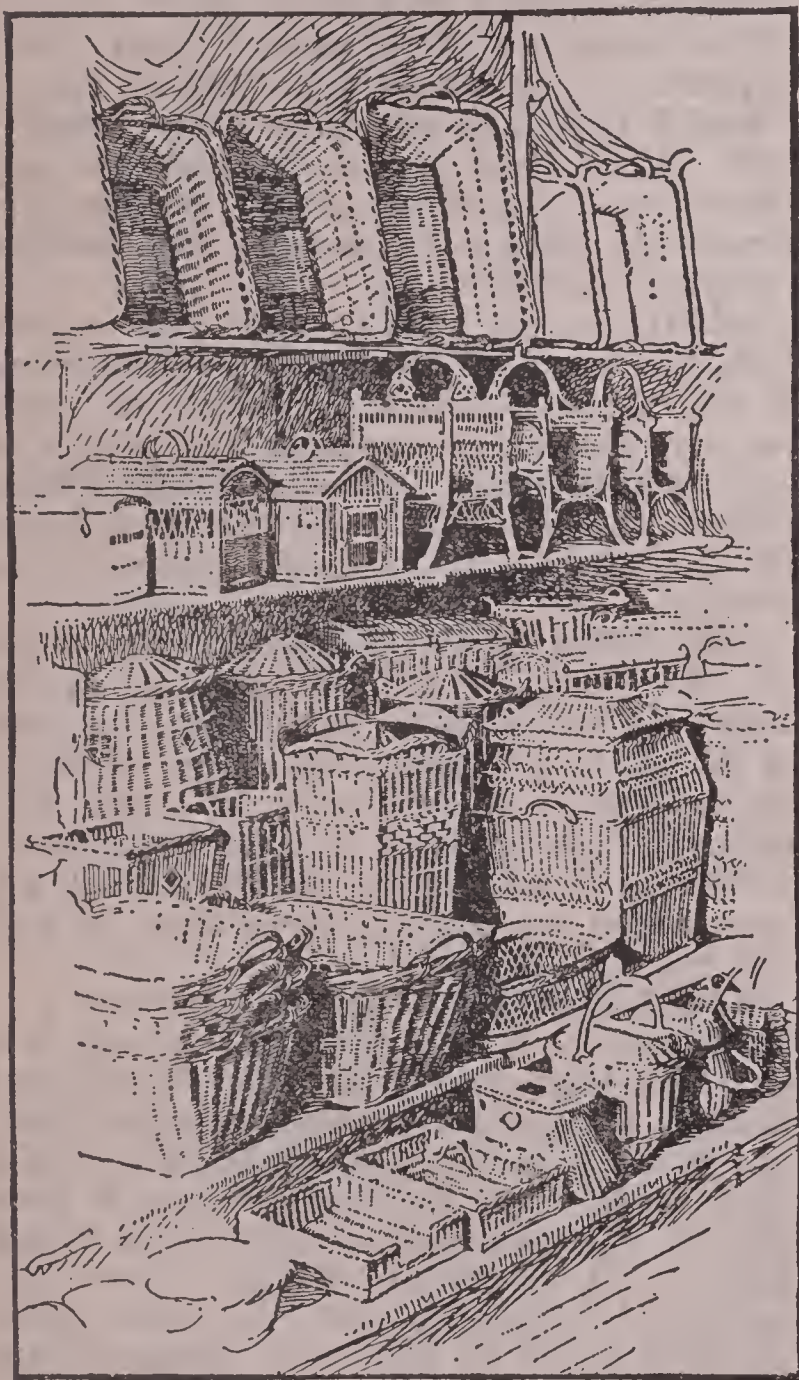
**BASILICA** (ba-zīl'ī-kā), in architecture, a public hall or a courthouse. The term was used extensively among the ancient Greeks and Romans, and had reference to the public buildings in which princes and magistrates administered justice. The Basilica Portia, built about 182 B. C., is among the first mentioned in Roman history. Structures of this class were very numerous in Rome and the provincial towns, especially before the time of Constantine I., and subsequently they were converted into Christian churches. They were usually surrounded by a peristyle of columns, and at one end was a semicircular or square apse. The five great patriarchal churches in Rome are still called basilicas. The term is used more or less in speaking of cathedrals, among them the cathedral in Quebec, Canada.

**BASILISK** (băz'ī-līsk), in fable, a creature variously represented to resemble a serpent, lizard, and dragon, and reputed to possess a fatal breath. In modern zoölogy the name is applied to a small reptile with four feet, a long



tail, and a broad, membranous hood at the back of the head. These animals inhabit tropical regions, especially Central and South America, where they live near or in the water. They swim and climb trees with ease. Some species attain a length of thirty inches. They are hunted for food in some parts of the West Indies.

**BASIN** (bā'sin), in geography, a term used to describe a collection of water, as a river,



BASKETS.

sea, or bay. In physical geography the term is applied to the area drained by a river or a river system. The highest line between two basins is the *divide* or *watershed*. In geology it is used to designate a depression of a strata which has later become filled with deposits. Some geologists think geological basins were cut out\* by the action of glaciers.

**BASKET** (bās'kēt), a light, airy vessel used for domestic purposes. Baskets were made long before the Christian era, and remains of them have been found in the tombs of Egypt.

In ancient times they were made water-tight by a coat of asphalt, and used as vessels to convey liquids. Now many kinds of splints and twigs are woven into baskets, but willow shoots are most commonly used for that purpose. They are prepared by soaking in water, and then peeled by tools and split. Some workmen make a rude product by using willow, ash, elm, and birch shoots without peeling them. Beautiful baskets are made with splints finely worked and nicely decorated with artistic colors. In France, Japan, and China large quantities of elegant baskets are made for the market. The Indians of North America still make very handsome baskets ornamented with beads and shells.

**BASKET BALL**, a popular game played indoors, with a ball thrown by hand into goals. The room in which the game is played is oblong, and the ground or floor contains about 3,500 square feet. At each end is a goal or basket, made by suspending nets of cord from metal rings. The goals are ten feet above the floor and eighteen inches in diameter, and the ball, made of inflated rubber bladder covered with a leather case, is round and from thirty to thirty-two inches in circumference. Two teams of five players each take part in the game, each side having a left and right guard, a center, and a left and a right forward. A referee, who has general supervision, puts the ball in play by throwing it into the center of the field somewhat higher than either of the centers can jump, and at right angles from the side lines. As soon as the ball leaves the referee, each team makes an effort to throw the ball into the basket of the other, and to prevent the opposing side from making a similar goal. The ball cannot be kicked or carried, but must be thrown or batted with the hand. If a player pushes or kicks an opponent or is intentionally rough, the opposing team is permitted to have a throw free at a distance of not less than fifteen feet. A goal from the field counts three points, and a goal made by a free throw counts only one.

Basket ball was invented by James Naismith in 1891. It became popular soon after, and is played extensively by militia companies, by the Young Men's Christian Association, and in many of the schools and colleges. Official rules were drawn up by the Amateur Athletic Union to govern the practice. The game furnishes healthful exercise and calls into use the principal muscles of the body. It requires quickness of perception, attention to points of advantage as the game progresses, and rapidity of thought and action. Besides, it furnishes pastime in the

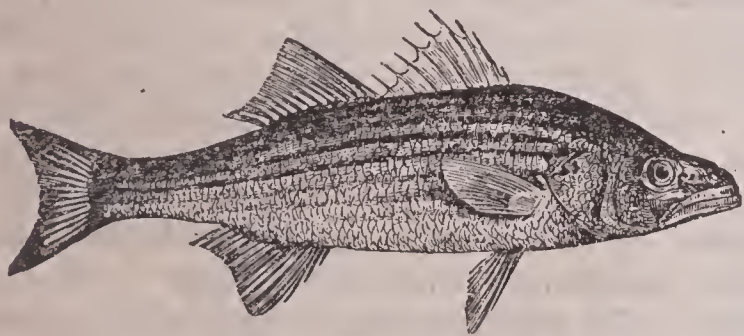


winter season as well as at other times of the year, and is played when football and baseball are out of season.

**BASQUES** (bâsk) a peculiar race of people which probably occupied the whole Iberian Peninsula at a remote date. At present the Basques are confined to the Spanish provinces of Biscay, Alava, Guipuzcoa, and Navarre, and the department of Basses-Pyrénées of France. The total number in Spain and France aggregates about 600,000. Their language, known as the Basque language, has no close affinity with any European tongue. They are considered descendants of the people of ancient Iberia. Their industries are chiefly agriculture, mining, and fishing. They are fond of music and celebrate their holiday, Sunday, in singing and dancing. The name *basque* is applied to a short waist worn by ladies, which was probably copied from the Basque costume.

**BAS-RELIEF** (bâ-rê-lêf'), in sculpture, a kind of art work in which the figures project slightly from the background. In this style the height is about equal to half of the thickness of the figure, but in many sculptures of the 16th century the Italian artists had the figures project very slightly. The palaces of Assyria had bas-relief work set in alabaster, and in the halls were elaborate figures representing their deities and scenes of war and hunting. Bas-reliefs are common in Egyptian monuments, but the most famous examples are those which form the frieze of the Parthenon at Athens. Cavo-relievo are a kind of bas-reliefs in which the whole figure is set below the general surface, and the relief is in a sunken panel.

**BASS** (bâs), a strong, active game fish. The name is applied to widely different fishes of the perch family. Among the common



STRIPED BASS.

American varieties are the *rock bass*, the *black bass*, the *spotted bass*, and the *ruddy bass*. Different species of bass are found both in the sea and in fresh water. Most of them are good for food and make fine sport for anglers, while others are coarse. The usual weight is about two pounds, while the *striped bass*, an American species, attains a weight of thirty pounds.

**BASSETERRE** (bâs-târ'), a city of the British West Indies, capital of the island of Saint Christopher, or Saint Kitts. It has a good harbor and a trade in sugar and fruit. The streets are improved and many of the buildings are modern and substantial. Population, 1906, 9,962.

**BASSETERRE**, a town of the West Indies, capital of the French island of Guadeloupe, at the mouth of a small river. The harbor is poor, but the town has considerable trade. It is the seat of a bishop and has some modern utilities. Population, 1906, 8,626.

**BASSIA**, the name of a genus of plants native to warm climates, including several species of trees valued for their fruit. The *Mahwa tree* of the East Indies is valuable for its timber, and oil is obtained from the seeds. A species yields the shea butter, which is an important article of commerce in the central part of Africa, and is considered quite palatable.

**BASSORA** (bâs'sô-râ), or **Basra**, a commercial city of Asiatic Turkey, capital of a vilayet of the same name, on the Euphrates River. The surrounding country is fertile and produces rice, vegetables, and the date palm. Though poorly built and without modern facilities, the city has an important trade in coffee, drugs, rice, camels, and manufactured articles. A stone wall surrounds the city, and within are several monuments and mosques. It has a military station and is the seat of British and American consulates. Population, 40,000.

**BASS STRAIT** (bâs), a channel north of Tasmania, which it separates from Australia. It is 120 miles wide and is studded with many islands. Flinders Island is on its eastern extremity and Kings Island on its western. The strait was discovered in 1798 by George Bass, a surgeon in the British navy.

**BASSWOOD.** See **Linden**.

**BASTIA** (bâs-tê'à), a seaport and fortified city of Corsica, opposite the Isle of Elba, eighty miles northeast of Ajaccio. Many of the buildings are modern, but the streets are narrow and crooked, and the older part of the city has many small structures. Two harbors, the old and the new, are utilized in its commerce, which includes trade in oil, leather, macaroni, and marble. Dye, soap, and wax candles are manufactured. It was founded in 1380 by the Genoese. Population, 23,675.

**BASTILLE** (bâs-têl'), a word formerly used in France to designate any strong castle defended by bastions, but now specially applied as the name of the prison and citadel of Paris built by Charles V. about 1370. This



structure, though designed as a defense against the English, was used as a state prison for persons of rank who had lost standing in the government and had forfeited public confidence. It had a capacity for seventy or eighty persons, and during the reigns of Louis XIV. and Louis XV. was used most extensively. Those confined were rarely criminals, but rather people who had displeased the king and his associates. These included political offenders, scholars, advocates, and priests, who were often confined so long that they were entirely forgotten by the public. On July 14, 1789, it was captured by a Parisian mob, which signaled the beginning of the Revolution. The next day it was destroyed and not a vestige now remains. Its site is marked by a column in the Place de la Bastille. The *fall of the Bastille* is an important epoch in French history and marks the downfall of the old monarchy.

**BASUTOLAND** (bâ-sōō'tō-länd), a British possession in South Africa, northeast of Cape Colony. The area is 10,293 square miles. It is bounded by the Orange River Colony, Natal, and Cape Colony, and is drained largely by head streams of the Orange River. The region is well watered and has a fine growth of grasses and forests. The climate is healthful and well fitted for Europeans. Coal, iron, and copper are the chief minerals. Agriculture is the leading industry. The possession was annexed to Cape Colony in 1871, and placed under the authority of the crown in 1884. Its government is administered under the direction of a high commissioner for South Africa, through a resident commissioner; the legislative power of the former is exercised by proclamation. The colony has about 260 schools, at which 13,120 pupils receive instruction. Several highways have been constructed and communication has been established with other South African countries by telegraph and railway lines. The native Basutos are a superior race of South Africa and are somewhat advanced in the arts of civilization. Maseru, the capital, has a population of 1,350. In 1904 the total population was 348,626, of which number 895 were whites.

**BAT** (băt), an animal with wings composed largely of a thin, membranous skin, which is stretched from the fingers of the fore limbs and along the sides back to the hind limbs and tail. It moves about in the twilight and darkness and is the only mammal that can fly with facility. The bat is found in the temperate and warm regions, but attains its greatest size and is most numerous in the tropics. The

bats of the temperate climate are mouselike in appearance, and, when stretched, their wings measure about sixteen inches. In the daytime they frequent caverns, hollow trees, crevices of ruins, and isolated lurking places, and at night come out to feed upon insects. During the entire winter season they sleep, except in warm climates. Many species sleep in daytime, hanging by their hind legs, head downward. Bats are more or less abundant in all countries, except in the extreme north and south. Some varieties are fruit-eating animals and live in orchards and vineyards, while others support themselves by sucking the blood of other mam-



HANGING BAT.

mals; this class is known as *vampire bats*. There are no less than 450 species of bats, but all are classed as mammiferous quadrupeds. They show great attachment for their young, often endeavoring to protect them in case of danger, even submitting to captivity rather than forsake them. The Australian *kalong* is the largest of the bats.

**BATANGAS** (bâ-tân'gäs), a city of the Philippines, capital of a province of the same name, in Luzon, fifty-two miles south of Manila. It is a seaport city of considerable importance and has a good harbor on Batangas Bay, an inlet from the Pacific. Among the chief buildings are the public library, a convent, and a palace. It has a large export trade and telegraph connections with interior and continental points. The manufactures include cigars, earthenware, clothing, and utensils. Waterworks and electric lights have been installed. It was captured by the United States in 1899, in the war against the natives. Population, 1901, 37,400.

**BATAVIA** (bâ-tâ'vî-à), a seaport city on the north coast of Java, capital of the Dutch East Indies, in the Province of Batavia. It is located on a large bay and is unhealthy, owing to its hot climate and low site. Europeans have improved the city by a system



of drainage and by building the new part on a more elevated tract of land. The chief buildings include the post office, the Java Bank, the Exchange building, the museum, and several Javanese temples. Among the modern improvements are electric lights, waterworks, and electric street railways. It has a large export trade in sugar, rice, coffee, tea, oil, indigo, and hides, principally with Holland. It was founded in 1619 by the Dutch, who improved it by building canals and an extensive harbor. A large per cent. of the inhabitants are Chinese and Malays. Population, 1906, 116,887.

**BATAVIA**, county seat of Genesee County, New York, 36 miles east of Buffalo, on the Lehigh Valley, the Erie, and the New Central railways. It is surrounded by a productive agricultural country, and is the seat of manufacturing establishments producing implements, machinery, shoes, textiles, canned goods, and flour. The chief buildings include the public library, the county courthouse, and the State School for the Blind. A monument to William Morgan, noted for his connection with the anti-Masonic movement in 1826, stands in a public place. It has a growing trade in merchandise and is improved by numerous municipal facilities. The city was founded in 1800. Population, 1905, 10,080; in 1910, 11,613.

**BATH** (bāth), a city of Somersetshire, England, on the Avon River. It is noted for its mineral water and baths. The mineral springs were known to the Romans, and remains of baths constructed by them in the 1st century B. C. have been discovered. The city is built largely of white stone obtained from quarries in the vicinity. Victoria Park, a beautiful public ground, contains fifty acres. The chief buildings are a public library, the theater, the Abbey Church, and the city hall. It is the seat of Bath College and Wesleyan College. It has important manufactures and a large railway and canal trade. Population, 1907, 48,885.

**BATH**, a city of Maine, county seat of Sagadahoc County, on the Kennebec River, about thirty-eight miles northeast of Portland. It is on the Maine Central Railroad and has extensive navigation facilities, as the water of the river rarely freezes. The manufactures include cigars, furniture, iron and leather wares, clothing, and machinery. It is surrounded by an agricultural country and has modern conveniences, including pavements and street railways. The first settlement was made in 1660, when an Indian mission was established. It was incorporated as a city in 1847. Population, 1900, 10,477.

**BATH**, a town in New York, county seat of

Steuben County, 98 miles southeast of Buffalo, on the Erie and other railroads. It has manufactures of harness, shoes, and clothing. The surrounding country is agricultural. It is the seat of an orphan asylum and a soldiers' and sailors' home, and has a public library and several county buildings. The first settlement was made on the site of Bath in 1793. Population, 1905, 4,894.

**BATHING** (bāth'ing), the immersion of the body, or a part of it, in water for the purpose of maintaining cleanliness and stimulating health. It was a part of the religion of many ancient nations, including the Egyptians, Hebrews, and Greeks, to bathe the body. The Koran makes it mandatory on Mohammedans to wash the face, hands, and feet five times a day. This command is observed so carefully that when the Moslem is in a desert and out of the reach of water the ceremony is performed with sand. The Romans built the most splendid baths constructed by the ancients. In the time of Emperor Diocletian the Roman baths had a capacity sufficient for 18,000 persons to bathe at once, while Emperor Caracalla built baths nearly a quarter of a mile square. These structures were provided with washing rooms, courts for games, gymnasiums, hot and cold water baths, vapor baths, swimming baths, and hot-air baths, and their walls were decorated with marbles, statues, mosaics, and historic paintings.

Baths are variously designated from the character of the process to which the body is subjected. A *Turkish bath* is applied by admitting hot air into the room where the bather sits, and the heat of the air is constantly increased until he perspires freely, when he goes into a washroom, where his body is briskly scrubbed with water and soap and cooled by a shower bath. He next plunges into a swimming bath of cool water, where he bathes freely, and, after emerging, he is dried, wrapped in a blanket, and lies down on a lounge until the natural warmth of the body returns. A *Russian bath* differs from the Turkish in that the hot air is displaced by hot steam, but in other respects they are similar.

A hot bath brings the blood near the surface, which reddens the skin, the veins become enlarged, and a heaviness is felt in the head. The effect of violent heat is to fatigue the body, hence warm baths should be carefully administered. The better way is to take lukewarm baths and increase the heat from time to time as the body becomes accustomed to it. A warm bath gives no shock to the bather and is always pleasant. It has a tendency to quiet the nerves



and increase the flow of blood, and is the best form for most persons. A cold bath causes a sudden chill, and is followed by a feeling of warmth, which is called a *reaction*. The bather should remain in water only until he feels the reaction, when he should come out and rub himself dry with a coarse towel. None but the strong are able to endure a cold bath, and this administered carefully is of much utility. *Sea bathing* is one of the most pleasant and beneficial exercises for the body. The salt water seems to have a wholesome effect upon the skin and is quickening to the organs, if the bather does not remain too long in the water.

Baths are usually known by the degree of temperature at which the water or vapor is administered. The average temperature of a cold bath is about 48° Fahr.; cool bath, 58°; tepid bath, 88°; warm bath, 95°; and hot bath, 100°. In many cities mineral water flowing from the ground is utilized for bathing purposes. Some of the most noted mineral baths in Europe are at Baden, Karlsbad, and Aachen, Germany; Spa, Belgium; and Teplitz, Bohemia. The leading natural hot baths of North America are at Hot Springs, Ark., and Hot Springs, S. D. The water is both mineral and thermal, ranging in temperature from 100° to 160°. Thousands of people patronize these health resorts, and indulge in bathing both for pastime and to regain lost health. Many physical ailments can be cured and the system can be greatly strengthened by the use of these natural remedies. In recent years it has become quite general to construct water systems, by which dwelling houses having bath tubs are supplied with water. In this way every member of the family can avail himself of a healthful bath without inconvenience, and have it administered at the proper time. Though bathing is generally healthful, a person should not remain too long in the water, and bathing within three hours after a meal should be carefully avoided.

**BATH, Knights of the**, a military order in Great Britain, the largest in number and the highest to which a commoner can attain. It was so named from the ceremony of bathing, which was formerly practiced when a knight was initiated, hence indicated that both purity and chivalry were required. The order probably dates from the early part of the 12th century, and it is thought that it was instituted by Henry I., who is said to have made Geoffrey of Anjou and others "Knights of the Bath." It was used in the coronation of Charles II., in 1660, and later fell into disuse, but was revived by George I. in 1725. At present it com-

prises three classes, Knights Grand Cross (G. C. B.), Knights Commander (K. C. B.), and Companions (C. B.).

**BATHOMETER** (bà-thöm'è-tër), an instrument to indicate the depth of water. It was invented by C. W. Siemens and is used on vessels, indicating the depth of the water below the ship or steamer. The instruments belonging to this class differ materially, ranging from the simpler forms used to measure shallows to the more complicated apparatus necessary to determine great depths. In general they depend upon the principle that underlies the law of gravitation, and that the attraction exerted by the land is stronger than that of water. The essential part is a vertical steel tube, at the lower end of which is a cup-shaped expansion, and the depth of the water is indicated on a micrometer scale as the mercury rises or falls in the tube. In some instruments oil or water is used instead of mercury. The column in the tube lowers in shallow water, since greater force is exerted in drawing down the mercury, and it rises in deeper water to the extent that the force is diminished. A sounding line is used to sink the instrument to the bottom.

**BATON ROUGE** (băt'ün-rōōzh), the parish seat of East Baton Rouge parish, and capital of Louisiana, on the east side of the Mississippi River, about ninety miles by railroad and 130 by river from New Orleans. It is on the Texas Pacific and the Yazoo and Mississippi Valley railroads, and occupies a prominence about twenty-five feet above high-water mark. The city is the seat of the State University, an asylum for the deaf and dumb, a military hospital, an agricultural experiment station, and a State penitentiary. Among the prominent buildings are the State capitol, the courthouse, the post office, the high school, and the city hall. It has manufactures of sugar, ice, clothing, cotton products, and machinery. Electric street railways, waterworks, and paved streets are among the improvements. It was founded by the French and was the capital from 1847 to 1864, when the seat of the State government was removed to New Orleans, but it was again made the State capital in 1880. The Union army occupied it in the Civil War, after New Orleans had been taken, and it suffered a Confederate attack under General Breckinridge, but was held by the Union army under General Williams, who was slain in battle. Population, 1900, 11,269.

**BATTALION** (băt-tăl'yün), the tactical unit of infantry. It constitutes the most numerous body of unmounted men in charge of one commanding officer who gives personal super-



intendence. It is made up of from four to ten companies, has a normal war strength of 1,000 men, and is commanded by a field officer. A regiment is constituted of two or more battalions; a brigade, of two or more regiments; a division, of two or more brigades; an army corps, of two or more divisions, and an army, of two or more army corps. See **Army**.

**BATTERING-RAM** (băt'tēr-īng-rām), an ancient war machine to batter down walls of forts and cities. It consisted of a great wooden beam with a heavy bronze or iron head. The length was from 50 to 180 feet, and the head of large rams weighed a ton. Many were built in frames, while others were on rollers or wheels with a cover over the front to protect the workers from falling missiles. The work of the ram was effected by about one hundred men, or by the use of ropes and pulleys. It was regarded an essential implement in the time of the ancient Greeks and Romans, who employed it extensively while laying siege to fortified cities.

**BATTERY** (băt'tēr-ĭ), the tactical unit of artillery. The term is applied to the largest number of mobile guns, with full equipments, that one man can personally superintend. They are usually distinguished as horse, field, and garrison. The first two consist of six guns each. Along with each battery are gunners to work the guns. Each battery includes a number of drivers who manage the horses by which the guns are transported from one locality to another. See **Artillery**.

**BATTLE** (băt't'l), a combat between two or more armies, or divisions of armies. Battles are fought either with the view of attaining local advantage, or influencing favorably the whole contest. The skillful commander aims to reach a decisive point in each engagement. This is *strategy*, while skill in active battle is called *tactics*. Each victory must be followed up in order to fully disable the beaten army and thereby gain the advantage of success. Battles do not depend upon their magnitude for importance, but rather upon their enduring effect upon social and political conditions. In Creasy's "Fifteen Decisive Battles of the World, from Marathon to Waterloo," a list of the battles is given that have largely influenced history and made civilization, more or less, what it is. The mind fills with awe when contemplating what human institutions might have been had these battles terminated differently. The following is a complete list as given by Creasy:

- B. C.  
490. Battle of Marathon.  
413. Defeat of the Athenians at Syracuse.  
331. Battle of Arbela.  
207. Battle of the Metaurus.

A. D.

9. Defeat of the Romans under Varus.  
451. Battle of Chalons.  
732. Battle of Tours.  
1066. Battle of Hastings.  
1429. Joan of Arc's victory at Orleans.  
1588. Defeat of the Spanish Armada.  
1704. Battle of Blenheim.  
1709. Battle of Pultowa.  
1777. Defeat of Burgoyne at Saratoga.  
1792. Battle of Valmy.  
1815. Battle of Waterloo.

**BATTLE CREEK** (-krĕk), a city of Michigan, in Calhoun County, on the Kalamazoo River, and on the Chicago and Grand Trunk, the Cincinnati Northern, and the Michigan Central railroads. The chief buildings are the post office, the high school, the public library, and the Post Theater. It has manufactures of threshing machines, knit goods, flour, furniture, hardware, carriages, machinery, and farming implements. Battle Creek College was founded here by the Seventh Day Adventists, in 1874, and later they established a sanitarium, which is attracting a large patronage. Health foods are made on a large scale at the sanitarium. The city has fine municipal facilities, and is noted as an educational and commercial center. It was incorporated as a city in 1860. Population, 1904, 22,213; in 1910, 25,267.

**BATTLEFORD** (băt't'l-fôrd), a town in Saskatchewan, at the junction of the Battle and North Saskatchewan rivers, near the line of the Canadian Northern Railway. It was the capital of the Northwest Territory from 1876 to 1883, and near it was organized the insurrection headed by Louis Riel. The surrounding country is devoted to farming and ranching. Population, 1901, 797.

**BAUTZEN** (bou'tsen), a city of Germany, in the kingdom of Saxony, on the Spree River, thirty miles northeast of Dresden. It has railroad and electric railway facilities and manufactures of leather, textiles, and clothing. A cathedral, a castle, and the royal palace are among the chief buildings. It became a town in the 10th century, in the reign of Otho I., and suffered greatly during the Thirty Years' War. In 1813 it was the scene of a great battle between Napoleon, with an army of 130,000 men, and an allied army of 90,000 Germans and Russians. Napoleon had made the attack and after a contest of two days retreated, having lost about 20,000 men. Population, 1905, 29,419.

**BAVARIA** (bâ-vâ'rĭ-â), Kingdom of, a crown state of Germany, next to Prussia the largest state of the German Empire. It consists of two separate portions, the eastern and larger part, or Bavaria proper, and the western, or Rhenish Bavaria. Eastern Bavaria is surrounded by Austria-Hungary, the Thuringian states, Hesse-Nassau, Saxony, Württem-



berg, Baden, and Hesse. Rhenish Bavaria, or Palatinate, is bounded by Prussia, Alsace-Lorraine, Hesse, and Baden. The area is 29,282 square miles.

**PHYSICAL FEATURES.** The surface is more or less mountainous and most of the boundaries are formed by mountain ranges. In Southern Bavaria are three ranges of the Alps, known locally as the Algäuer Alps, the Salzburger Alps, and the Bavarian Alps. Of the last mentioned the Zug Spitze, 9,725 feet, is the highest peak. The Böhmerwald is in the northeast, and in the north are the Rhöngebirge and the Fichtelgebirge. An elevated plain stretches through the interior of Bavaria, and in the Palatinate are the Harz Mountains, whose peaks reach an elevation of 2,500 feet above the sea. Most of the drainage is by the Danube and its tributaries. These tributaries include the Altmühl, Regen, Vils, and Wörnitz from the north, and the Lech, Inn, Iller, and Isar from the south. The Main River drains the northwestern part. Amersee and Chiemsee are among the lakes in the southern part. The rainfall is greatest in the eastern part of Bavaria, about seventy-five inches, and in the Palatinate and the higher altitudes it averages twenty-four inches annually.

**NATURAL RESOURCES.** Nearly one-third of the kingdom consists of forests, which yield large returns from the sale of timber. The minerals are valuable, especially coal and iron, and there are deposits of salt, graphite, and building stone. The soil is noted for its fertility.

**INDUSTRIES.** Agriculture is the most important enterprise, and is developed to a higher state of perfection than in most of the European countries. Associations and institutes for the purpose of teaching farming are maintained, and the matter of storing seed, selecting choice grades of domestic animals, and harvesting cereals and forage are carried on through coöperative associations. Hay, rye, and oats take the highest rank in the quantity produced. Other products embrace barley, wheat, potatoes, sugar beets, hops, and rape seed. Stock raising is conducted with much care, and the cattle and horses of Bavaria are among the best seen on the European market. The vine-growing industry receives marked attention, especially in the Palatinate.

Manufacturing as an enterprise has developed to a great extent the last two decades, especially in the output of steel and iron. In the manufacture of beer the kingdom takes high rank and its production of spirituous liquors is a notably important enterprise. The manufacture of textiles, leather, tobacco, earthen-

ware, chemicals, and agricultural implements is developed to a considerable extent. Navigation by water is furnished by the Main and Danube rivers and by Lake Constance. The Ludwigs Canal serves as a connecting link between the Black and North seas, since it connects the Main, a tributary of the Rhine, with the Altmühl, a tributary of the Danube. Transportation by steam railways and electric lines is well provided for in all parts of the kingdom.

**GOVERNMENT.** For the purpose of government Bavaria is divided into seven districts. These are Upper Bavaria, Lower Bavaria, Swabia, Upper Palatinate, Lower Franconia; Middle Franconia, Upper Franconia, and Palatinate. The government of the kingdom is a constitutional monarchy; of which the king is the chief executive, and the crown is hereditary in the male line. Six ministers constitute a council of state and assist the king. The legislative power is vested in the king and the parliament, or *landtag*, which consists of the two houses known as the chamber of councilors of the realm, or upper house, and the chamber of deputies, or the lower house. In the former are eighty members and in the lower 159. Bavaria is represented in the *Bundesrat* of the German Empire by six members and in the *Reichstag* by forty-eight. The state provides amply for education, which is free and compulsory. Three famous universities are located at Würzburg, Munich, and Erlangen.

**INHABITANTS.** The inhabitants are almost exclusively German, including only about 50,000 Jews. About thirty-three per cent. are Protestants and more than half of the entire population are Roman Catholics. Munich, the capital, is located on the Isar River. Augsburg, Nuremberg, Ratisbon, Bamberg, Erlangen, Baireuth, and Schweinfurt are the principal commercial centers. In 1905 the kingdom had a population of 6,176,057.

**HISTORY.** In ancient times the territory comprised in Bavaria was inhabited by Celtic tribes, known as the Boii, and the region was conquered by the Romans about the year 15 B. C. It became a possession of the Franks in the time of Charlemagne, in the 8th century, and in 1070 was acquired by the Guelph family. The territory was transferred to Otho, Count of Wittlesbach, in the latter part of the 12th century, and its government has been administered by this family almost without intermission to the present time. Napoleon raised Bavaria to the dignity of a kingdom in 1805, and the king aided France in the Napoleonic wars. The present constitution was adopted in



1818. In 1866 Bavaria sided with Austria in the Austro-Prussian War and lost some territory annexed to it by Napoleon. When Napoleon III. declared war against Germany in 1870, Bavaria joined Prussia and took a prominent part in the military movements against France. It was largely at the suggestion of the King of Bavaria that William of Prussia accepted the title of Emperor of Germany. It has since remained important as an integral part of the empire, influential in its councils, and a leader in promoting the commercial and colonial development of Germany.

**BAY** (bā), or **Bay Tree**, the general name of several trees and shrubs which resemble the laurel, and applied both to the fruit and the trees. The red bay is native to the southern part of the United States and has wood colored much like mahogany. Bay laurel is a term sometimes applied to the common laurel or cherry laurel. The bay tree of California is a fine species, and rose bay is the name sometimes given to species of the azaleas and rhododendrons. Some trees belonging to this class have berries that yield a fatty oil used in veterinary medicines. The leaves are sometimes used in cookery for the flavor, and in England and some other countries as decorations for Christmas. In ancient times sprigs of the bay tree were worn as a signal of victory.

**BAYA** (bā'yà), a kind of weaver bird common in the East Indies. The color is yellow mixed with brown, and the beak is large and conical. Its nests are built in the form of a flask, suspended from a high branch, and the entrance is from below. The male and female birds have separate chambers. It is easily trained to obey and is fond of small articles of ornament.

**BAYAMO** (bā-yä'mö), a town of Cuba, in the province of Santiago, sixty miles northwest of the city of Santiago. It is surrounded by an agricultural country. The Spaniards founded it in 1514. At the time of the Spanish occupation it was prominent as a stronghold of insurgents and revolutionists. Population, 1899, 3,022.

**BAY CITY**, county seat of Bay County, Michigan, on the Saginaw River, seventy-five miles northeast of Lansing. It occupies a fine site about four miles from Saginaw Bay, and is on the Peré Marquette, the Michigan Central, and other railroads. The county courthouse, the post office, the city hall, the Masonic Temple, and the First Presbyterian Church are among the chief buildings. It has city waterworks, fine public schools, and a large library.

The manufactures include furniture, salt, earthenware, machinery, hardware, clothing, and tobacco products. The city is one of the most prosperous in the State, situated in a fine farming and dairying country, and has a large jobbing trade. Its streets are well paved and lighted, and traversed by electric street railways. It was settled in 1836 and chartered as a city in 1865. Population, 1910, 45,166.

**BAYEUX** (bā-yē'), a city of France, in the department of Calvados, Normandy, twenty miles northwest of Caen. It is nicely situated on the Aure River, five miles above its outlet into the English Channel, and has a trade in cattle, grain, and dairy products. The chief building is a cathedral said to be the oldest in Normandy. It occupies the site of the Roman town known as Augustodurum. Population, 1901, 7,315.

**BAYEUX CATHEDRAL**, the oldest cathedral in Normandy, located at Bayeux, France. Most of the present buildings date from the 11th to the 13th centuries. Many notable improvements were made in 1077 by William the Conqueror, and various additions have been added since. To the west are two steeples and several beautiful sculptured porches built in the 12th century.

**BAYEUX TAPESTRY**, a linen cloth twenty inches wide and 214 feet long, on which scenes of the invasion and conquest of England by the Normans were skillfully worked. It is said to be the work of Matilda, the wife of William the Conqueror. The scenes begin with Harold's visit to the Norman court and end with the defeat of the English and the death of Harold at Hastings. It is divided into seventy-two compartments, and on each one the subject of the scene is indicated in Latin inscription. It was discovered in 1730, and is now kept in the library of Bayeux, France, as a valuable record of scenes and customs in the early period of Norman-French history.

**BAYONET** (bā'ö-nēt), a short weapon of steel, constructed something like a dagger, and attached to the end of a musket or rifle. It was so named from the circumstance that the bayonet was first used at Bayonne, France, and it came into general use about the middle of the 17th century. The first bayonets were carried by the soldiers, and when used to repel a cavalry charge, or when making an advance upon the enemy, they were thrust into the muzzle of the gun. Later they were fastened on the outside so as to permit both the use of the bayonet and the gun for firing upon the enemy. With the introduction of modern firearms the bayonet lost some of its impor-



tance as a weapon, but many military men still regard it highly serviceable in making a charge, especially when culminating an infantry attack.

**BAYONNE** (bā-yōn'), a city of New Jersey, in Hudson County, situated immediately southwest of Jersey City, from which it is separated by the Morris Canal. The site is adjacent to New York and Newark bays, on the New Jersey Central Railroad, and within it are included the villages of Bergen Point, Salterville, Bayonne, and Centerville. It has dock facilities, electric street railways, waterworks, pavements, public lighting, and numerous schools. The manufactures embrace lumber products, chemicals, machinery, textiles, and clothing. Many New York business men reside in Bayonne. It was chartered as a city in 1869. Population, 1910, 55,545.

**BAYONNE**, a city of France, in the department of Basses-Pyrénées, on the Adour River, near the Bay of Biscay. It is well built and strongly fortified. It has a commodious harbor, in which three lighthouses are maintained, and its export and import trade is considerable. Sugar refineries and shipyards are among the industries. A cathedral built in the 13th century is its chief building, and it is the seat of a naval school and a public library of 12,000 volumes. Charles IV. of Spain renounced the crown at Bayonne in 1808. Anciently it was called Lapurdum. Population, 27,500.

**BAYREUTH.** See **Baireuth.**

**BAY RUM**, a liquid used for toilet purposes and as a liniment in treating rheumatism. It is obtained by distilling with rum the leaves of the bayberry tree (*Myrcia acris*), which is native to the West Indies.

**BAZAAR** (bā-zār'), or **Bazar**, an exchange or market place where goods are kept for sale. The term is in common use in Eurasia, especially in the East, where a number of shops, either open or covered, are grouped about a square or in a series along the streets. Retail traders occupy the bazaars and offer for sale a variety of small articles, such as shawls, jewelry, household utensils, and wearing apparel. The term is applied in America to places where fancy work and other articles are sold to raise money for the support of an enterprise or for charity.

**BEAD** (bēd), or **Bede**, a small globular or cylindrical body, thirty or forty of which are strung together and worn for ornament or used for decoration. The name is from the Anglo-Saxon word *beade*, or *bede*, signifying a prayer. The Roman Catholics string beads together, to the number of thirty or forty, to

keep count of prayers offered. In this form they constitute a *rosary*. Every tenth one is larger than the rest, called a *gaude*. The *gaudes* are used for counting paternosters, and the ordinary beads for Ave Marias.

**BEAM** (bēm), in architecture, a piece of timber or other material placed across the walls of a building and which serves to support the rafters. It binds together the parts of the frame as a tie and supports weight. Wood was employed chiefly in architecture as beams until in more recent times iron and steel came into very extensive use, and in some cases beams are now made of cement.

The word *beam* is applied in different ways and has several technical uses. A plow beam is the main piece, either of wood or steel, and to it the colter, plowshare, and moldboard are fixed. The main cross timber in a ship is called a beam, and serves to support the deck and prevent the sides from falling apart. The beams used in large steamboats are of iron, extend across the hull, and are supported near the middle by pillars. In a balance the beam is the part from which the scales are suspended, and the term is applied to a part of a weaver's apparatus, usually a wooden cylinder, on which the web is wound.

**BEAN** (bēn), an agricultural product grown for food in early history in Egypt and Palestine, and now largely cultivated in gardens and fields as food for man and beast. It is an annual, from two to twelve feet high. The seeds, usually from four to ten, grow in pods about ten inches long. They are kidney-shaped and measure from one-sixth of an inch to over an inch in length. Beans are nutritious food, containing twenty-three per cent. of nitrogenous matter, similar to casein in cheese, and thirty-six per cent of starch. There are many varieties, colors, and sizes. The so-called *kidney* bean is grown extensively in the gardens of Canada and the United States. Other popular species include the *lima* bean, which is quite large and is harvested for cooking before it is ripe, and



CLIMBING BEAN.



the *string* bean, a variety with fleshy pods. Beans produce from fifteen to fifty bushels to the acre, a bushel weighing sixty pounds.

**BEAR** (bâr), the name of an animal common to both the warm and cold climates. Numerous species are found in America and



GRIZZLY BEAR.

Eurasia, but they do not occur in Australia and Africa. They belong to the carnivorous or flesh-eating animals, but show considerable fondness for honey and some kinds of vegetables, and several species live largely on fruits. In cold climates they attain a larger size and greater strength than in the warmer regions, and are much more savage. The body is stout and muscular, with strong legs, a short tail, and long shaggy fur, and the feet are supplied with strong claws well adapted for climbing and digging. They delight to roam in mountain districts and on the seaside, and are skilled as swimmers. The winter season is spent largely by sleeping in caves, especially by the females, which rear their young in the winter.

Among the many species is the *grizzly bear* of North America, which is found largely in the region of the Rocky Mountains. It is the most ferocious animal of North America and attains a large size, sometimes a length of nine feet, measuring from the nose to the tail, which is very short. It is colored brown, white, and black, and possesses grizzly or shaggy hair. The *black bear* has its home in all the uninhabited parts of North America. It is much smaller than the grizzly bear, about five feet long, has smooth, glossy, black fur, and lives largely on vegetable food, but in case of hunger will attack and carry off small animals like calves and hogs. It delights to climb trees and rob wild bees of their honey. Its character and habits are similar to those of the *brown bear* of Europe, which is solitary and subsists on animal and vegetable foods. The *cinnamon bear* has a color much like cinnamon and re-

sembles the black bear in its habits. The *polar bear* inhabits the northern portions of America and Eurasia. This species is white and of large size, some species being as large as a horse and weighing 1,400 pounds. It hibernates in the winter season, usually in a deep hole dug in the snow or hillside. It lives near the sea or lakes, since it depends upon sea birds, seals, and fish for its principal food. In Southern Asia the *Malayan bear* is found. It is the smallest of the bears and lives exclusively on insects and vegetables and vegetable fruits.

The bear is a cunning animal, both in obtaining its food and in its habits when trained. In a wild state it often watches other animals from behind shelter, such as a rock or a tree, where it carefully studies their habits, and employs ingenious devices whereby it may make a capture. Under training the bear becomes skilled in many arts of amusement and exhibition. It can be taught to carry a gun like a soldier, to dance to music, to beat a drum, and to perform various capers, and, therefore, is employed to a considerable extent in shows and exhibitions of trained wild animals. The clumsy motions, grave manners, and solemn face make its actions interesting. However, it loses none of its cunning in captivity, and has learned to secure rare bits of food from manager and spectators as compensation for exhibiting its best skill.

The bear is hunted for its fur and flesh. Rugs, robes, and overcoats are made of the fur, which has become very expensive within recent years. The flesh is eaten and the fat is used in making bear's grease. Ornaments are made of the teeth and claws.

**BEAR, Great and Little**, known in astronomy as *Ursa Major* and *Ursa Minor*, two constellations in the northern sky near the north star. *Ursa Major* contains 138 stars visible to the naked eye. Among them are seven stars—six of the second and one of the fourth magnitude—which form the *Great Dipper*. *Ursa Minor* contains twenty-four stars, seven of which constitute the *Little Dipper*, and at its handle is *Polaris*, known from time immemorial as the North Polar Star. The latter was called *Cynosure* by the Greeks, and before the invention of the mariner's compass it was the star

“Whose faithful beams conduct the wandering ship  
Through the wide desert of the pathless deep.”

**BEAR and BULL**, two terms applied in the stock exchange and at the board of trade. They were first used in London with reference to two parties having contracted, the one to deliver and the other to take stock at a future time



at a specified price, and in the intervening time the party to deliver sought to depress the price and the party to receive sought to raise the value. From this circumstance the former came to be called a bear, in allusion to the habit of that animal to pull down with its paws, and the latter a bull, from the custom of that animal to throw up its horns. At present the term is used very generally in America and Europe. Those who wish to lower the price are said to *bear stock*, and those who wish to raise it, *bull stock*.

**BEARBERRY** (bâr'běr-rÿ), a small shrub native to America and Eurasia, and found widely distributed in Canada and the northern part of the United States. It has evergreen leaves and produces red berries, which are eaten by wild fowl and other wild animals, especially the bear, hence the name. Some species are used in medicine as an astringent tonic.

**BEARD** (bērd), the hair on the lower part the face of a man, which appears at the age of puberty. Its color is usually lighter than the hair of the head. It is a protection against cold, and serves in preventing dust from being inhaled. Among ancients a long beard was a mark of manliness, and slaves were deprived of beards, though Alexander the Great required his army to shave. The barber's art was first introduced in Rome about 300 B. C. The Normans, at the time of their invasion of England, shaved the entire face and part of the back of the head. Louis XIII. of France was not endowed by nature with a beard, and during his time ornamental trimming of the beard and mustache became general in France, and thence spread over the continent. In the 16th century clergymen generally wore long beards, a custom still common among the priests of Western Asia. The face was wholly shaven at the beginning of the 18th century, but the practice of wearing beards and mustaches was again inaugurated by France in the early part of the last century, and the custom is now quite general.

**BEAR LAKE, Great.** See **Great Bear Lake**.

**BEAR RIVER**, a river of northern Utah and southern Idaho. It rises in Summit County, Utah, in the Uinta Mountains, flows north into Idaho, and after a circuitous course of about 400 miles discharges into Bear River Bay, an inlet from Great Salt Lake. It is geologically an interesting stream and passes through a region greatly diversified by mountains and desert tracts of land. The Oregon Short Line Railway follows the valley through

a portion of Wyoming and Idaho. In Bear Lake County, Idaho, it passes through the northern extremity of North Lake, which is considered a part of Bear Lake lying immediately south.

**BEATRICE** (bē'à-trīs), county seat of Gage County, Nebraska, on the Big Blue River, about forty miles south of Lincoln, on the Chicago, Rock Island and Pacific, the Union Pacific, the Burlington Route, and other railroads. Besides numerous substantial buildings, it has a fine stone courthouse, a Federal building, and a public library. The city has excellent public schools and a business college, and is the seat of the Nebraska Institution for Feeble-Minded Youths. It is noted for its quarries of magnesian limestone, which is used largely for building material. The manufactures consist of clothing, cigars, and machinery. Large quantities of cereals and live stock are shipped to eastern and southern markets. Population, 1900, 7,875.

**BEAUMONT** (bō'mönt), a city in Texas, county seat of Jefferson County, on the Neches River. It is situated on gently rolling ground and has transportation facilities by the Kansas City Southern, the Texas and New Orleans, and other railroads. The surrounding country contains productive deposits of petroleum and natural gas, which take high rank among the most important of America. The chief buildings include the county courthouse, the central high school, the post office, the public library, and many churches. It has electric street railways and other municipal improvements, and is an important market for petroleum, lumber, and farm produce. The manufactures include lumber products, machinery, cigars, flour, utensils, and clothing. Its rapid growth dates from the discovery of petroleum in 1901. Population, 1900, 9,427.

**BEAUVAIS** (bō-vă'), a city in France, capital of the department of Oise, on the Thérian River, forty-one miles northwest of Paris. It is nicely situated in a fertile valley and has manufactures of Goeblin tapestry, woolen goods, carpets, and cotton textiles. Railroad and electric facilities are among its improvements. The chief building is the cathedral of Saint Pierre, in the Gothic style, but it is not entirely finished. Beauvais was besieged in 1472 by Charles the Bold, Duke of Burgundy, who was repulsed after a heroic defense under the leadership of the heroine Jeanne Lainé. Population, 1901, 17,265.

**BEAVER** (bē'vēr), a rodent quadruped valued for its fur. The body is about two feet long, has a flat, scaly tail ten inches long, and



weighs from thirty to sixty pounds. Its color is chestnut or reddish-brown, but sometimes black ones are found, and some are white. The feet have five toes. The fore feet are designed for work in preparing material for habitations, and the hind feet are webbed for swimming. Beavers are found mostly in the northern parts of North America and Eurasia, but small colonies still exist in Central Europe. They are most numerous in the northwestern parts of North America and Central Russia, but formerly they were very common in all parts of these divisions.

Beavers are classed among the semi-aquatic animals that live near lakes, rivers, and other waters where trees and shrubs abound. Their houses are built at the edge of the water, and they dam bodies of water that are sufficiently shallow to freeze solid in the winter, in order to increase the water mass and thus prevent it from freezing to the bottom. These dams are



BEAVER.

constructed of small trees, stones, and grasses mixed with mud. The mud is put on with the feet and smoothed down by the tail, which resembles a trowel. They are skillful at cutting down trees, even as thick as one foot in diameter, and usually cut in largely from the side near the water so as to cause the tree to fall in that direction. Their work is done at night. They subsist on roots, bark, and water plants, of which they lay by a sufficient supply for the winter.

The beaver is valuable for its fur, which is used for ladies' cloaks, for dress trimmings, and for men's collars and gloves. In the 17th century beaver fur was used largely in the manufacture of men's hats, from which high hats came to be called *beavers*. Similar hats are now made with silk plush covering. In the early part of the last century fully 200,000 beaver skins were exported annually from America, but the trade has become greatly limited, owing to a general destruction of the

beaver in settled districts. The meat of the beaver is prized as an article of food, but the tail is a delicacy. The animal yields an anti-spasmodic medicine.

**BEAVERDAM**, a city of Wisconsin, in Dodge County, about sixty miles northwest of Milwaukee, on the Chicago, Milwaukee and Saint Paul Railroad. It is beautifully situated on Beaver Lake, near the outlet, which furnishes water power. It has a public library and is the seat of Wayland Academy. The manufactures include flour, hardware, machinery, cigars, and farming utensils. It was settled in 1841 and incorporated in 1856. Population, 1905, 5,615.

**BEAVER FALLS**, county seat of Beaver County, Pennsylvania, on Beaver River, near its junction with the Ohio, thirty miles northwest of Pittsburg. It is located in a fertile district, which produces cereals and live stock, and is on the Erie and the Pennsylvania railroads. The city has an abundance of water power, and coal and natural gas are obtained in the vicinity. The manufactures include cars, fence wire, ironware, stoves, machinery, flour, and farming implements. The chief buildings include the county court house, the public library, and Geneva College. It was formerly called Brighton. Population, 1900, 10,054.

**BECHUANA** (bĕch-ŏŏ-ă'nā), a race of people that occupy the interior part of South Africa, including the region north of Cape Colony and a large part of the Kalahari Desert. They have frizzled hair, but not kinky, thick lips and nostrils, and are of a dark brown or bronze color. The language spoken belongs to the Bantu family and is copious and expressive. Their chief occupation is cattle raising and agriculture, and they engage in a small way in mining and manufacturing. In the mode of life they are not nomadic, but live in villages. The section occupied by them is known as Bechuanaland, which was long a crown colony of England, but was annexed to Cape Colony in 1895. See **Cape Colony**.

**BED**, an article of household furniture in which to sleep. Savages sleep on the ground or on skins of animals, while the Japanese sleep on mattresses, using a wooden rest for their heads which closely fits to the neck, and the Chinese use low bedsteads generally elevated only a small distance above the floor. The beds used in America are similar to those common to Europe. They consist of a mattress supported from the ground by a bedstead. Some use folding beds, which serve for beds at night and articles of furniture in the daytime. In former times feathers were the principal articles used



in making beds and bed coverings, and they are still used, but mattresses now form one of the chief articles used for bedding. Bedsteads were formerly made exclusively of wood; now they consist largely of iron frames with steel springs covered with mattresses. The best mattresses are made of horsehair, while cheaper grades are made of shavings of paper and wood.

**BED**, or **Stratum**, in geology, a layer of stratified sedimentary rock of similar materials. Formations of this kind are due to the ebb and flow of the tide, and to the movement of silt or material deposited by rivers and the action of waves. The strata differ materially, consisting of several layers or of single sheets or beds. A thin layer is called *lamina* or seam, and where several beds of the same kind of rock are deposited the aggregate is termed a formation.

**BEDBUG** (bĕd'bŭg), an insect found in pigeon houses, nests of swallows and bats, and in beds. It hides away in the daytime and comes out to seek its food at night. The body is flat and the head small. The younger insects are almost white, while the adults have a reddish color. Their food consists largely of blood drawn from the body by pricking through the skin and sucking it out. Bedbugs are eaten by cockroaches, by which they are killed in large numbers.

**BEDFORD** (bĕd'fĕrd), a town in England, capital of Bedfordshire, forty-five miles northwest of London. It is pleasantly situated on the Ouse River and has railway facilities. The public buildings include a library, a prison, an insane asylum, and a fine Gothic church. Ironware is manufactured extensively, especially farming implements, and it has a large trade in lace, corn, and straw hats. Near the town is Elstow, the village where John Bunyan was born, and he wrote his "Pilgrim's Progress" while a prisoner in the town jail of Bedford. Population, 1901, 35,114.

**BEDFORD**, county seat of Lawrence County, Indiana, in the southern part of the State, on the Baltimore and Ohio and other railroads. In its vicinity are important deposits of limestone, which is quarried extensively for building purposes. It has railroad shops, roundhouses, machine shops, and other industries. The city has a considerable trade and fine public buildings, and is the seat of Bedford College. It was settled in 1756 and incorporated in 1817. Population, 1900, 6,115.

**BEDLAM** (bĕd'lam), or **Bethlehem**, a celebrated hospital for the insane in London. It was formerly the priory of Saint Mary of Bethlehem, and was converted into an asylum in 1647. The patients were removed to Saint

George's Fields in 1814, where the accommodations are first class. Bedlam became notorious because the inmates were treated very brutally, hence the name is synonymous with a place of uproar or wild confusion.

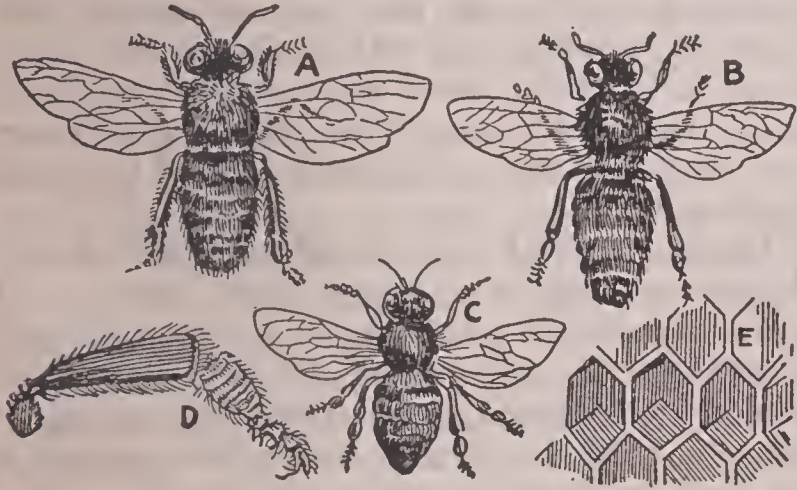
**BEDLOE'S ISLAND** (bĕd'lōz), so named from the former owner, and secured as property of the government in 1800. It is located in New York Harbor, within the corporate limits of New York City, about one mile southwest of the Battery. The area is thirteen acres. In 1841 the government erected a fort upon it, known as Fort Wood, and in 1884 it became the site of the statue of "Liberty Enlightening the World."

**BEDOUINS** (bĕd'ōō-ēnz), meaning *dwellers in the desert*, a Mohammedan people of the Arab race who lead a wandering life in the deserts of Northern Africa and Western Asia. Originally they were confined to the deserts of Arabia, but at the present time they occupy many regions. They engage in the occupation of shepherds, horse breeders, and herdsmen, and often secure means of subsistence by robbery and plunder. Their government is in families under shieks, or tribes under emirs. Though ignorant of written books, they know history by tradition, most of which relates to the genealogy of their own people. The men dress in long shirt-skirts, protect their feet with sandals, and wear red and yellow handkerchiefs to cover their heads. They manufacture their own material for clothing, subsist largely from their herds, and eat locusts, rice, honey, and the flesh of small animals. Some tribes are advanced in agriculture and have fixed homes. The lance is the weapon in general use among the Bedouin tribes.

**BEE**, the name of any one of a large group of insects, of which the honeybee is the most important representative. In the classification of Linnaeus, all the insects of this group were assigned to the genus *Apis*, but this term is now generally restricted to the honeybee, and the group is classified as two families, the *Apidae* and the *Andrenidae*. In general, it may be said of bees that the head and thorax have feathery hairs, the hind feet are flattened, and the tongue is fitted to lap the nectar of flowers. Probably about 5,000 species are included in the group. The honeybee is considered the most intelligent of the insects. Owing to its industry and the useful product resulting from its labor, it has from remote times attracted general attention and interest. It is probable that more has been written about bees than about any nation of people. At present they abound in almost all parts of the world, except in extremely cold regions.



**THE HONEYBEE.** The honeybee lives in communities or *swarms* made up of three classes: *queens*, *workers*, and *males*. The workers are females whose generative organs are imperfectly developed and they rarely produce eggs. In each swarm there is but one true female, called the *queen*. She is impregnated by the male while in the air and never leaves the hive at any other time, except when swarming. A few days after impregnation she begins to lay the eggs, one in each cell, and some days she deposits as many as 3,000. The queen bee is longer than either the males or the workers



A. Drone; B, Queen; C, Worker; D, Leg of Worker; E, Cells for Honey.

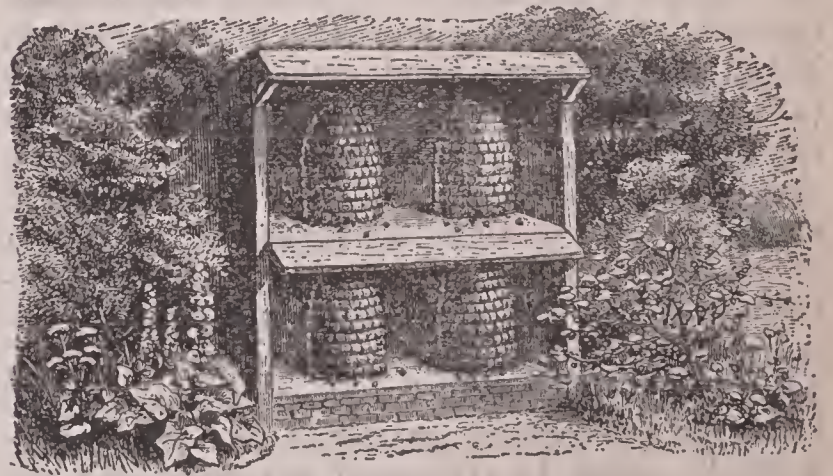
and can be easily distinguished from the others. The males are called *drones* from the low humming sound which they make in their flight. They do not work and average usually about one drone to every thirty bees. All the work of the society is done by the workers. They gather the honey, make the wax, build the cells, and feed and take care of the young. After the swarming season is over, they kill or expel the drones, as if to economize the food which they lay up for winter.

The eggs are deposited in different cells, some for workers, and others for drones and queens. The eggs produce small white larvae in about three days. They are fed with pollen or dust of flowers mixed with water and honey by the workers. After being fed five or six days, they begin to spin a cocoon around themselves. The young bees mature from the cocoon in about sixteen days. The queen bee inspects the size of the hive and the number of young queens about to leave the cocoons, and if she finds the swarm small the young queens are killed, but if the society is large one is permitted to come out.

When the young queen appears, the old queen goes from the hive and takes with her a part of the bees, forming a new community. This is called swarming and takes place in the summer season; in the temperate climates this

occurs two or three times each season. The new swarm may be easily secured by watching the society in the swarming season, and keeping an empty hive near by, in which the bees will soon begin to make honeycomb and deposit honey. But if no such hive is provided, and in timber districts where communities live in trees, the new swarm moves from place to place until it finds a hollow tree or some suitable place in which to found its home. The old hive is governed by the new queen until another queen appears, when she forms a swarm and seeks a new location. In cases where two queens come out at the same time, as they sometimes do, they fight each other until one of them is killed.

Bees are very active and strong. They make flights to gather food at great distances, which they easily endure without stopping to rest. When they are some distance from the hive, they fly up into the air to observe the direction, and then take the shortest line for the hive. In timber districts, where bees hive in trees, they seek water at the brooks, and their location may be found easily by observing the direction in which they fly after leaving the brook, or the flower where they gathered food. From this habit of bees we have the term *bee line*. The workers and queens each have stings in the back of the body, while the drones are stingless. The sting of a bee is effected by making a wound with a sheath, into which poison is injected and a dart is thrust in to deepen the



OLD STYLE BEE HIVE.

wound. When the sting is lost, the bee dies. Insects die from the effect of a bee sting, while man and animals have been killed by the attacks of large swarms. The health of bees is remarkable and their diseases are few. The greatest cause of harm is want of good sanitation, too close confinement, dampness, and want of ventilation. In caring for bees it is necessary to provide them with abundant pasture. New swarms should be fed with syrup. An abundant supply of water is essential to good health.



Pollen and the sweet juices of flowers are the food of bees. They go from flower to flower and gather the pollen on the hairs of their legs, while the sweet juices of flowers are taken up by the trunk. The trunk is made up of several divisions so it can be turned easily, bent, shortened, or lengthened to fit the flower cup, which enables them to easily gather the sweets. The front legs and trunk serve to gather juices and pollen from flowers not full blown. The juices are passed from the trunk into a kind of stomach or honey-bag, where they are changed into honey. This stomach serves only for the purpose of making honey, as they possess a second stomach for the digestion of food. The stomach for honey is so constructed that its contents may be utilized at any time for storing in the cells or feeding the young. The workers make the wax by a process of growth on the back part of the body, where a pouch is located filled with wax sticks, from which it is taken by the bees and used in making honeycomb. The honeycomb is constructed of cells, some being used for honey and others for eggs. These cells are in the form of a hexagon, which form serves the best purpose and economizes space.

The cells in which honey is deposited are slightly larger than those intended for hatching, and are constructed nearly horizontally, which admits of easy filling, and the honey is retained in the cells chiefly by capillary attraction. In constructing honeycomb the bees begin at the top of the hive and build downward, placing cells back to back in the process of construction. When the cells are filled with honey they are carefully sealed up with wax to prevent it from escaping. In the construction of honeycomb the entire space is utilized, with here and there small openings to allow the passage to and from the different parts of the hive. Large bee-keepers supply the hive with small frames containing the foundations for honeycomb, which, when filled with honey, are taken from the hive, put in a honey extractor, and the frame with the comb is afterward put back into the hive. In this way the bees are enabled to use one set of comb a number of times, thereby increasing their production of honey. Many bee-keepers feed their bees with syrup, more or less, the entire year, thereby maintaining the swarm and utilizing practically all the honey production. A fair-sized community includes one queen, from five to eight hundred drones, and from fifteen thousand to twenty-two thousand workers. The weight of a good swarm is from six to ten pounds.

**CLASSIFICATION.** Bees have been variously classified according to their habits. The newest

classification, which has been suggested by W. H. Ashmead of the United States Museum, divides them into fourteen groups. Of these the first two, the honeybee and the bumblebee, are called social in their habits, because they live in communities. All other bees are solitary in their habits, each one living and working alone. They include some very interesting species, such as the leaf-cutting bee, which cuts off the leaves of plants to line its nest. Another is the carpenter bee, which bores tunnels into the stems of pithy plants, such as the brambles, in which the eggs are laid. The mason bee builds its nests of mud or moistened clay. Bees as a whole are extremely useful in the cross fertilization, since they carry the pollen as they pass from bloom to bloom. Indeed, clover can be grown successfully only where this work is done by bees.

**BEECH** (bēch), a useful and well known deciduous tree of America and Eurasia. It grows to a height of about one hundred feet and a diameter of four feet, and is a fine ornamental tree, especially when standing alone. Its wood is solid, but brittle, and when exposed to air rots easily or is eaten by worms. Under water it is very durable, and thus serves a good purpose in constructing sluices and water mills. In France it is used in the manufacture of wooden shoes, and in many countries for furniture. The fruit is a three-sided nut and is used as a substitute in making coffee and a kind of bread. In some countries the fruit is pressed to express the oil, known as *beech oil*, which serves for food and lighting purposes. The common species include the *white beech*, *red beech*, and *copper beech*. Large beech forests were abundant in England and Western Europe in ancient times, where herds of swine were fed on the fruit.

**BEE-EATER** (bē'ēt-ēr), the name applied to several birds related to the kingfisher. They have long wings and a greenish color, resemble swallows in flight, and prey upon wasps, bees, and other insects. Their nests are built in holes, which they construct in river banks or on the seaside. In many places, especially on the Volga and Don, they have honeycombed the banks by excavations. In some countries they are a pest on account of their destruction of bees, which they catch on the wing. Their feathers are valuable as an article for ornaments.

**BEEF** (bēf), the flesh of the ox or cow, used either fresh or salted. It is the most nutritious of all meats, and is well adapted to the most delicate constitutions. A beefsteak is known by the part of the animal from which



it is taken, as rib, sirloin, or round. Porterhouse, sirloin, and prime are considered the best cuts. The best quality comes from well-fed animals. The cut edge of good beef is bright red in color, and should be of a uniform tint, except where marked by fat and connective tissues. It loses twenty per cent. of its weight in roasting and thirty per cent. in boiling. In the raw state it contains fifty per cent. of water. It possesses the greatest amount of nutrition when fresh, but is preserved by canning, salting, drying, and many other ways with good results. Beef producing and beef packing are two highly important industries in the United States and Canada.

**BEEFEATER**, the name of a bird of the starling family, native to South Africa. It associates with the buffalo, camel, and cattle, and feeds upon the larvae of flies. Birds of this class are sometimes called *ox-peckers*. The name "beefeaters" has been applied for many years to the yeomen of the royal guard in Great Britain. Their costume is in the fashion of the time of Henry VII. and has been changed but slightly for four centuries.

**BEEF EXTRACT**, an article of diet obtained by extracting the juice of beef and then evaporating the water. It is prepared by placing the meat in a large kettle with a dome-shaped cover, and extracting the juice by heat. An outer jacket, filled with water, surrounds the lower part of the kettle, serving to apply the heat uniformly, and after the juice is drawn off it is strained and put into jars or cans and sealed hermetically. Beef extract has about forty times the nutriment of beef, and is important as a food for infants and invalids. It is prepared for service in the form of soup or beef tea.

**BEER** (bēr), a beverage prepared by means of a process of fermentation from malt, hops, and water. The malt for general manufacture is made of barley, but wheat, oats, rye, corn, and India rice are used to some extent. The different kinds of beer are usually classed as *porter* and *ale*; the latter is prepared chiefly from pale malt and has a pale amber color, while the former is prepared by using a portion of roasted or black malt along with the pale malt. This has the effect of giving porter a somewhat bitter flavor and a darker color. These two classes are again subdivided into a great many varieties, depending upon the strength of the hops and the malt added. Mild ale, bitter ale, barley wine, pale ale, and table beer are terms by which the different varieties are known.

From history we learn that beer was a well

known beverage among the Egyptians 3,000 years B. C., and was extensively manufactured by the early nations. Larger quantities of it are consumed than of any other beverage. In its manufacture Germany ranks first, Great Britain second, and the United States third. In the United States there are over 2,000 breweries that manufacture annually over 40,000,000 barrels, which is largely consumed within the country, together with several varieties imported from Europe. The consumption of beer in the United States averages about fifteen gallons for each person, while the consumption in some of the countries of Europe is much larger. In Belgium the consumption per capita is fifty-one gallons; in Great Britain, thirty-six, and in Germany, thirty.

The process of making beer is called *brewing*. The first step in the process is to place the barley or cereal in an iron cistern, where it is soaked or steeped from 70 to 95 hours, when the water is drawn off and the barley placed on the floor of a dark room, where it swells and sprouts as if planted in the ground. This process is called *germination*. When the little sprouts have grown about half an inch long, the largest possible quantity of sugar has been formed. The malt is then taken to a drying kiln, where it is dried for a period depending upon the kind of beer to be made. In making light-colored ales the malt is dried only a short time, while in darker colored ales a longer time is allowed; this depends entirely upon the strength and color desired. After the malt is dried, it is crushed and mixed with hot water in a mash tub. Here another change takes place, by which the starch is converted into sugar, called *grape sugar*. After a few hours the liquid, now called *sweet wort*, is drawn off and boiled with hops in a copper kettle. It is next strained and cooled and put into a fermenting tun, where a little yeast is added, which causes it to froth and bubble up, which indicates that an important change is taking place; that is, the sugar is changed by the action of the yeast into carbonic acid and alcohol.

Beer contains from one to ten per cent. of alcohol, the quantity depending of course upon the amount of sugar contained in the malt. Any liquor which has passed through the change of fermentation is known as *fermented liquor*. When this process has been completed, the beer is drawn off into hogsheads and allowed to settle. From this it is pumped into kegs or barrels and stored in cellars for use. While stored, fermentation goes on slowly for some time; the beer remaining in this state for a long time is called *lager beer*, meaning, in Ger-



man, stored beer, and the beer used immediately after fermentation is called *schenk beer*. The process differs somewhat in different breweries, but the general method is practically the same. The largest breweries in the United States are located at Saint Louis, Chicago, Milwaukee, Philadelphia, Baltimore, and New York. Montreal and Toronto are leading brewing centers of Canada.

**BEERSHEBA** (bē-ēr'shē-bà), meaning *well of the oath*, a locality about fifty miles southwest of Jerusalem, now called Bir-es-Se-ba. At this place Abraham made an alliance with Abimelech, the Philistine King of Gerar, which he ratified with an oath and a valuable gift of lambs. It was a place of some importance down to the Crusades, but now is a dismal ruin.

**BEESWAX** (bēz'wāks), the fatty substance secreted by bees and used by them in constructing the honeycomb. It is not collected from plants, but is a secretion elaborated within the body of the animal from saccharine matter or honey, and extruded in scales from beneath the rings of the abdomen. It is an article of commerce, useful in modeling, for candles, and divers other purposes. Before being put on the market, it is purified and bleached or whitened.

**BEET** (bēt), a well known vegetable valued as food owing to the large quantities of sugar it contains. Four kinds of this vegetable are



RED BEET.

SUGAR BEET.

cultivated—the *common beet*, the *chard*, the *sea beet*, and the *mangel-wurzel*. The common beet embraces several species, differing in size, color, and shape. The yellow and red beets, usually classed as common beets, are the best for table use, though the chard is a favorite among laborers and agriculturists in France and Ger-

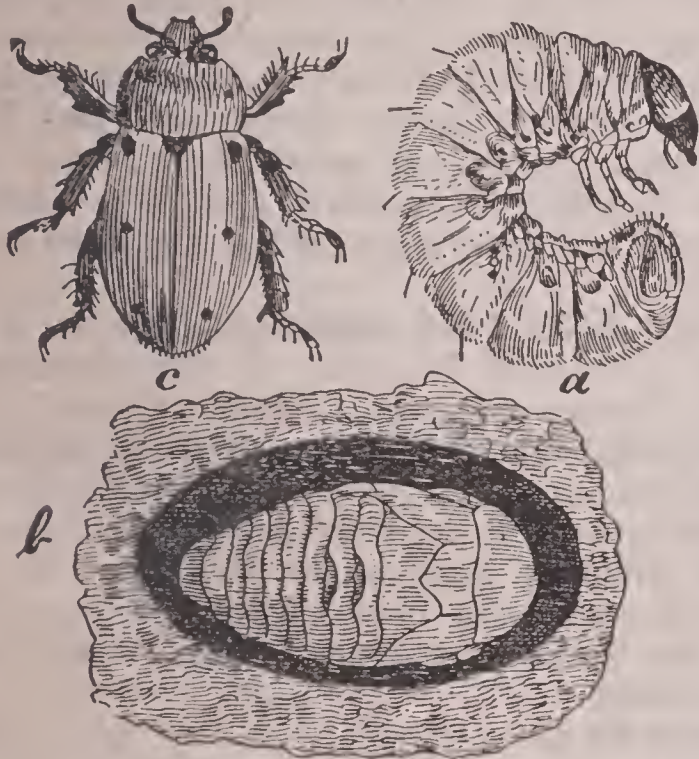
many. Gardeners cultivate the sea beet largely for greens. The mangel-wurzel is a coarse, large beet. It is sweet and nutritious, and is stored in cellars for winter use as cattle feed. The white beet is used in the manufacture of sugar.

In 1810 Napoleon began to encourage the manufacture of sugar from beets, but the industry developed largely from the discoveries of Count von Arnim (q. v.). Since then large quantities of sugar have been manufactured in Europe from this vegetable, particularly in the German Empire. In the United States experiments in beet sugar manufacture were not extensively made until 1890, when the Department of Agriculture at Washington sent 5,000 packages of beet seed to different parts of the country for the purpose of experimenting in different localities. These seeds were distributed through twenty-eight states and territories, with directions for planting and the culture of the plant. After maturing the crop, about 1,000 localities sent samples to Washington to be used in making tests of their value in beet sugar manufacture. It was found by careful examination that a zone about 200 miles wide, extending from the Atlantic to the Pacific, through portions of New York, Pennsylvania, Ohio, Indiana, Illinois, Iowa, and Nebraska, possesses admirable qualities to develop this industry. California produces more beet sugar than any other State, while Washington, Nebraska, Kansas, Utah, and Colorado rank high. It is thought that by the larger development of the beet sugar industry the United States will be able to produce sufficient quantities of this product to supply the demand of the domestic market. California alone has sufficient available territory to produce all the sugar now imported, and many other states possess almost equal natural advantages. Canada has a large area of land suitable for the culture of the sugar beet, particularly in British Columbia, Ontario, and Alberta. The industry is developed most extensively in Ontario.

**BEETLE** (bē't'l), an order of insects called by naturalists *Coleoptera*, which means sheathed wings. They possess four wings, an inferior pair, which are the real wings used in flying, and a superior pair that form a protection for the others. In walking they appear to have no wings, so nicely are the real wings covered and protected. The real wings are membranous, while the wing covers are horny, often beautified by green, yellow, blue, and diversified colors. There are no less than 150,000 species showing slight differences in color, size, form, or habits, of which fully 11,000 are native to



the region of North America lying north of Mexico. They undergo three full stages in life. At first they are *grubs* or *larvae*, in which form they have three pairs of legs, horny heads, and wormlike bodies; those hatched in fruit and nuts have no legs. The second stage is entered after a case or cocoon has been prepared,



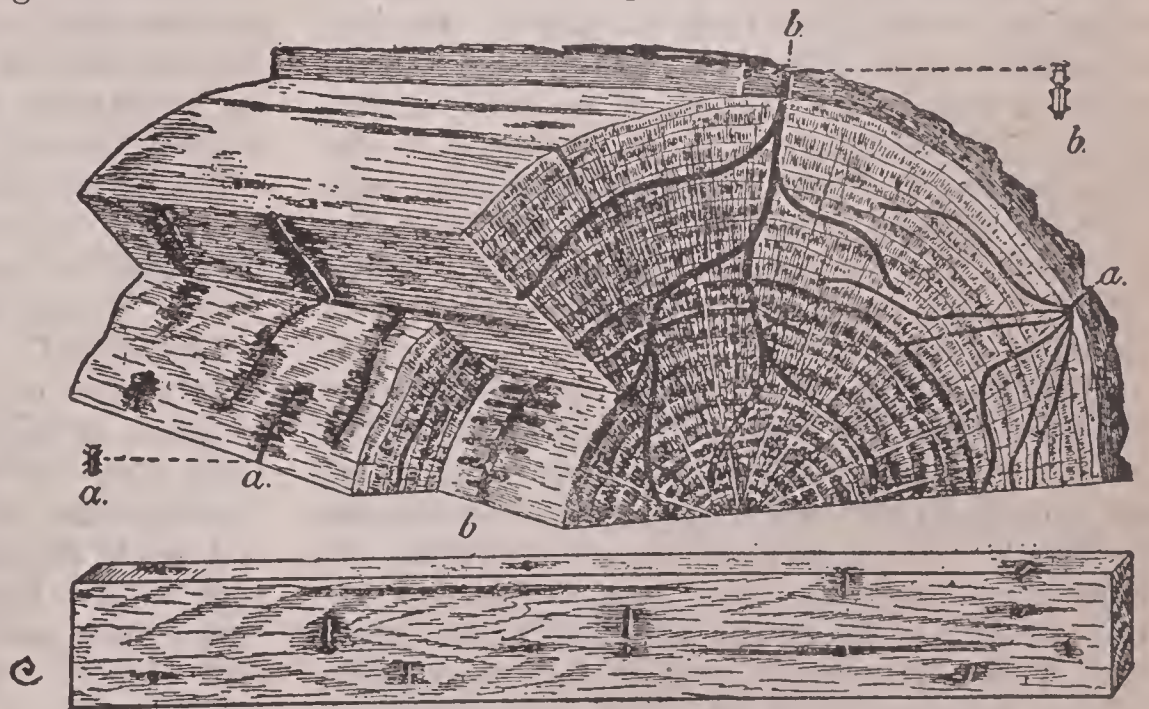
A, LARVA; B. PUPA; C. BEETLE.

though a cocoon is not always provided. This is called the *pupa state*, in which many varieties lie for years before developing into beetles. Most species live on land, though there are a large number that live in water. Land beetles live under rocks, logs, or leaves, among stones, and in holes drilled in wood.

Various beetles have been named from their size, form, and habits of life. The *carrion beetles* are those that feed upon dead animals. *Scavenger beetles* live on filth and refuse matter, and are provided with feet fitted to dig holes in the ground. *Sexton beetles* have a very strong scent so they can easily find the dead bodies of small animals, such as frogs, snakes, and mice. These they take to a place where the ground is soft and bury them safely under cover. In these remains they deposit their eggs, and when the young are hatched they feed upon the food provided in this way. The *ambrosia beetle*, of which there are several species, bores in oak and other wood, often doing great damage. A class

of beetles extensively known as *tumble bugs* belong to this class. In ancient Egypt they were called *sacred beetles* and were worshiped, for the reason that they are useful in clearing up manure and burying it below the surface. This they do by making round balls, in which they lay their eggs, and then bury them deep in the ground. *Tiger beetles* have stripes and are fierce in combat with other insects. They prey upon other beetles, flies, and caterpillars, and possess cannibalistic tendencies among themselves. The *bombardier beetles* possess a strong liquid, which they shoot at their enemies. Similar beetles include the *spring beetles*, *horned bugs*, and *curculios*. The last mentioned live in orchards and feed upon fruits and grains. The worms often found in plums, nuts, apples, and various other fruits are hatched from eggs laid by beetles. A species of beetle known as *Spanish fly* is used in making powder and blistering plasters. Other well known beetles are the *potato bug*, *squash bug*, *oil beetle*, *ladybird*, *glow worm*, *blister beetle*, and *firefly*. See illustration below.

**BEGGAR** (bĕg'gĕr), one who continually implores people for alms. The practice of begging may be a necessity with some aged and physically defective persons, while others engage in it from the dislike for work. In 1572 a law of England provided a severe penalty for all able-bodied persons convicted of the offense. Laws prohibiting vagrancy are on



OAK WOOD DAMAGED BY THE AMBROSIA BEETLE.

a b, two species of beetles; c, log cut from damaged timber.

the statute books of many countries, the purpose being to prevent beggar vagrants from roaming over the country.

**BEGONIA** (bĕ-gō'nĭ-à), the name of a large family of plants, of which several species are cultivated in flower pots and green-



houses. The plants are perennial and include both herbs and shrubs. Among the popular species grown in gardens as flowering plants are those known as *Begonia*, *Beefsteak Geranium*, and *Glory of Lorraine*. The flowers are largely pink or red. Young plants are raised from the seed, or they may be obtained by



BEGONIA.

dividing the bulbous roots and by cutting and placing the stems in the soil. Many varieties of fine flowers have been propagated from the tuber-root kind.

**BEHEMOTH** (bē'hē-mōth), a large animal described in the Bible (Job xl, 15-24). The description indicates that the animal referred to is grass-eating and lives in or near the water, hence it is thought the author referred to the hippopotamus. In Job xl, 25-31, it is associated with the leviathan. Some writers think that the crocodile, the ox, or the elephant was meant, while others associate the two names with primeval monsters.

**BEHISTUN** (bā-hīs-tōn'), or **Bisutun**, a town in Persia, located near a mountain of the same name, and celebrated for the remains of ancient sculptures and inscriptions found in the vicinity. The mountain has an altitude of 1,700 feet, and the most remarkable inscription is in the limestone about 300 feet high. Sir Henry Rawlinson copied the inscription, which was made in the time of Darius I., King of Persia, about 518 B. C., and contains an account of his military triumphs. These inscriptions were made after polishing the rock and applying varnish harder than the limestone. The writing is in the cuneiform characters and in the Median, Persian, and Assyrian languages.

**BEHRING SEA.** See **Bering Sea.**

**BEIRUT.** See **Beyrout.**

**BEJAPoor** (bē'jā-pōor), or **Bijapur**, a ruined city of India, in the presidency of Bombay, 245 miles southeast of Bombay. The site is on a tributary of the Kistna River, and surrounding it are lofty walls of hewn stone. Anciently the city was a great commercial center, and its downfall dates from 1686, when it was captured by Aurungzebe. The tomb of Mahomet Shah and other remains of Mohammedan construction are among the ruins, most of which indicate splendid workmanship and fine examples of eastern art. The modern town is not important and has a population of 17,500.

**BEL AND THE DRAGON**, a book of the Old Testament, belonging to the Apocrypha. The Roman Catholic Church regards it a canonical book of the Bible, and the Anglican, Lutheran, and a number of other churches recommend it to be studied for edification. It was probably written in Alexandria in the Greek, and dates from the 3rd century B. C. In the Vulgate version it is part of the Book of Daniel.

**BELFAST** (bēl'fäst), a city in Maine, county seat of Waldo County, thirty miles southwest of Bangor, on the Maine Central Railway. It has a good harbor on Penobscot Bay and railroad connection with the principal cities of the State. Shipbuilding, printing, and the manufacture of shoes and lumber products are among the chief industries. Granite quarries are worked near the city, and the surrounding country is agricultural. A Masonic temple, a public library, and an Odd Fellows' building are among the chief architectural structures. The first settlement on its site was made in 1870 and its incorporation as a city dates from 1850. Population, 1900, 4,615.

**BELFAST** (bēl'fäst'), a city of Ireland, county seat of Antrim County, capital of the province of Ulster, about twelve miles from the Irish Sea. It has railway connection with the leading cities of Ireland, is on the Ulster Canal, and has a fine harbor on Belfast Lough. Near it flows the Lagan River, which is crossed by several bridges that connect the city with adjacent villages. It occupies a fine site, but most of the ground is reclaimed marshland. The city is the seat of vast commercial and manufacturing interests, the most important in Ireland. Its products and exports consist of cotton and woolen goods, linen fabrics, ropes, canvas, ships, clothing, and machinery. It is the seat of fine schools and several institutions of higher learning, including Queen's College and the Royal Academic Institution. Among



the chief buildings are the museum, the government offices, the Corn Exchange, and the public library. It has extensive botanical gardens, electric street railways, and municipal waterworks. The city is largely Protestant; among whom the Presbyterians predominate. Population, 1901, 349,180.

**BELGIUM** (běl'gĭ-ŭm), a kingdom of Europe, whose northern boundary is formed by Holland, eastern by Germany, southern by France, and western by the North Sea. In latitude it lies between 49° 30' and 51° 30' N., and in longitude 2° 33' and 6° 6' E. Its greatest length from southeast to northwest is 165 miles; breadth, 120 miles. The area is 11,373 square miles.

**PHYSICAL FEATURES.** The surface is made up largely of fertile lowland, though there are some sandy and marshy tracts. A range of the Ardennes Mountains, highest altitude 2,200 feet, traverses the section lying southeast of the Meuse River. From the southeastern part the surface inclines toward the northwest, where dikes are utilized to prevent overflows from the sea. An unfertile tract, the Campine, is in the northern part of the province of Antwerp, but this has been greatly improved by superior husbandry.

The Meuse and Scheldt rivers, though both rise in France, are important for drainage and navigation. The Dender, Lys, and Rupel are tributaries of the Scheldt, and the Lesse, Sambre, and Ourthe flow into the Meuse. Rainfall is abundant and the average temperature is about 50° Fahr. In summer the climate is somewhat hotter than in Great Britain, and the winters are longer and more severe.

Coal is the chief mineral and is found in fields having an area of about 550 square miles, chiefly along the Sambre and Meuse rivers. Marble, slate, and limestone quarries are worked extensively in the eastern part. Other deposits worked more or less extensively include copper, lead, iron, peat, and calamine.

**AGRICULTURE.** Agriculture has declined somewhat with the development of other enterprises, in which capital and labor became interested. The demand for cereals and other farm products is greater than the supply. All of the domesticated animals of Europe are grown profitably, especially cattle, and the dairying interests have been developed very efficiently. Hogs, sheep, and horses are grown in all the provinces. Among the cereals may be mentioned rye, which is grown most extensively, oats, barley, buckwheat, spelt, and sugar beets. The vine is cultivated on large tracts along the Mass River, and tobacco, hops, rape, flax, fruit,

and vegetables are grown. About one-sixth of the surface is covered with forests, including beech, oak, elm, and poplar. Forestry is important as an enterprise, and the products have a high annual value. The fisheries of its coast and inland waters yield large returns.

**MANUFACTURES.** Manufacturing takes first rank among the industries of Belgium and is the chief source of its prosperity. Modern machinery is utilized extensively, but most of the work is done in small shops, in which only two or three workmen are employed. In 1908 there were fully 80,000 establishments in the dwelling houses of workmen who carried on small manufacturing industries without any paid labor. Chief among the larger enterprises is the manufacture of textiles, both linen and woollen, and this industry is represented at Bruges, Brussels, Limburg, Ghent, Liège, and Mechlin. Carpets are made in large quantities at Brussels and Tournay, and Brussels and Bruges are centers for the manufacture of lace and fine lawn and damask fabrics. Other products ranging high in value are machinery, leather, chemicals, glass, furniture, clothing, jewelry, and spirituous liquors. Cheap fuel has caused the development of large steel and iron works, though the ores are mostly imported.

**TRANSPORTATION.** A network of railroads covers the entire country, and in proportion to its area Belgium has the greatest railroad mileage in the world. In 1835 the first line, from Mechlin to Brussels, was open for traffic. The government owns nearly all of the railroads, which aggregate a total of over 3,000 miles. Electric lines are operated in all the cities and many suburban districts. Canal transportation of much value is utilized, and the Meuse and Scheldt rivers are navigable throughout their entire length in Belgium. The import and export trade is carried largely through Ostend and Antwerp, and the imports have exceeded the exports for the past fifty years. France, Germany, Great Britain, the Netherlands, and the United States have the largest proportion of trade in the order named.

**GOVERNMENT.** For the purpose of government Belgium is divided into the nine provinces of Limburg, Namur, Luxemburg, Brabant, Antwerp, Liège, Hainaul, East Flanders, and West Flanders. The executive power of the nation is vested in the king, and the crown is hereditary in the direct male line of descent. A council of ministers responsible to the chambers assist the monarch, and every royal act must be validated by the signature of a minister. Chief



legislative power is vested in the king and the chambers, which consists of the senate and chamber of deputies. The senate has 102 members, of whom fifty-six are appointed by the provincial councils and the remainder are elected by direct suffrage of male citizens. The chamber of deputies has 152 members, elected by direct suffrage, and in this branch originate all bills dealing with the revenue. Each province has a council chosen by direct vote, in which is vested the power to legislate in matters of local government. The provinces are divided into *arrondissements*, and these are again divided into smaller districts known as *communes*. Cases tried by the lower courts are subject to review by the court of cassation or supreme court.

The standing army numbers 51,552 men, and the war footing is about 148,500. Wars of aggression are prohibited by the constitution, hence the army is intended only for national defense and the preservation of neutrality. The coins, weights, and measures correspond in name and value to those of France.

**EDUCATION.** The church and state were separated by the constitution of 1831, but religious instruction is directed in the public schools by the Roman Catholic clergy. Support is given to the schools by the state and local governments, and the classes range from the elementary schools in the communes to the higher schools and universities. Higher education culminates in the state universities at Ghent and Liège, and free universities are maintained at Louvain and Brussels. In the higher institutions instruction is given in law, medicine, engineering, arts, and manufactures. Roman Catholic is the religion of most of the people, and this church maintains many parochial schools.

**INHABITANTS.** Belgium is so named from the people anciently called Belgae, who were of the ancient Celtic family. Two types make up the present population, those who descended directly from the ancient Belgae, and those who are a mixture of Celts and Germans. Flemish and French are spoken in the southern part, while German is the language of the northern section. However, these three are the national languages. Brussels, the capital, is a large and prosperous commercial center. Other cities of importance include Antwerp and Ostend, both important seaports, and Ghent, Bruges, Liège, Verviers, and Ixells. Belgium is the most densely populated country in Europe. Population, 1906, 7,238,622.

**HISTORY.** Anciently Belgium was a part of Rome, when it was included in the territory

known as Belgae. It was the battle ground and center of contention in many European wars, and its territory has belonged to many different nations. The Battle of Waterloo was fought in the province of Brabant, in 1815, after which it was united to Holland, the two countries forming the kingdom of the Netherlands. In 1830 Belgium was separated from Holland and became a distinct kingdom, forming a constitutional monarchy. Prince Leopold of Saxe-Coburg was elected its first king, in 1831, with the title of Leopold I. He was succeeded after a prosperous reign of thirty-four years by his son, Leopold II. At present its political parties are known as the Liberals and the Radicals, which are about evenly divided, and each has been in the ascendancy at different times. In 1885 King Leopold II. gave efficient and vigorous support to the explorations of Stanley in Central Africa, and consistently opposed the maintenance of slavery in that region. The Congo International Congress held at Berlin made his government the controlling influence in the Congo Free State, Belgium reserving the right of annexation after 1900. Albert, born April 8, 1875, son of the Count of Flanders, the brother of King Leopold, is the presumptive heir to the Belgium throne. He married Princess Elizabeth of Bavaria in 1900.

**BELGRADE** (běl-ġrād'), the capital of Serbia, called by the Turks "the House of the Holy War." It occupies an important site at the junction of the Save and the Danube rivers, thus making it the southern key to the Austro-Hungarian Empire. It is connected by railroads with the countries to the north and south, and has a fine system of electric street railways. The chief buildings include the cathedral, the public library with 100,000 volumes, the national theater, the royal palace, and a number of fine churches. It has waterworks, electric lights, pavements, a considerable trade, and numerous manufactures. Several fine gardens and drives beautify it, and statuary adorns its public places, among them the statue of Prince Michael III. The Greeks were in possession of Belgrade until 1073, when it was captured by the Hungarians. Later it fell into the hands of the Bulgarians, Servians, Austrians, French, and Turks. In 1862 it became the capital of Serbia, and was finally evacuated by the Turks in 1867. The Treaty of Berlin, in July, 1878, after the close of the war between Russia and Turkey, recognized Serbia as an independent state, thus giving Belgrade considerable governmental advantages. The city is fast losing its Turkish ap-



pearance and partaking of European characteristics. Population, 1905, 77,816.

**BELIEF** (bê-lêf'), the mental act or operation of accepting as true and real any proposition on proof afforded by reasoning, or any alleged fact or opinion on evidence of testimony. It stands in opposition to the conviction that results from personal observation or experience, which is stronger than that resting on testimony or reasoning. The term *belief* is also used to express unwavering acceptance of anything as true.

**BELIZE** (be-lêz'), the capital of British Honduras, Central America, located on Honduras Bay, at the mouth of the Belize River. It is the center of a growing import and export trade in rosewood, cedar, logwood, mahogany, sugar, cocoanuts, and other tropical productions. The city is well built. It has extensive telegraph connections, a good harbor, and several fine schools and churches. Population, 1905, 9,113.

**BELL** (bêl), an instrument for producing a ringing sound, made chiefly of a kind of bronze called *bell metal*. It consists of a reversed cup, at the apex of which an ear or canon is formed, used for suspending it from a beam or some fixed body above. On the inside is a hammer or clapper, which generates the sound by percussion on the reversed side of the cup. In Exodus xxviii, 33-34, golden bells are mentioned in connection with worship. The antiquity of bells is also shown by the discovery of Sir Austin Layard (1819-94) at the site of the ancient city of Nineveh, where he secured bells made of one part tin and ten parts copper. In Greece and Rome bells were used, not only in religious observances, but were common at the markets, camps, and baths. Those made at an early date were of a comparatively small size until about the year 400 A. D., when the Bishop of Nola introduced the use of larger sizes in Campania. Their use in England began in the 7th century, and they were first cast in that country about 940, but in Ireland and Scotland they were probably used at an earlier date. The great bell of Saint Paul's Cathedral in London was cast in 1882. It has a diameter of 9.07 feet and weighs 35,470 pounds. The bell of Westminster, known as Big Ben, was cast in 1856 and has a weight of 30,324 pounds.

Bells are now in common use in churches, either singly or in a series, and are employed extensively in city buildings, at private houses, and in offices and hotels. Some bells are famous in history on account of their large size, beauty, and clearness, or some important historic event announced by their ringing. Among the most famous are the following:

WHERE LOCATED.	WEIGHT IN TONS.	WHEN MADE.
Cologne, Germany .....	11	1448
Halberstadt, Germany .....	8	1457
Rouen, France.....	16	1501
Breslau, Germany.....	11	1507
Lucerne, Switzerland.....	8	1680
Paris, France .....	15	1680
Vienna, Austria.....	18	1711
Moscow, Russia .....	216	1736
Montreal, Canada.....	14	1847

Several of these bells have been recast, notably the Keiserklocke at Cologne, in 1875, which now weighs twenty-five tons. The great bell of Moscow is the largest ever made, and hung



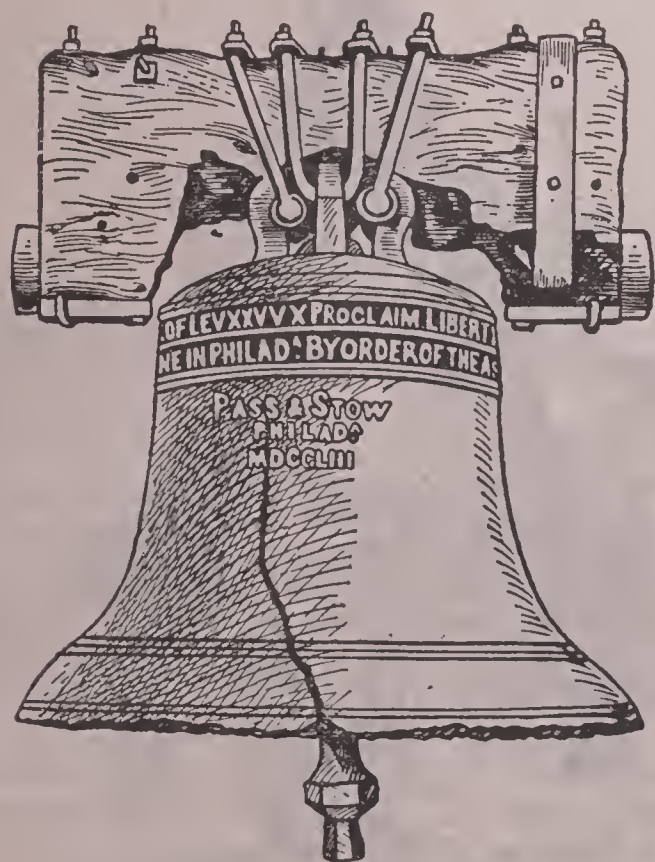
GREAT BELL OF MOSCOW.

suspended only a short time, owing to a fire. It now serves as a dome to a chapel that was excavated below it. The famous Liberty Bell, which rung when the Declaration of Independence was issued in 1776, was made in 1751. Montreal, Canada, has the largest bell in America, weighing thirteen and a half tons.

The material used chiefly in making bells, known as bell metal, consists of an alloy of tin and copper with a little zinc and lead added. In England and Germany good results have been secured by casting bells of cast steel. Glass has been used with excellent results as to tone, but durability is wanting. Bells are cast in molds made of fine sand. The molten metal is drawn off from a great furnace into an



earthen or crucible pot, which is swung by a crane. The molten metal is poured over the mold into a pit beneath the floor of the foundry. When the bell has been cast, it is drawn out of the pit and its rough places are finished with files and chisels. The size of the bells and their thickness depends upon the purpose they are to serve. The small bells are proportional in weight to the larger ones, and are rung by means of ropes, which cause them to swing to and fro. Others are struck by hand, and some by means of a hammer on the outside. *Curfew bells* are rung in some towns to warn the people that it is time to retire, *fire bells* give warning of and indicate the location of fire, and *church bells* call to service, or toll the announcement that death has visited the com-



LIBERTY BELL, PHILADELPHIA.

munity. Many churches in the larger cities have chimes, which consist of a set of bells, and the sounds produced are pleasing and musical. The most recent inventions in bells include electrical contrivances, such as are used for danger signals and to call attendants in hotels and offices. They provide both rapidity and convenience at short and long distances. Bells of this kind are constructed of two electro-magnets, provided with an armature, to which a clapper is fixed that vibrates between two gongs. When an alternating current is generated, the attraction and repulsion of the armature causes the bell to ring.

**BELLADONNA** (bĕl-lă-dŏn'nă), or **Deadly Nightshade**, a plant native to Eurasia, but some species are now cultivated successfully in America. It is widely distributed over Europe,

where it grows wild in forests, near fences, and in waste places. The berries are shining black and, like all parts of the plant, are very poisonous. Vinegar is an antidote to counteract the effects of this poison. The plant attains a height of four or five feet. Its leaves, roots, and fruit are used in making medicine, which is useful in palsy, fevers, epilepsy, and other ailments. Some species are beautiful flowering plants.

**BELLAIRE** (bĕl-âr'), a city of Belmont County, Ohio, five miles from Wheeling, W. Va., on the Ohio River. It is on the Pennsylvania, the Baltimore and Ohio, and other railroads, and is important as an industrial and commercial center. It has a public library and several fine school and church buildings. The manufactures include window glass, pig iron, farm machinery, nails, hardware, cigars, and clothing. Gas and electric lights, pavements, waterworks, and street railways are among the improvements. In the vicinity are extensive deposits of coal, clay, and limestone. Population, 1900, 9,912.

**BELLBIRD**, a bird native to South America and the West Indies, so named from the metallic sound of its voice, which resembles the tolling of a bell. The bill is broad and depressed and flexible at the base, and at the upper side is a tubular appendix about three inches in length. This hornlike growth stands erect when the bird becomes excited, or when it utters its note. A similar bird is found in Australia and New Zealand.

**BELLEFONTAINE** (bĕl-fŏn'tân), a city in Ohio, county seat of Logan County, forty-five miles northwest of Columbus, on the Ohio Central and other railroads. It is located on the highest ground in the State. The chief buildings include the county courthouse, the high school, and several churches. Railroad machine shops, flouring mills, and carriage works are among the chief manufacturing establishments. It has a growing trade in farm produce and merchandise. The waterworks and lighting plants are municipal properties. The first settlement was made in 1818. Population, 1900, 6,649.

**BELLE ISLE**, an island north of Newfoundland, at the northern extremity of the Strait of Belle Isle. Much of the surface is rocky. The area is about fifteen square miles. At the southern extremity is a lighthouse 470 feet high. The Strait of Belle Isle separates Newfoundland from Labrador, and is the connecting link between the Atlantic and the Gulf of Saint Lawrence.

**BELLEVILLE** (bĕl'vîl), a city in Illinois, county seat of Saint Clair County, about four-



teen miles southeast of Saint Louis, on an elevated district in the midst of a fertile farming country. It is on the Southern, the Illinois Central, and the Louisville and Nashville railroads. The city is a prosperous commercial and manufacturing center, and has modern municipal facilities, and adjacent to it are productive coal mines. Its manufactures consist of ironware, woolen goods, fermented and distilled liquors, flour, and machinery. It has a public library, the Saint Peter's Cathedral, a fine courthouse, and a convent for the education of young ladies. The municipal improvements include electric street railways, brick and macadam pavements, and waterworks. The first settlement was made in 1814 and it was incorporated in 1846. Population, 1910, 21,122.

**BELLEVILLE**, a city in Ontario, Canada, and county seat of Hastings County, on the Grand Trunk Railroad. It is located on the Bay of Quinte, at the mouth of the Moira River, and is an important commercial center. The manufactures include ironware, clothing, fermented and distilled liquors, and dairy products. It is the seat of several educational institutions, including an asylum for the deaf and dumb and Albert University, founded in 1857. The principal improvements include waterworks, sewerage, and street pavements. Population, 1901, 9,117.

**BELLEVUE** (bĕl-vū), a city of Kentucky, in Campbell County, on the Ohio River, opposite Cincinnati, Ohio. It has a growing trade, is improved by good municipal facilities, and has several fine schools and church buildings. Many Cincinnati business men reside here. It was incorporated in 1871. Population, 1900, 6,332.

**BELLINGHAM** (bĕl'ing-am), a city in Washington, county seat of Whatcom County, seventy-eight miles north of Seattle, on the Northern Pacific, the Great Northern, and other railroads. It is located on Bellingham Bay, an inlet from the Gulf of Georgia, and has a large coastwise trade. The harbor is safe and well improved. It is important as an export market for merchandise and produce. Sawmills, tanneries, brickyards, flouring mills, and machine shops are among the leading manufacturing enterprises. The trade is largely in fruit, cereals, live stock, fish, and products from the farm and dairy. Coal mines, and stone quarries are operated in the vicinity, and the surrounding country is devoted to farming and fruit culture. It is the seat of a State normal school and has a public library, a substantial courthouse, and numerous schools and churches. The public improvements include a library,

waterworks, and electric street railways. Settlements were made in the vicinity in 1858 and the town was named Whatcom. Bellingham dates from 1903 when Fairhaven and Whatcom were united to form the city. Population, 1900, 6,834; in 1910, 24,298.

**BELLOWS** (bĕl'lūs), a machine or instrument for producing a blast of air, used principally for blowing fires in furnaces, forges, and mines, or for filling pipe organs. It was used by the ancients, both nomadic and civilized. The common bellows are made by joining two wooden sides together with leather stretched entirely around, and so fastened that two handles moved back and forth cause air to be forced out through the nozzle. A valve on the side admits the air as the handles are moved apart, but closes when brought together. This results in the air being driven out with much force. More powerful instruments designed for factories or workshops are provided with machinery to obtain propulsive force. In the larger industrial establishments where large quantities of coal are burned fan-blast machines are used for the same purpose. They have the advantage of furnishing a continuous current of air.

**BELL ROCK**, or **Inch Cape**, a reef of rocks in the North Sea, opposite the mouth of the Tay, about twelve miles from Arbroath Scotland. The danger of this reef to navigation has been partly overcome by the erection of a large lighthouse, in 1810, under the direction of Robert Stevenson. The lighthouse is 120 feet high, has an alternating red and white revolving light, and is enforced by the ringing of two bells during storms. The reef, which is about 2,000 feet long, is partly uncovered at spring tides.

**BELOIT** (bĕ-loit'), a city of Rock County, Wisconsin, on the Rock River, about forty-seven miles southeast of Madison, on the Chicago and Northwestern and the Chicago, Milwaukee and Saint Paul railroads. It is the center of a fine agricultural country and the seat of large factories engaged in the construction of plows, reaping and mowing machines, boots and shoes, engines, and machinery. Besides having good public schools, it is the seat of Beloit College, a well established institution of higher learning under the direction of the Congregationalists. The chief buildings include the public library, the city hall, and the central high school. Gas and electric lights, street railways, and waterworks are among the municipal improvements. It was first settled in 1824 and became an incorporated town in 1856. Population, 1905, 12,855; in 1910, 15,125.



**BELT**, or **Belting**, in machinery, an endless flexible cord or band used to transmit power or motion between two parallel shafts. Driving belts are usually broad or flat bands of leather or rubber, but there are a vast number of forms made of different materials, such as ropes, chains, and cables, which are used to transmit power from one roller, wheel, or pulley to another. The best leather belts are made of oak-tanned leather, cut from the back of hides and curried in tallow and cod oil. Under suitable care and with proper connections, belts of this kind can be used to drive machinery from twenty to thirty years. India rubber is preferred as a material for belting by a number of manufacturers, as it does not absorb moisture or stretch and decay, but its tendency to deteriorate with age makes it less durable. Iron and steel wire and chains are used extensively, but they require a peculiar construction of pulleys. A variety of woven-fabric belts are employed, including hair, cotton, and various textile fabrics, though in general they are most serviceable in smaller machinery. The two ends of a belt may be united together by riveting, or by clamps of various construction, and in the lighter class of belting it is customary to lace the ends together with a strap of leather. Where great power is transmitted, it is necessary to have leather belts of several thicknesses, frequently as much as four layers, and the width ranges from twenty to fifty inches. Heavy rubber belting is sometimes six-ply thick, from thirty to fifty inches wide, and about 300 feet long, depending, of course, upon the construction of the machinery and the power to be transmitted.

**BELT, Great and Little**, the names of two narrow channels which connect the Baltic Sea with the Cattegat. The Great Belt is thirty-seven miles long and about eighteen miles wide, and passes between the islands of Fünen and Zealand. It has dangerous shoals and sand banks, and a swift current prevents the strait from being frozen over except in very severe winters. The Little Belt separates Fünen from Jutland. It is thirty miles long and from one to twelve miles wide, and in general respects resembles the Great Belt.

**BELUCHISTAN.** See **Baluchistan**.

**BELTEIN** (běl'tân), or **Beltane**, a festival common among the Celtic people in former times, which was celebrated annually in the beginning of May down to the early part of the 19th century. Some writers have associated it with fire worship or with the worship of the sun, while others regard it a season for burning rubbish at the time of cleaning house

yards. In some localities festivals known by this name were celebrated in the month of November.

**BELUGA** (bě-lū'gā), or **White Whale**, a kind of whale or dolphin found in the Arctic Sea. It has a broad head and is from ten to fifteen feet long, and is hunted for its skin and oil, known as *porpoise oil*. The sturgeon of Southern Russia is known as beluga, and is hunted for its flesh and a kind of isinglass obtained from it.

**BELVIDERE** (běl-vī-dēr'), a city of Illinois, county seat of Boone County, on the Kishwaukee River, seventy-six miles northwest of Chicago, on the Chicago and Northwestern Railroad. A public library, an opera house, and the county courthouse are among the chief buildings. The manufactures include flour, farming implements, and machinery. The city has several fine churches and schools, waterworks, and an electric system of lighting. It was settled in 1836 and incorporated in 1857. Population, 1900, 6,937.

**BEMBA.** See **Bangweolo**.

**BENARES** (běn-ă'rěz), a city in the northern part of India held sacred by the Hindus. It is the focus of a network of railroads, on the Ganges River, which makes a turn at this place. The site on which the city is built rises like an amphitheater, thus presenting a magnificent view of its beautiful palaces, mosques, and other buildings. The city is the residence of many priests. Vast numbers of religious mendicants and Hindu pilgrims wend their way to this revered city to worship in its ancient edifices, or to temporarily wash away their sins in the sacred waters of the Ganges. Historically sacred bulls wander at large to indicate the sacredness of the city. There are no less than 1,500 Hindu temples within the city limits, besides 275 Mohammedan mosques. Benares is surrounded by a fertile district and has a large trade in merchandise. The manufactures include utensils, embroidered cloth, clothing, shawls, silk, jewelry, and other Eastern products. A portion of the city is occupied by Europeans, who founded a government college which is now attended by about 1,250 students. They constructed a beautiful bridge across the Ganges River, containing sixteen spans. Little is known of the early history of the city. According to Hindu tradition it was founded at the time of the creation. Population, 1905, 225,173.

**BENDER** (běn'děr), or **Bendery**, a town of Russia, in the government of Bessarabia, sixty miles northwest of Odessa. It is located on the Dniester River, fifty miles from its mouth,



and has a large trade in grain and live stock. The manufactures embrace machinery and clothing. A fine Greek church, a gymnasium, and the government buildings are its chief improvements. Many of the people are Jews and Armenians. Russia captured it in 1770, but it was ceded to Turkey in 1774, and in 1812 it was finally given to Russia by the Peace of Bucharest. Population, 32,350.

**BENEDICTINES** (běn-ě-dĭk'tĭns), an order or society of monks, who observe the rules of Saint Benedict. It dates from 529, when Saint Benedict founded the first monastery of this order on Monte Cassino, near Naples. The rule of living requires that its members be industrious, avoid laughter, take the vow of poverty, and exercise frugality in living. They teach the trades and industries, especially weaving, dyeing, tanning, glass-blowing, sculpturing, masonry, and other industrial and fine arts. In the Middle Ages the Benedictines were concerned in the preservation of the ancient classics, and through them many art and literary treasures have been transmitted to modern times. The monks of this order include many scholars and learned men noted for their piety and interest in disseminating knowledge. The order lays claim to the distinction that twenty-four of its members became popes; 200, cardinals; and 4,250, bishops. It is known and exercises influence wherever the Roman Catholic church has a foothold.

**BENEFIT ASSOCIATIONS**, or **Fraternal Societies**, the organizations whose chief objects include the cultivation of social relations, the assistance of members during the time of sickness and disability, and the payment of specified benefits in case of death. A number of these associations are secret societies, in a certain sense, but only so far as their lodge meetings are concerned, while their general business is open to public scrutiny. They have allied certain forms of insurance and friendly intercourse, thus aiding in educational advancement and distributing benefits on a fraternal basis to the members. Their business, so far as it pertains to life insurance, is conducted on an assessment basis, classified in accordance with the age of the assured. They are particularly numerous in the United States, where the annual income of this class of fraternal societies is about \$63,500,000, while the expenditures are about \$61,285,000. The largest among these are the Odd Fellows, the Knights of Pythias, the Ancient Order of United Workmen, and the Knights of the Maccabees, but many others have a large membership. A comparatively large business is transacted in

Canada, where they are generally termed *friendly societies*, and many are established by the workmen themselves. Although life insurance is issued by most of the societies named below, it is not strictly compulsory. A member may belong to and enjoy all the privileges of many of them without carrying life insurance, and under such circumstances his privileges are fraternal and for personal edification. These associations have been a source of benefit to many homes on account of the payment of small life policies, and because of the friendship and acquaintance of friends of deceased members. Below is a fairly complete list of benefit associations, together with the dates when organized:

NAME OF ASSOCIATION.	ORGANIZED.
American Legion of Honor .....	1877
Ben Hur, Tribe of .....	1894
B'nai B'rith, Independent Order of .....	1843
Brith Abraham Order .....	1859
Catholic Knights of America .....	1877
Catholic Mutual Benefit Association .....	1876
Choppers, Order of .....	1900
Chosen Friends, Order of .....	1879
Druids, United Ancient Order of .....	1839
Elks, Benevolent and Protective Order of .....	1868
Equitable, Aid Union .....	1879
Foresters, Ancient Order of .....	1832
Foresters, Ancient Order of, of America .....	1874
Foresters, Independent Order of .....	1874
Golden Chain, Order of .....	1880
Golden Cross, United Order of .....	1876
Good Fellows, Royal Society of .....	1882
Heptasophs, Improved Order .....	1878
Hibernians of America, Ancient Order of .....	1836
Home Circle .....	1880
Independent Order Free Sons of Israel .....	1849
Irish Catholic Benevolent Union .....	1869
Knights and Ladies of Honor .....	1877
Knights of Honor .....	1873
Knights of Pythias .....	1863
Knights of Saint John and Malta .....	1884
Knights of the Golden Eagle .....	1873
Knights of Maccabees .....	1880
Mystic Circle, The Fraternal .....	1884
National Provident Union .....	1883
National Union .....	1880
New England Order of Protection .....	1887
Odd Fellows, Independent Order of .....	1819
Pilgrim Fathers, United Order of .....	1879
Rechabites, Independent Order of .....	1842
Red Men, Improved Order of .....	1870
Royal Arcanum .....	1878
Royal Templars of Temperance .....	1870
United American Mechanics, Order of .....	1845
United American Mechanics, Junior Order of .....	1853
United Friends, Order of .....	1881
United Workmen, Ancient Order of .....	1868
Woodmen of America, Fraternity of Modern .....	1883
Woodmen of the World .....	1890

**BENEVENTO** (bă-nă-věn'tō), a city of Southern Italy, in a province of the same name, near the junction of the Sabato and Calore rivers. It occupies the site of the ancient Beneventum, and is noted for its remains of antiquity. The famous arch of Trajan, built in 114 A. D., and its cathedral, constructed after the Lombard-Saracenic style in the 12th century, are among the most noted buildings. Population, 1906, 24,893.

**BENGAL** (běn-gāl'), the largest of the gov-



ernmental divisions of British India, containing an area of 151,543 square miles. It constitutes a lieutenant governorship and, besides Bengal proper, includes Behar, Orissa, Chota Nagpur, and the tributary states. The tributary states have an area of 58,500 square miles. Bengal is located south of the Himalaya Mountains, and north of the Gulf of Bengal. Through it flow the Brahmaputra and Ganges rivers, two valuable water courses, which, below their confluence, form the greatest delta in the world. The glaciers of the Himalaya Mountains supply the two chief rivers of the district with immense volumes of water in the months of June and July, and cause a large region to be inundated similar to the inundations of the Nile. As a result of this the low lands of the delta are fertile and produce large quantities of cereals and fruits.

The mean temperature of Bengal for the year is about 80° near the coast, and in the elevated regions to the north it is about 54°. In the eastern part the rainfall is extremely large, averaging over 100 inches in a year, and is equaled only by the precipitation of the Amazon valley and the lake region of Africa. Three seasons make up the year, including the hot, from March to June; the rainy, from June to October; and the cold, from October to March. The district is generally unhealthy for Europeans on account of its variations in moisture and temperature. Along the coast extend great trackless forests, in which the Bengal tiger and the rhinoceros are numerous. Many reptiles and carnivorous animals infest the swamps and canebrakes of the low and marshy coast and the delta. The district is frequented by destructive floods and occasionally by cyclones, while earthquakes have visited it at numerous times. Among the chief products are opium, cane sugar, tobacco, indigo, cotton, rice, and many varieties of tropical fruits. In the northern portions, adjacent to the foothills of the Himalayas, are extensive deposits of copper, petroleum, and coal, while salt beds are common in various parts of that region. A large commerce is carried on with Great Britain, China, Germany, the United States, and the Straits Settlements.

The first British settlement in Bengal was made by the East India Company in the early part of the 17th century. Calcutta was founded in the latter part of that century, and is the largest city and most important commercial center of British India. Large additions of territory were made subsequently by conquest, and the country became a crown province in 1858. It is the most highly developed district of

British India, and has made material advancement in educational arts and sciences. At Calcutta several colleges and a fine university have flourished for many years. The district has a well organized system of public schools, at which the fundamental arts of an education and higher instruction are given free of tuition. A number of industrial, professional, and denominational institutions are in a flourishing condition. Bengal contains many cities and is penetrated by a network of telephone and telegraph lines. It has transportation facilities by the Indus, the Brahmaputra, and about 24,850 miles of railways. The dialect spoken chiefly is known as *Bengali*, but the people of some of the regions speak the *Hindi* and *Uriya* dialects. The inhabitants belong largely to the Hindu race, but along the river valleys the Burmese predominate. About one-third of the people affiliate with the Mohammedan religion and the remainder are Animists, Buddhists, and Christians. Population, 1901, 78,448,735.

**BENGAL, Bay of**, a part of the Indian Ocean, south of Asia, located between India and Farther India. It is visited by southwest monsoons in winter and northeast monsoons in summer. The Andaman and the Nicobar Islands are the chief land masses within the bay. It receives the inflow from the Ganges, Irawadi, and Brahmaputra rivers. The tides sometimes rise to the height of seventy feet where the shores are elevated. Rangoon, Calcutta, and Madras are the chief cities tributary to the Bay.

**BENGALI** (běn-gă'lě), a branch of the Aryan language spoken in Bengal and other parts of India. Calcutta is the chief center of influence among the people who speak this language. It is thought to be an outgrowth from the Sanskrit and bears to it about the same relation that the Romance languages have to Latin. About 45,000,000 people speak the language. It has an interesting literature and numerous periodicals are published in the Bengali.

**BENGUELA** (běn-gă'la), a district in the western part of Africa, one of the divisions of the Portuguese colony of Angola. It is situated in a mountainous section between Mossamedes and Loanda. It has deposits of sulphur, copper, and petroleum, and the region is considered rich in mineral wealth and fertility of soil. Benguela, the capital, is a market for rubber, coffee, and fruit. It was founded in 1617 and was long a center of the slave trade.

**BENI** (bă'ně), a river of Bolivia, rises in the Bolivian Andes, and after a course of 900



miles unites with the Mamoré to form the Madeira. It is navigable about half its length, and provides direct communication for a large part of Bolivia with the Amazon.

**BENIN** (běn-ēn'), a district of Western Africa, in Upper Guinea. It is bounded by Dahomey, the Niger, and the Bight of Benin, an extension from the Gulf of Guinea. The soil is fertile and produces yams, cotton, fruit, and sugar cane. The region was discovered and partly explored by the Portuguese in 1484. It became a possession of Great Britain in 1897, when it was incorporated in the protectorate of the Niger coast called Nigeria.

**BEN LOMOND** (běn lō'münd), a mountain in the Grampian Highlands of Scotland, twenty-seven miles northwest of Stirling. It is on the east side of Loch Lomond and rises to an elevation of 3,192 feet. Duchary Water, a feeder of the Forth, has its source in Ben Lomond. On clear days a fine view may be had of the surrounding country, including Loch Lomond and the fertile plains of Ayrshire and Renfrewshire. Scott in his "Lady of the Lake" makes this mountain a place of prominence.

**BEN NEVIS** (běn nē'vīs), a mountain in Inverness-shire, Scotland. Its height is 4,406 feet, with a precipice of 1,500 feet on the northeast side. It is the highest eminence in the British Isles. In 1883 an observatory was erected on its summit, and subsequently a carriage road was established to its top.

**BENNINGTON** (běn'ning-ton), the county seat of Bennington County, Vermont, famous for the battle fought here in the Revolution. It is located on the Rutland and the Lebanon Springs railroads, thirty-seven miles northeast of Troy, N. Y., and is a manufacturing center of considerable importance. The leading manufactures are woolen goods, pottery, ironware, furniture, and machinery. The chief buildings include the county courthouse and several public schools. It has waterworks and a system of electric lighting. It is the seat of a soldiers' home, and near the city is a monument 300 feet high to commemorate the Battle of Bennington. This engagement took place on Aug. 16, 1777, when General Stark at the head of the "Green Mountain Boys" defeated a detachment of Burgoyne's army commanded by Colonel Baum. It resulted in the capture of public stores and 600 British prisoners, and a complete victory for the Americans. Before the battle the American commander made his well known statement, "We will bag the fox, or Mollie Stark will be a widow." A successful celebration of the centennial of the battle was held in 1877, at which the President of the

United States, his Cabinet, and many prominent men took part. Population, 1900, 5,656.

**BENTON HARBOR**, a city of Michigan, in Berrien County, sixty miles east of Chicago, Ill. It is situated on the Saint Joseph River and has transportation facilities by the Peré Marquette and other railroads. The Benton Harbor Canal connects it with Lake Michigan, which is about one mile from the city, and steamers from all principal points on the Great Lakes enter its harbor. The manufactures include furniture, flour, machinery, and clothing. It has a growing trade in fruit, cereals, and merchandise. In the vicinity are mineral springs whose water has medicinal properties. Population, 1904, 6,702; in 1910, 9,185.

**BENZENE** (běn'zēn), or **Benzole**, a mineral fluid obtained from the distillation of coal tar and usually classed with the hydrocarbons. It is secured from a grade of oil that floats on water when coal tar is distilled. At about the freezing point of water it solidifies and forms a mass of crystals. It is a good solvent for fatty substances, hence is much used for cleaning purposes. It burns with a bright flame. Nitrobenzene is formed by mixing benzene with nitric acid. Aniline (q. v.) is made from nitrobenzene.

**BENZINE** (běn'zīn), a liquid obtained from coal tar and petroleum, consisting of hydrocarbon. It is highly inflammable and nearly colorless, and has a peculiar but agreeable odor. It is used in the manufacture of gutta-percha and India rubber on account of its solvent powers. Benzine is also used in removing grease spots from clothing, for cleaning gloves, in the manufacture of paints and varnishes, and as a burning fluid.

**BENZOIN** (běn-zoin'), or **Gum Benjamin**, a resinous substance obtained from a tree native to Southern Asia and the East Indies. It is fragrant and is used in perfumery and in medicine. The trees that yield benzoin, of which there are several species, are cultivated, and the resin is obtained by making incisions in the bark. The Roman and Greek Catholic churches use it as incense.

**BEOWULF** (bā'ō-wulf), an epic poem of the Anglo-Saxons dating from the 8th or 9th century, the original manuscript of which is in the British Museum. The manuscript is imperfect and many points are obscure, but it is regarded the longest and most important writing in Anglo-Saxon literature. In it the adventures of Beowulf, an Anglo-Saxon hero, are recounted, particularly his defense and delivery of the Danish kingdom from the monster Grendel and his ferocious mother.



**BERBERS** (bēr'bērz), the name of a historic people in Northern Africa, found mostly in the mountainous districts of Morocco, Algeria, and Tripoli, and in the northern part of the Sahara Desert. They are of middle stature, possess dark hair and dark, piercing eyes, and are austere in manner and cruel in disposition. Their life is largely pastoral, but they engage to a limited extent in hunting and trading, and in some districts follow agriculture and mining. They manufacture various rude implements for cultivating the soil, clothing, water mills, and implements of war. In government they are subject to the Turks in Tripoli, to the French in Algeria, and to the Sultan in Morocco, but large numbers are still unconquered, or live in tribes under independent chiefs. In early history they were conquered successively by the Phoenicians, Romans, Vandals, and Arabs. The predominating religion is Mohammedanism, and the spoken language is classed with the Hamitic tongues. Their peculiar characteristics show that they are a distinct and peculiar race. They number about 5,000,000. The four different classes of Berbers are known as the Amazirgh in northern Morocco; the Shulah in southern Morocco; the Kabyles in Algeria, and the Berbers in the Sahara Desert.

**BERGAMO** (bēr'gā-mō), a city of Lombardy, in northern Italy, twenty-eight miles northeast of Milan. It is an important market and manufacturing center. The city consists of two sections, the upper and the lower, which are connected by a system of street railways. A fine statue of Garibaldi stands in Garibaldi Place. The public library contains 70,000 volumes. Other buildings include the city hall, the cathedral, and an academy of arts. In early history it was strongly fortified. It was destroyed by Attila in 452 A. D., and later became one of the chief cities of the Lombard kings. Population, 1906, 47,772.

**BERGAMOT** (bēr'gā-mōt), the name of a genus of fruit trees, including several species of pears and citrons. Bergamot oil is made of the citron, or bergamot orange. It is cultivated in Eurasia, and bears a fruit shaped like a pear, yellow in color, which yields a fragrant oil valued as a perfume. This oil is obtained by pressure or by distillation. It is used for flavoring, and in the manufacture of cologne, pomades, and essences.

**BERGEN** (bēr'gen), a seaport city of Norway, on the coast of Vaagen Bay, in the province of Bergen. The chief buildings include the Lutheran cathedral, the museum, and the nautical school. It has a fine library of 80,000 vol-

umes. Bergen is the second city of Norway, carries on extensive manufactures, and is noted for its fisheries. The stock fisheries yield an income of about \$2,500,000 annually, while its cod-liver oil industry, distilleries, and shipbuild-



BERGAMOT ORANGE.

ing are likewise extensive. It has railroad and electric street railway facilities, electric lighting, pavements, and good schools. Population, 1905, 72,251.

**BERHAMPUR** (bēr'ūm-pōor), a town of India, in the lieutenant governorship of Bengal, 115 miles north of Calcutta. It was long a military station of Great Britain. A college, several churches, and the government buildings are among the most important structures. It was the scene of hostilities in the Sepoy mutiny of 1857. Population, 25,380.

**BERIBERI** (bā-rī-bā'rī), or **Kakke**, a disease more or less prevalent in Japan and Southern Asia. It is a form of neuritis, but is known as kakke in Japan and beriberi in India. The patient becomes numb or paralyzed and sometimes madness and paroxysms occur. Death frequently results from this disease in from twenty to thirty hours, though many cases are protracted or do not prove fatal.

**BERING SEA** (bē'rīng), the northern extension of the Pacific Ocean, bounded on the north by Asia and Bering Strait, east by Alaska, south by the Aleutian Islands, and west by Kamchatka. It communicates with Bering Strait, which separates Asia from North America, and connects Bering Sea with



the Arctic Ocean. Bering's Island is northwest of the Aleutian chain, off the coast of Kamchatka, and is of no value except as a station for seal fishing. It is not inhabited and possesses no timber. The island has an area of thirty square miles, and is noted as the burying place of its discoverer, Vitus Bering.

**BERING SEA QUESTION**, a controversy between the United States and Great Britain, which originated after the transfer of Alaska from Russia in 1867. In 1870 the Alaska Commercial Company leased of the United States the Pribilof Islands, in Bering Sea, and the Commander Islands of Russia. The company was limited to capture not over 100,000 seals each year, and was required to pay the government \$50,000 rental annually. The seals taken from the territory in twenty-three years and sold in the London market were valued at \$33,000,000. A dispute arose between Great Britain and the United States as to the control of the seal fisheries, both claiming the territory in dispute. An arbitration commission met at Paris, March 23, 1893, to settle the controversy, after receiving a report from experts. The result of the arbitration was that definite boundaries were fixed for the sealers of Canada and the United States, and proper precaution was taken for the protection of young seals. This adjustment led to a satisfactory conclusion, both on the part of England and the United States, and the maintenance of the law, whereby the seal fisheries are regulated and the seals protected from extermination.

**BERING STRAIT**, the narrow passage of water which connects the Arctic with the Pacific Ocean, separating Asia from America. The distance at the narrowest point, between East Cape in Asia and Cape Prince of Wales in America, is about thirty-eight miles. Three small islands lie about midway between these points. The depth ranges from 150 to 200 feet. It is frozen in winter, when the ice is formed in great ridges due to the action of the waves, and fog prevails most of the time in the warmer season. It was discovered by the Russians in 1648, and subsequently explored by Vitus Bering and Captain Cook.

**BERKELEY** (bĕrk'li), a city in Alameda County, California, nine miles northeast of San Francisco, on the California and Nevada and the Southern Pacific railroads. It is the seat of the California State College of Agriculture, the University of California, and the California Institution for the Deaf, Dumb, and Blind. Other institutions include the Berkeley Bible Seminary, the Bowen Academy, and

the Boone University School. The city is noted as one of the leading educational centers of the far west. Its industries include planing mills, canning factories, machine shops, and commerce. It has waterworks and electric street railways. It was settled in 1868 and incorporated in 1878. Population, 1910, 40,434.

**BERKSHIRE HILLS** (bĕrk'shĭr), the name of a hilly region of Massachusetts, situated in Berkshire County. These highlands are an extension of the Green Mountains of Vermont, and trend in chains north and south through the western part of the State. Graylock, the highest peak, has an elevation of 3,500 feet, and Mount Everett is about 2,600 feet high. The scenery is beautiful in the summer season, when many tourists visit the points of interest.

**BERLIN** (bĕr'lin), a city of Coos County, New Hampshire, on the Androscoggin River, about twenty miles east of Lancaster. It has transportation facilities by the Boston and Maine and the Grand Trunk railroads, and about fifteen miles distant is Mount Washington. The public improvements include a public library, electric lights, waterworks, and several fine school and church buildings. The chief manufactures are pulp, flour, machinery, earthenware, vehicles, cigars, and clothing. An abundance of water power is obtained from the river, which has a fall of 400 feet in six miles. Population, 1900, 8,886.

**BERLIN**, the county seat of Waterloo County, Ontario, on the Grand Trunk Railway. It is located on the Grand River, about sixty miles west of Toronto. The manufactures include butter, malt liquors, leather goods, clothing, and machinery. It has a public library, street railways, waterworks, and electric lighting. The chief buildings include a high school, the city hall, and a Catholic college. Population, 1901, 9,747.

**BERLIN**, the third city in Europe, and the capital of the German Empire. It is situated in the province of Brandenburg, on the Spree River, and is the capital of the kingdom of Prussia. The city is located in the center of what was originally a sandy plain, but the region has been improved by fertilization and cultivation and produces abundantly. In the 13th century it was a small fishing village inhabited by Wends. Its growth and prosperity date from the reign of Frederick William, the Great Elector, from 1640 to 1688, who united the separate duchies of which Prussia is now formed and made Berlin the capital, largely because of its central location. In 1861 it covered an area of 14,000 acres; in 1888, over 1,000,000 acres,



and at the present time it is the largest city in the German Empire.

The original or older part of Berlin has narrow streets and is built irregularly, but the newer part is well platted, has wide streets covered with substantial paving, and its edifices and public buildings are constructed of durable stone in fine architectural forms. Frederick I., successor of Frederick William, devoted much energy to enlarging and beautifying the city, and at the end of his reign it had a population of 50,000. Many substantial improvements made by him are still intact. At the end of the reign of Frederick II. the city had grown to a population of 145,000. After the defeat of Napoleon in 1815, the rise of German power made Berlin a center of art and science, and an important seat of commerce, while, following the successes of Germany in 1870-71, its growth



was stimulated with a rapidity never before known. In 1905 it had a population of 2,040,148.

Berlin is one of the great centers of art and intelligence. The royal library contains more than a million volumes, besides 16,000 manuscripts and charts. Its museums are among the most famous, containing magnificent specimens of ancient and modern treasures. Eight public museums, besides the National Gallery and Royal Museum, are maintained and liberally endowed. Each has an old and new part, in which the different exhibits are located. Among them are antiquities of remote ages; casts of ancient, mediaeval, and modern sculptors; pictures representing the six great epochs in human progress; collections of engravings; and galleries of curiosities.

Among the many elegant churches of Berlin are the Michaelskirche (Catholic), and the Protestant Dankeskirche, Heilige-kranskirche, Zionskirche, and Thomaskirche. The system of education is compulsory. Schools, public and private, are divided into kindergarten, elementary, middle, and higher. There are about thirty high schools, some of which have gymnasiums attached, while others are called *real-schulen*, in which Latin, higher mathematics, modern languages, sciences, and commercial pursuits are taught. The universities, normal schools, and academies culminate in the University of Berlin, one of the great seats of modern learning.

Among the noted thoroughfares of Berlin is Unter den Linden, reputed to be the most beautiful street in the world. It is adorned by magnificent structures its entire length of two-thirds of a mile. Many public places are beautified with costly monuments. The most noted is the one dedicated to Frederick the Great, opposite the emperor's palace, which was completed by Rauch in 1703, and is regarded the finest monument in Europe. Other noted monuments are those dedicated to Frederick William III., those commemorating the generals of the Seven Years' War and the generals who fought against Napoleon I., and a beautiful bronze Gothic monument erected by Frederick William III. to commemorate the victories of 1813-15. The monument built by Emperor William I., in the Königsplatz, to commemorate the triumphs of 1864, 1866, and 1870, rises to a height of 187 feet. These and others represent by statues and busts the celebrated

German promoters of literature, science, and political and military life. There are zoölogical and botanical gardens remarkable for extensive and beautiful collections of animal and plant growth. The city has 750 public buildings, including the Royal Palace, the Reichstags Building, and the Brandenburg Gate.

The interior of the city is devoted almost exclusively to commerce, while the residence portion is distributed around the outside. Railroads, electric street railways, extensive canals, and tramways are accessible in all parts of the city, and make it at once a notable center of modern convenience and business activity. The electric lights, gas system, telephones, and tramways are owned, controlled, and operated under the government of the city. The sewer system



of Berlin is not only complete and serviceable, but is counted one of the most practical in the world. All the refuse matter is carried to a central point, from which it is pumped by means of great tunnels to outlying districts and used for fertilizing the soil. This condition makes it possible to utilize the refuse animal and vegetable matter of the city for the purpose of increasing the production of vast areas of tillable land, a result that should be obtained in all cities. Manufactures and trades are conducted on a large scale. The production of ladies' mantles alone is over twenty-five million dollars annually, while sewing machines, clothing, machinery, hardware, jewelry, musical instruments, and other productions are of equal proportions.

The government of the city is under the direction of a mayor and thirty-four magistrates, who are elected without regard to politics. The council consists of 108 members, elected for six years, the term of one-third expiring every two years. Voters are divided into three classes; those who pay one-third of the whole city tax, those who pay taxes equal to two-thirds, and the remainder. Each of these classes has an equal representation on the council. Under this system the problem of city government has been successfully solved, and Berlin is not plagued with the usual corruption in government common to most large cities.

**BERLIN, Treaty of**, a treaty concluded at Berlin, Germany, July 13, 1878, by the Berlin Congress, made up of representatives from Turkey and the six great powers, at the conclusion of the war between Russia and Turkey. The six great powers are Russia, Germany, England, France, Italy, and Austria. It was called at the suggestion of Prince Bismarck. By its terms Greece was enlarged, Britain got Cyprus, Russia took Bessarabia, Austria received Bosnia and Herzegovina, Bulgaria was divided into Rumelia and Bulgaria proper, Persia and Russia got part of Armenia, and the independence of Servia, Rumania, and Montenegro was recognized.

**BERLIN, University of**, the great national university of Germany, and one of the largest and best equipped institutions of higher education in the world. It may be said to date from 1807, when Frederick William III. called a convention of the most noted German scholars to consider the establishment of an academy or university. The plan was supported by Wilhelm von Humboldt, a brother of Alexander von Humboldt, and he was made first minister of education in 1808 to cooperate with the ministry of the interior in securing support. The palace of Prince Henry and a stipulated annual

income were assigned to the foundation in 1809, from which year the present organization may be said to date. It has departments of medicine, theology, philosophy, including the arts and sciences, and jurisprudence, and with it are affiliated several institutions, such as museums, seminaries, and observatories. The minister of education has general control, and support is given by the state through endowments and appropriations. The library has 175,000 volumes, and students have access to the royal library, which has more than a million volumes and many ancient and modern manuscripts. Admission is granted to men of all nationalities and to women under certain restriction. About 400 professors and instructors have charge of the work, and the attendance approximates 12,000 students.

**BERMUDA** (bēr-mū'dà), or **Somers Islands**, a group of 360 islands in the Atlantic Ocean, about 675 miles southeast of New York. Only twenty islands of the group are inhabited and the total area is only twenty square miles. Their formation is largely of coral remains, and they are surrounded by living coral growths. The productions consist of vegetables, including onions, potatoes, and lily-bulbs, and some cereals. A public school system of fifty-five schools, with 1,790 students, is supported by government grants. The islands are a favorite summer resort for people from the United States and Canada, and furnish the New York markets a considerable supply of vegetable products. The value of exports aggregates \$600,000, while the imports are somewhat larger. They have a favorable, healthful, and pleasant climate, but the soil is sandy and not productive without fertilizing. These islands are divided into nine parishes that are represented in an assembly and council, and are under the direction of a governor appointed by Great Britain, to which country they belong. They were first discovered by Juan Bermudez, a Spaniard, in 1522, and rediscovered by Sir George Somers in 1609. A cable line connects the group with Halifax, Nova Scotia. Hamilton, the chief town, has a population of 2,246. The total population, in 1905, was 17,860.

**BERMUDA GRASS**, a kind of grass thought to be native to India, but now cultivated extensively for fodder. It grows in height from one to two feet, depending upon the quality of the soil, and roots at the joints. In many regions it is esteemed as a lawn grass, since it is hardy and remains green until late in autumn. It does not endure in shade, but thrives in either dry or wet places, though it is killed by standing water.



**BERNARD DOG, Great Saint**, a variety of dog that derived its name from the hospice of Saint Bernard, where a number are kept for the purpose of assisting in the rescue of perishing travelers. The monks of the hospice are accompanied by these dogs when in search of travelers. They have long been trained to search for persons who might be lost in the mountain passes of the Alps, and are still used for that purpose. When sent in search of persons they carry a flask of wine or brandy about the neck for the relief of the travelers. These dogs have saved many lives in the regions of perpetual snow, not only in the Alps, but elsewhere.

**BERNARD, Great Saint**, a celebrated pass in the canton Valais, Switzerland, leading over the Alps between Switzerland and Italy. At the crest of the pass is the famous monastery of Saint Bernard, a mile and a half above the sea, the highest dwelling in Europe, first established in the year 962. The snow covers the pass nearly the entire year, and terrible storms often overtake the travelers. This pass has been a famous outlet across the Alps. The armies of Charlemagne, of Frederick Barbarossa, and of Napoleon crossed at this pass. The last mentioned took his army in 1800, including infantry, cavalry, and artillery, numbering about 30,000 men, safely into Italy. It is thought that Hannibal also crossed by the Great Saint Bernard.

**BERNE** (běrn), or **Bern**, the seat of government of a canton by the same name and the capital of the republic of Switzerland. It is located on the Aar River, on a beautiful promontory, and is the center of numerous railroads and extensive commercial enterprises. It is one of the pleasantest cities of Europe, built largely of freestone, and walks and trees extend along both sides of the streets. The public buildings include the Gothic Cathedral, built in the latter part of the 15th century, the Federal Building, the Church of the Holy Spirit, the university, the townhouse, the public mint, and the theater. It has a city library of 100,000 volumes and the finely constructed Swiss National Library. Other institutions include the public museum, the armory, and many academies and hospitals. All modern municipal conveniences have been provided. Canals wind through the streets from the Aar River, and numerous fountains and monuments adorn its public places. The manufactures include gunpowder, leather goods, dress fabrics, firearms, paper, musical instruments, and other products, although it is not a great manufacturing center. The city was founded

by Berthold V. in 1191. It became a free city in 1218, and in 1353 united with the Swiss Confederacy. The spoken language is German and the people are mostly Protestants, only a small per cent. being Catholics and Jews. Population, 1907, 73,185.

**BERRY** (běr'ry), a small, fleshy and juicy fruit which does not open when ripe. It contains a pulpy mass in which the seeds are immersed. Some varieties are one-celled, but others contain compartments united at the axis, and from the axis to the rind. Good examples are gooseberries, currants, grapes, and belladonna. The term is applied to strawberries, which bear seeds on a pulpy receptacle.

**BERYL** (běr'il), a mineral found in many parts of Canada, the United States, and other countries. It crystallizes in six-sided prisms, and ranges as colorless, blue, green, or yellow, though always quite pale. Those of a sea-green or clear yellow color are preferred as gems, and the rich green kinds are emeralds. Jewelers call the finer grades *acqua marine*. Brazil furnishes the best grade of beryls, but choice varieties occur in Ceylon, the Urals, and in the Rocky Mountains, especially in Colorado.

**BESANÇON** (be-zōn-sōn'), a city of France, located on the Doubs River, and capital of the department of Doubs. It is considered one of the strongest cities of France, owing to its citadel, which is located on an elevated rock 410 feet high. The chief buildings include the cathedral, the museum, the public library, a college, and the prefecture. In the time of the Caesars it was known as Vesontio and was occupied by the Romans a long term of years. It has many structures dating from the Romans, including a triumphal arch built by Marcus Aurelius. The Burgundians held it in the 5th century, and the Germans in the 12th. In 1679 it was ceded to France. The city now is a railroad and manufacturing center. Its products include cotton, woolen, and silk goods, machinery, ironware, and watches. The latter industry employs over 3,400 hands. It is the birthplace of Abel Rémusat and Victor Hugo. Population, 1906, 56,168.

**BESSARABIA** (běs-sā-rā'bī-à), a province of Russia, bordering on Rumania and the Black Sea. The surface is level except in the northwest, where timbered ranges of the Carpathian Mountains attain to considerable elevations. Much of the soil is fertile and in a state of good cultivation, and all classes of live stock and cereals common to Europe are grown profitably. The inhabitants are made up of different races and include Bulgarians, Russians, Poles, Jews, and Tartars. Turkey



governed the region from 1503 until 1812, when it was ceded to Russia by the Peace of Bucharest. The Treaty of Paris gave the south-eastern part to Turkey in 1856, but it was restored to Russia in 1878 by the Treaty of Berlin. Kishinev, the capital, has been the scene of many massacres of Jews. The area is 17,600 square miles and the population 1,933,500.

**BESSEMER** (bēs'ē-mēr), a city of Jefferson County, Alabama, fifteen miles southwest of Birmingham, on the Southern, the Louisville and Nashville, and other railroads. It is noted as the center of an iron producing region, and is the seat of extensive rolling mills and blast furnaces. The manufactures include tobacco, machinery, clothing, and brick. It has a large trade in cereals and merchandise. The city is improved by waterworks, sewerage, and excellent school and church buildings. Population, 1910, 10,864.

**BETEL** (bē't'l), or **Betle**, the name of a narcotic stimulant derived from a certain species of pepper. In the market it is known as betel pepper or as betel nut, depending upon the form in which it is sold. The betel nut used as a stimulant in Asia is made by slicing the nut of *areca palm*, flavoring with a little quicklime, and wrapping it with the leaf of the betel pepper. It has aromatic and astringent properties, colors the teeth black and the tongue and lips scarlet, and is bitter and unpleasant to a person not in the habit of using it. Both male and female, young and old, chew it habitually. A supply is carried in small cases, and people offer it to each other as snuff or cigars are offered by Europeans. The plant, of which there are several species, is cultivated extensively. The fruit of the areca palm is about the size of a cherry and is grown for the market in Ceylon and Southern Asia.

**BETHANY** (bēth'ā-nī), a village about two miles east of Jerusalem, Palestine, containing at present about 200 inhabitants. It was the home of Mary, Martha, and Lazarus, where Christ often visited and worked numerous of his greatest miracles. Near this place Christ's ascension took place. Travelers are shown a cave near Bethany in which Lazarus was buried and the site of his home.

**BETHESDA** (bē-thēz'dà), which implies "home of the stream," a pool near Saint Stephen's Gate and the Temple of Omar in Jerusalem. It is associated with the healing of the impotent man. The length of the pool is 460 feet; width, 130; depth, seventy-five feet. It is now called Birket Israel. See John v, 2-9.

**BETHLEHEM** (bēth'lē-hēm), a borough of Northampton County, Pennsylvania, about

fifty miles north of Philadelphia, on the Lehigh River. It is on the Lehigh Valley, the Central of New Jersey, and other railroads, and a bridge across the Lehigh River connects it with South Bethlehem, the seat of Lehigh University and the Bethlehem Ironworks. The chief buildings include the public library, the Church of the Nativity, and Saint Luke's Hospital. It has manufactures of silk textiles, graphite products, brass and iron implements, machinery, flour, and cigars. A system of theological institutions is supported by the Moravians, in one of which General Lafayette was nursed after being wounded at the Battle of Brandywine. Bethlehem was founded by the Moravians in 1742 and was chartered in 1851. Population, 1900, 7,293.

**BETHLEHEM**, "the house of bread," a small town six miles south of Jerusalem, in Palestine, the birthplace of Christ. It contains the Convent of the Nativity, built by Empress Helena in 327 A. D., destroyed in 1236 by Moslems, and restored by the Crusaders. It is in charge of Armenian, Greek, and Latin Christians. Under a richly adorned grotto are crystal and silver lamps that mark the exact spot where Christ was born. The manger in which he was laid is one of the central attractions. An elaborate inscription in Latin contains the information, "Here Jesus Christ was born of the Virgin Mary." The town has three convents for Greeks, Armenians, and Roman Catholics. The inhabitants engage largely in trades and the manufacture of crucifixes and rosaries to sell to pilgrims. Population, 7,885.

**BETHSAIDA** (bēth-sā'ī-dà), the "house of the fish," the name of two villages on the Sea of Galilee, one of which still remains. These villages were on the western and northern shores of the lake. The former was the birthplace of three of Christ's disciples, Peter, Philip, and Andrew; the latter was the scene of the feeding of five thousand by Christ.

**BEVERLY** (bēv'er-ly), a city of Essex County, Massachusetts, on a bay of the Atlantic, eighteen miles northeast of Boston. It is on the Boston and Maine Railroad and is connected with Salem by a bridge which spans the bay. It has a good harbor, extensive leather and shoe factories, and grain elevators, and has modern municipal facilities, including gas and electric lights, pavements, and street railways. The public library contains 12,000 volumes. It is the seat of the New England Institute for the Deaf and Dumb. The region was settled in 1630 and the city was chartered in 1894. Population, 1905, 15,222.



**BEYROUT** (bā'rōōt), or **Beirut**, formerly called Berytus, the chief seaport of Syria, sixty miles northwest of Damascus. It is of commercial importance, being visited by steamers of the regular service from French, German, British, and Egyptian ports. Its exports consist largely of tobacco, wool, olive oil, cereals, and gums. The chief manufactures include cotton and silk goods, jewelry, and clothing. Its commerce with foreign powers is tending to give it a modern appearance and many European facilities. It has a number of fine schools, churches, synagogues, and government buildings. It was an important city in the time of the Phoenicians. The Byzantine emperor, Theodosius II., greatly enlarged it, and its greatest importance was reached in the time of the Crusades. Subsequently it fell into the hands of the Druses, was bombarded by the British in 1840, and is now under Turkish dominion. Population, 1905, 118,890.

**BÉZIERS** (bā-zyā'), a city of France, in the department of Hérault, thirty-eight miles southwest of Montpellier. It is on the Orb River and the Canal du Midi, and has steam railroad and electric railway facilities. It is the seat of a fine Gothic cathedral, a college, and a public theater. Glass, silk textiles, leather goods, and machinery are among the manufactures. It was a fortified town in the time of the Romans, and the scene of a massacre of the Albigenses by Simon de Monfort, who killed about 20,000 of its citizens. Population, 1906, 52,268.

**BHUTAN** (bōō-tān'), or **Bhotan**, an independent state of India, located south of the Himalaya Mountains and west of Tibet. The surface is greatly diversified by mountain ranges, some of whose peaks have an altitude of 16,500 feet above the sea. Stock raising and agriculture are the chief industries, and the manufactures are confined largely to textiles, musk, and utensils. The people are a mixture of Aryan and Tibetan stock, and practice both polygamy and polyandry. Buddhism is the chief religion. The government is administered by two rulers, one a secular and the other a spiritual official. Dosen, or Punakha, is the capital. Great Britain annexed a part of the territory of Bhutan in 1865. Population, about 200,000.

**BIAFRA** (bē-ā'frā), **Bight of**, an inlet on the Atlantic coast of Africa, the eastern part of the Gulf of Guinea. It lies between Cape Lopez and Cape Formosa, and borders French Congo and the German possession of Kamerun. Prince's Island and the islands of Saint Thomas and Fernando Po are near or in the bight.

**BIBLE** (bī-b'l), the book held by Christians

to contain the word of God and regarded as infallibly true. The word *Bible* is derived from mediaeval Latin, in the singular number, and means a book. The Greek form of the word is plural and means books. As commonly used it signifies *the book*, in comparison with which other books or writings are unworthy; or, if they be called books, then the Bible becomes *the book of books*. The Latin words *scriptura*=writing, *scripturae*=writings, convey the idea that the Scriptures are the only writings worthy of being called writings; therefore, they stand higher than all other books. This use came from the Latin fathers and has met general acceptance by all Christian nations.

The Bible consists of two parts, the Old and the New Testament, meaning covenants between God and his people. It includes also the *Apocrypha*, which is held to be canonical by some, and as good and useful for family reading by others. The Roman Catholics and several other Christian churches hold the Apocrypha canonical, but combine with it church traditions regarding faith and morals. Protestant churches do not accept more than the Old and New Testament as the canonical word of God. Jews accept only the Old Testament. The Jewish religion holds that a compact exists between God and the Jews, while the Christian religion holds that God has given the Bible as a compact between Himself and the human race.

The Greeks of Alexandria completed a translation of the Old Testament about 230 B. C., known as the *Septuagint*. This is the earliest and most famous version, and was adopted by the early Christian Church as well as by the Jews, and has always held an eminent place in Bible history and interpretation. There are other celebrated versions, known as the *Syriac version*, made in the 2d century B. C.; the *Coptic version*, in the 3d or 4th century A. D., and the *Gothic version*, in the 4th century. Both the Coptic and Gothic were made from the Septuagint. Jerome in the year 405 A. D. completed the most important Latin version, largely on the basis of the original Hebrew, which is known as the *Vulgate*. The first edition of the entire Hebrew Bible was published in 488 in Soncino. It was written on linen cloth, skins, or papyrus kept in rolls. The books of the New Testament were written in Greek, with the possible exception of Saint Matthew, which was, perhaps, originally written in Hebrew, but was early translated into the Greek. No other book has been so largely translated and generally read as the Bible. In



modern times it has been extensively circulated in all languages.

In 1382 the first English translation was made, known as the *Wyclif's Bible*, but the first printed version of the New Testament was Tyndale's, and in 1535 Miles Coverdale published the first complete English Bible. In the reign of Mary the English refugees at Geneva published the *Great Bible* through the efforts of Lord Cromwell, and later several other editions were issued. In 1611 the authorized version of King James appeared, which is known as the *King James Bible*. It was instigated by Hugh Broughton, and undertaken after the Hampton Court Conference was suggested by King James I. Six companies, two at Cambridge, two at Oxford, and two at Westminster, consisting of forty-seven scholars, undertook the work, while at London a general committee revised the portion translated by each committee. The entire work was done in three years. Owing to the purity of style and the general accuracy with which the translation was made, it has superseded all other versions in the English. The version recognized by the Roman Catholic Church is a translation made from the Latin Vulgate; the New Testament translation was completed at Rheims in 1582, and the Old Testament at Douay in 1609-10.

In 1870 the convocation of Canterbury appointed a committee to investigate the necessity of making a new version in English. They reported favorably, and accordingly two companies were organized, one each for translating the Old and the New Testament. The company consisted of members of the convocation and other eminent scholars, and was aided by two similar companies organized in America to aid the British scholars. They published what is known as the Revised Version of the New Testament in 1881 and that of the Old Testament in 1884. Although some alterations were made and a number of points in accuracy, clearness, uniformity, and grammatical constructions were effected, the King James edition still occupies a larger field. The German translation holds equal rank with the English, and is the most famous for clearness and accuracy of the early translations into the modern languages. It was made by Martin Luther in 1534, and is generally accepted by German speaking people as the most accurate in that language.

The Jews divide the Old Testament into three divisions: the law, the prophets, and the sacred writings. *The Pentateuch*; as the five Books of Moses are usually called, contains the Jewish law, but of course includes also prophecy, history, and biography. The law

is included in three parts: the *Book of the Covenant*, followed by the Israelites till the reign of Joshua; *Deuteronomy*, from Joshua to the exile; and the *Priestly Code*, which became authoritative after the Restoration. The prophets were divided by their scholars into the Former and the Latter. The Former Prophets embrace the historical books containing much of interest regarding the Jewish nation and their statesmen. They begin with Joshua and include all of the Old Testament books up to the prophet Isaiah. The Latter Prophets include the portion from Isaiah to Malachi, with the first and last included. The sacred writings of the Old Testament embrace the history of the Jewish people, their praise of God in psalms, their lamentations, proverbs, and prophecies. The whole contains many promises that the people are to be delivered out of all earthly troubles, and attain perfect bliss by the advent of a Messiah. These prophecies are still held by the Jews to indicate the coming of a deliverer, to whose advent they still look with hopeful confidence, while to Christians the prophecies mean a promised delivery which has been effected by the birth of Christ.

The New Testament commences with the *Gospels*, four accounts of the life of Christ by his followers; the first by Matthew, the second by Mark, the third by Luke, and the fourth by John. Matthew and John were disciples of Christ, while Mark was a companion of Peter, and Luke a companion of Paul. The Gospels are followed by the *Acts of the Apostles*, which gives an account of the early church and its foundation. Later come the twenty-one letters of the apostles to the churches, and some to the apostles as they were engaged in the active work of organizing and spreading the gospel. The last Book of the New Testament is the *Revelation of Saint John*, commonly called the *Apocalypse*. The books of the New Testament usually appear in uniform order, while the order of the Old Testament depends largely upon its translation. In the Hebrew Bible the divisions are different from those of the English, which in this respect follows the Greek Septuagint and the Latin Vulgate. The Jewish division into the law, the prophets, and the psalms is quoted in Luke xxiv, 44, in these words, "that all things might be fulfilled that are written in the law, and in the prophets, and in the psalms." While the books are arranged differently, we give below the order in which they usually appear. The sixteen prophets, which belong to the Old Testament, are separated for convenience in reference:



## BOOKS OF THE OLD TESTAMENT.

Genesis,	II Kings,
Exodus,	I Chronicles,
Leviticus,	II Chronicles,
Numbers,	Ezra,
Deuteronomy,	Nehemiah.
Joshua,	Esther,
Judges,	Job,
Ruth,	Psalms,
I Samuel,	Proverbs,
II Samuel,	Ecclesiastes,
I Kings,	Song of Solomon.

## THE SIXTEEN PROPHETS.

Isaiah,	Jonah.
Jeremiah,	Micah,
Lamentations,	Nahum,
Ezekiel,	Habakkuk.
Daniel,	Zephaniah.
Hosea,	Haggai,
Joel,	Zachariah,
Amos,	Malachi.
Obadiah,	

## THE APOCRYPHA.

I Esdras,	Song of the Three Holy
II Esdras,	Children,
Tobit,	Susanna,
Judith,	Bel and the Dragon,
The Rest of Esther,	Manasses,
Wisdom of Solomon,	I Maccabees,
Ecclesiasticus,	II Maccabees.
Baruch,	

## BOOKS OF THE NEW TESTAMENT.

Matthew,	I Timothy,
Mark,	II Timothy,
Luke,	Titus,
John,	Philemon,
The Acts,	Hebrews,
Epistle to the Romans,	Epistle of James,
I Corinthians,	I Peter,
II Corinthians,	II Peter,
Galatians,	I John,
Ephesians,	II John,
Philippians,	III John,
Colossians,	Jude,
I Thessalonians,	Revelation.
II Thessalonians,	

No matter under what form of translation the various books appear, the contents of the Bible has for its object to give an account of the world as the creation of an Almighty Creator, always and everywhere present. It accounts both for the origin and government of mankind, and exhibits the relation of man to his Creator. While it teaches him how to live and die, it inspires him with thoughts of the most momentous proportions that can occupy the human mind. It is the aim of all sacred books, no matter of what religion, to explain the origin of all things and account for the relations of nature and humanity to something divine. The Bible is immeasurably superior to all other sacred books in that it leads to a conception, and unfolds to the soul the divine nature, of one personal God, who exercises a divine love and care for his creatures. On this quality ascribed to God by the Bible many rest their claim that it is divinely inspired by direct revelation from heaven.

The *Mazarin Bible* was the first book to be printed from movable type. It was issued by Gutenberg (q. v.) at Mainz, Germany, in 1450

and it is in the Latin. The name is from Cardinal Mazarin (d. 1661), in whose library the first copy to attract attention was found in 1760. A number of Bible curiosities, including some points of general interest, were ascertained by a convict who was sentenced to solitary confinement. Among them the following are the most noteworthy: The Bible contains 3,586,489 letters, 773,692 words, 31,173 verses, 1,189 chapters, and 66 books. The word *and* occurs 46,277 times; *Lord*, 1,855, and *reverend* but once, which is in the 9th verse of the 111th Psalm. The middle verse is the 8th verse of the 118th Psalm. In the 21st verse of the 7th chapter of Ezra are all the letters of the alphabet except *J*. The finest chapter to read is the 26th chapter of the Acts of the Apostles. The 19th chapter of II Kings and the 37th chapter of Isaiah are alike. It was found that the longest verse is the 9th verse of the 8th chapter of Esther, and the shortest is the 35th of the 11th chapter of Saint John. The 8th, 15th, 21st, and 31st verses of the 107th Psalm are alike. Each verse of the 136th Psalm ends alike. There are no words or names of more than six syllables.

**BIBLE DISTRIBUTION**, an enterprise having for its object the translation of the Bible into all spoken languages and its circulation for the dissemination of the Christian cause. The enterprise dates from the early part of the 19th century, but received its greatest impetus in 1820, up to which year 2,843,291 Bibles had been circulated. The circulation in the past four decades has averaged about thirty million copies each ten years. Since this work was begun the total circulation exceeds 185,000,000 copies. The languages into which the Bible has been translated have now reached 363. They are distributed as follows: the British Isles 6, Continental Europe 71, Asia 103, the Oceanic Islands 52, Africa 96, and America 35. There are no less than one hundred societies promulgating the spread of light and knowledge by means of the Bible through the world. No less than \$25,500,000 has been spent for this laudable purpose the past seventy-five years. The societies that have been most potent in this enterprise are the American Bible Society, the British and Foreign Bible Society, the Prussian Bible Society, and the Imperial Russian Bible Society. In 1829, 1856, 1866, and 1882 it was the aim of the American Society to place a Bible in every home in America not already supplied.

**BIBLIOGRAPHY** (bĭb-lĭ-ŏg'ŕà-fĭ), the science or knowledge of books, relating both to the external features and the value of their



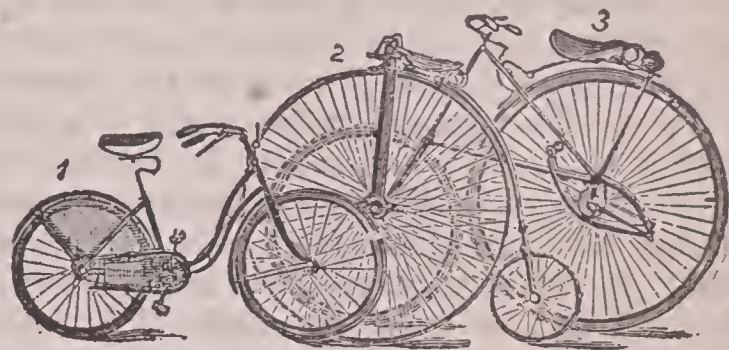
contents. The subject is sometimes divided into *pure bibliography*, which relates to the external feature of books, and *applied bibliography*, which takes cognizance of their repute and degree of value. A classification of a list of works treating of some particular branch of knowledge is called a *bibliography*, such as a bibliography of electricity or one of political economy. Conrad von Gesner (1516-65), of Switzerland, prepared his "Bibliotheca Universalis," in which he published a very extensive list of books issued in the Hebrew, Greek and Latin languages. The work known as "The American Catalogue," published in New York City, contains a comprehensive list of authors and a title index of books published in the United States, supplemented with an annual issued from time to time. The "English Catalogue" contains a similar list of books or works published in Great Britain. A large number of German works of this kind have been issued, notably among which is Kayser's "Complete Book-Lexicon." Lorenz's "General Catalogue" is a very comprehensive French work. American works that should be mentioned in this connection are Baker's "Guide to the Best Fiction," Scribner's "Bibliographical Guide to American Literature," and Duyckinck's "Cyclopaedia of American Literature." Allibone's "Critical Dictionary of English Literature" contains a comprehensive list of both English and American books.

**BIBLIOMANIA** (bīb-lī-ō-mā'nī-à), the name used to describe the passion for acquiring or possessing books, especially those considered rare and of unusual value. Persons who make such collections regard rarity more important than utility and seek to acquire books issued from a certain press, of early and rare editions, or those in which the author personally signed his autograph. *Editions de luxe* were the first to be gathered, and later books issued by Caxton, Gutenberg, and other early printers came into great demand. The Mazarin Bible, with imprint of 1450, said to have belonged to Cardinal Mazarin, sold in 1804 for £3,950. Books in which certain faults or typographical errors were overlooked by noted authors sometimes bring high prices, and copies of "Decameron" of the first edition are especially valuable. The Grolier Club of New York City is a society of book lovers who reprint rare works for their own use.

**BICEPS** (bī'-sēps), the large muscle of the upper arm, which gives a full appearance to the front part of that limb. At the lower end it is attached to the radius by a tendon, and at the upper extremity to the scapula. The

action of the biceps is to bend the elbow. At the outer and posterior part of the thigh is another biceps. The muscle back of the arm, which works in unison with the biceps, is called triceps.

**BICYCLE** (bī'-sī-k'l), a two-wheeled machine for riding by pressing the feet on pedals. The modern safety bicycle has been brought to a high state of perfection and has assumed an important place as a means of locomotion. It not only serves for pleasure and for convenience in travel, but is utilized in war by the equipment of soldiery for military service. In many countries large bodies of armed men are drilled and equipped to use the bicycle as a means of transportation and for service in the intelligence department. It is a popular machine for long trips into the interior of continents, or for the



1. SAFETY BICYCLE. 2 AND 3. HIGH-WHEELED BICYCLES.

purpose of crossing large bodies of land for exploration and newspaper reporting.

The first bicycle was introduced into England in 1818. It consisted of a two-wheeled contrivance with a seat affixed to a wooden beam, on which the rider sat astraddle, and by kicking the ground facilitated moving forward. This finally led to the conclusion that two-wheeled machines could be made in such a manner that the rider would not need to depend upon his feet for aid in keeping it in an erect position. In 1869 a bicycle was manufactured in Europe known as the *bone-shaker*, which consisted of a wood and iron frame, and later rubber tires and steel frames were added. The bicycles made in 1880 weighed about fifty pounds and were high-wheeled machines with rubber tires.

The manufacture of high-grade bicycles dates from about 1895, when machines having a weight of twenty pounds were introduced. This pattern is now in general use. It is provided with pneumatic tires, tubular steel frames, ball bearings, and endless chains, and some patterns have chainless appliances. The pneumatic tire is made of several thicknesses of canvas enforced by vulcanized rubber, and contains an endless air-tight rubber tube. It is held to a steel or wooden rim. By means of ball bearings



friction is greatly reduced, and tubular frames aid in the reduction of weight. The modern *safety bicycle* is a popular invention and serves a variety of useful purposes. The most recent improvement is the addition of an electric storage battery, or a gas engine, by which the rider is aided in the use of the machine. The difficulty of riding against a strong current of wind or up grades is thus overcome, and facilities are provided to enable making greater speed at less exertion of the body. This machine in its various forms is popular and has displaced the use of the horse to a certain extent as a business conveyance. It is called a *motor bicycle*.

**BIDDEFORD** (bĭd'dĕ-fĕrd), a city of York County, Maine, on the Saco River, fifteen miles southwest of Portland. It is on the Boston and Maine Railroad. The city has excellent street railway service, fine schools, gas and electric lighting, and other modern conveniences. Its public high school is one of the finest in the State. The granite in its vicinity is inexhaustible in quantity and superb in quality. The city is surrounded by an agricultural country and has extensive factories and a large commerce. It was settled in 1630, incorporated in 1718, and became a city in 1855. Population, 1900, 16,145.

**BIELA'S COMET** (bĕ'là), a comet discovered in 1772, again in 1805, and again in 1826, the last time by an Austrian officer named Wilhelm von Biela (1782-1856), from whom it was named. He calculated its orbit, and showed that the period was six and one-half years. It appeared in 1832, 1839, 1846, and 1852, but since then has not been observed. At its appearance in 1846 it was split into two parts, which phenomenon was also observed six years later. It is thought that the meteoric showers in 1885, 1892, and 1899 were due to the earth passing through the orbit of the lost body.

**BIGAMY** (big'á-mĭ), the offense of marrying while the first wife is still living, or while the first husband is still alive, without first obtaining a divorce. It is defined in the criminal law as a statutory offense and is punishable by fine and imprisonment, or both.

**BIG BETHEL** (bĕth'el), a village of Virginia, between the James and York rivers, ten miles northwest of Fortress Monroe. It was the scene of an engagement in the Civil War, on June 10, 1861, when Gen. B. F. Butler with 2,500 Federals made an attack upon 1,800 Confederates under Gen. F. W. Pierce. Several attempts were made by the Federals to carry the works by assault, but the attacks were repulsed, and the Confederates retired during the night.

**BIG BLACK RIVER**, a tributary of the Mississippi, rises in Choctaw County, Mississippi. It is about two hundred miles in length, fifty miles of which are navigable. In 1863 General Grant operated on the banks of this river and carried the works of the Confederates under General Pemberton May 17, and compelled the remaining forces to retreat to Vicksburg.

**BIG HORN**. See **Rocky Mountain Goat**.

**BIG HORN RIVER**, a tributary of the Yellowstone, which rises in the northwestern part of Wyoming, in the Wind River Range. In its upper course it flows toward the southeast, which part is known as the Wind River, then north through the Big Horn Mountains in Montana, and joins the Yellowstone near Big Horn, Mont. The scenery in the upper part of its course is grand. Its length is about 380 miles.

**BIGNONIA** (big-nō'nĭ-à), a genus of flowering shrubs, so named from the Abbé Bignon. About 100 species have been described, most of which are native to South America. Many are twining shrubs with tendrils and are cultivated extensively in gardens. The *trumpet flower* is a well-known species.

**BIG RAPIDS**, a city in Michigan, county seat of Mecosta County, fifty-five miles north of Grand Rapids, on the Peré Marquette and the Grand Rapids and Indiana railroads. It is on the Muskegon River, which is crossed by a number of bridges, and is surrounded by a fertile region. The chief buildings include a public library and a courthouse, and it is the seat of the Ferris Institute. The chief manufactures are furniture, hardware, and machinery. Big Rapids was settled in 1859 and was incorporated ten years later. Population, 1905, 4,852.

**BIG SANDY**, a tributary of the Ohio River, formed at Louisa, Ky., by the junction of the Tug Fork and West Fork. The West Fork has its source in the southwestern part of Virginia and flows through Kentucky, and the Tug Fork rises in West Virginia. The latter and the Big Sandy form a part of the boundary between Kentucky and West Virginia. The Big Sandy is navigable its entire course of eighteen miles, from Louisa to the Ohio River, and the West Fork is navigable for eighty miles.

**BILE** (bĭl), the fluid separated from the blood of the portal vein by the cells of the liver, where it is collected by the biliary ducts. These unite to form larger ones and finally merge into the right and left hepatic ducts, which unite to form the common hepatic duct. The last mentioned unites with the cystic duct to form the common bile-duct, which opens on



the mucous surface of the second part of the duodenum. Bile is secreted continuously, though most rapidly an hour after eating, and a supply is retained in the gall bladder, whence it flows continuously. It is of a golden-red color, and bitter taste, and is somewhat viscid. In the process of digestion, it serves to aid more or less, especially in reducing the fatty substances and stimulating the peristaltic motion of the intestines, and in disenfecting the contents of the large intestine. The amount secreted daily is from twenty to fifty ounces. Gall stones result from solidification of the bile, and biliousness is caused when bile is not secreted in due quantity.

**BILL**, in legislature, a form of statute proposed for passage in either branch of the legislative department, which, after passing both houses and receiving the executive's signature, becomes a law. In the United States and most countries a bill for raising revenue must originate in the Lower House, but amendments may be proposed and made in the Senate.

**BILL**, the statement of an account for goods sold, services rendered, or work done, either written or printed. It may state the amount claimed by the creditor in gross or by items. When the term is used to describe a legal or commercial document, it is associated with some other word or words that define its application. The principal kinds of bills are defined in the following list:

**BILL OF ATTAINDER**, a legislative enactment to punish the person or persons guilty of treason or felony, involving the loss of all personal and real property and the infliction of cruel and unusual punishments. A person attainted cannot sue or testify in any court, or claim any civil rights or legal protection, and cannot receive or transmit any property by inheritance. Great Britain abolished bills of attainder in 1870, and the Constitution of the United States prohibits the passage of such a bill.

**BILL OF COSTS**, an itemized list of the costs of an action at law. It is filed by the successful party and is subject to the approval of the clerk or some similar officer, and the amount verified is added to the judgment.

**BILL OF EXCHANGE**, a written order signed by the person issuing it, in which another is directed to pay a third party a specified sum of money and charge it to the account of the first. The person issuing it is the drawer; the one receiving it, the payee; and the one to pay it, the drawee, and frequently triplicates are written, one for each of the three parties interested. A foreign bill of exchange is

drawn in one state or country and payable in another, and a domestic bill is drawn and payable within a State. Bills of exchange are commonly called drafts, and the largest volume of business in all commercial centers is transacted in drafts and personal checks.

**BILL OF EXCEPTION**, in law, a statement of objections made by an attorney in the course of a trial to the ruling of a judge. The objections are made for the purpose of putting the points decided on record so they may be reviewed by the full bench or by a higher court to which an appeal may be taken, and if the exceptions are well founded the case is reversed or remanded for new trial.

**BILL OF INDICTMENT**, a written document presented to a grand jury, accusing one or more persons of having committed a felony or high crime. If the grand jurors consider the evidence sufficient to support the accusation, they indorse it *A true bill*, but if the evidence is insufficient it is marked *Not a true bill*.

**BILL OF HEALTH**, a certificate issued by a consul or other proper officer to the master of a ship clearing out of a port in which contagious diseases are epidemic, or are suspected to be, certifying to the state of health of the crew and passengers on board.

**BILL OF LADING**, a memorandum of goods shipped by vessel bearing the signature of the master of the vessel, who acknowledges the receipt of the goods and agrees to transfer them in good condition to the point of destination, natural damages excepted. The term is applied in the same manner to bills covering shipments made by railroads, but they are frequently called waybills or freight receipts.

**BILL OF RIGHTS**, in government, a summary of the fundamental rights and privileges claimed by the people. The principles of political liberty in Great Britain are defined in the *Bill of Rights* adopted by Parliament in 1689, after the Prince and Princess of Orange became king and queen, and it is one of the three great documents of that country. The first twelve amendments to the United States Constitution are referred to by the same name, since they set forth specifically certain inalienable rights of the people. After the revolution in France, in 1789, a number of bills of rights were enacted by the conventions.

**BILL OF SALE**, a formal statement issued as evidence of the sale of personal property. Such an instrument is necessary when the property sold does not pass into the possession of the purchaser, but remains in the custody of the party who sold it. To make such a bill valid in some states or countries, against the claim



of a third party, it is necessary to have it recorded in the public records of the town or county. A bill is frequently given to a creditor as security for borrowed money or as surety that an account will be paid.

**BILLIARDS** (bĭl'yĕrdz), an indoor game played with ivory or paste balls on a rectangular table. The balls are driven by a cue made of an ash rod or stick against each other or into pockets. The game is one of the most popular and extensively played of all indoor games. Rules and regulations guide the player in the manner of driving the balls and in the number of points to be made. Among the games played are the *five-pin pool*, *fifteen-ball pool*, *Chicago pool*, *bottle pool*, *Parisian pool*, and many others variously designated. The origin of the play dates far back in history. Contests for the world's championship are frequent.

The table used in playing billiards is covered with cloth, has raised, cushioned edges, and its dimensions are about six by twelve feet. The cue is a straight, round staff of wood from four to eight feet in length, tapering from the butt to the tip, and tipped at the point with a thin leather, which is chalked to cause it to take hold of the smooth and polished surface of the balls. The balls are usually of ivory, measure two and one-sixteenth inches in diameter, and are differently colored. A popular game is played with three balls, one red and two white, and one of the white balls has a spot to distinguish it from the others. At the beginning of the game the red ball is placed upon the top of the table, at a point about twelve inches from the top cushion and in the center width of the table, and the other two balls are placed at different points at the opposite end of the table. The game is won or lost according to the ability of the players to strike their own ball against that of the adversary or the red ball so either may be driven into the pockets, or to strike both balls with that of the player. In America the game is played very generally with three balls on tables not provided with pockets, and the object of the player is to effect a *cannon*, that is to drive his own ball so it will strike the red ball and that of his adversary.

**BILLINGS** (bĭl'lingz), a city in Montana, county seat of Yellowstone County, 240 miles southeast of Helena, on the Northern Pacific and the Chicago, Burlington and Quincy railroads. It is nicely situated on the Yellowstone River, which furnishes an abundance of water for irrigation. The surrounding country is well adapted to stock raising. As an

inland market for wool it takes high rank, and much live stock is shipped to domestic and foreign points. Coal is mined in the vicinity, and marble and limestone quarries are worked profitably. A public library, a city hall, an opera house, a courthouse, and numerous schools and churches are among the public buildings. It has a growing trade in merchandise. Population, 1900, 3,221.

**BILLINGSGATE** (bĭl'lingz-gāt), a wharf and fish market in London, England, located near the London bridge, on the Thames. This market was established in 1699, and has continued to be free and open for the sale of all kinds of fish. The term *billingsgate* originated from this market, due to the coarse or abusive language heard there in former times.

**BILOXI** (bĭ-lōks'ĭ), a city of Mississippi, in Harrison County, on the Gulf of Mexico, and on the Louisville and Nashville Railroad. It has a well improved harbor and is the seat of several schools and a convent. It carries a large trade in fruit, vegetables, oysters, and merchandise. The canning industry is a growing enterprise, and large quantities of canned goods, such as oysters, crabs, fruit, and vegetables, are exported. Shipyards and machine shops are growing enterprises. The first settlement in its vicinity was made across Biloxi Bay, on which the city is located, by a company of French under Iberville and his brother, Jean Bienville (q. v.), in 1699, and named from the Biloxi Indians. Its growth is due to its convenient location as a trade center, and as a popular winter resort. Population, 1900, 5,467.

**BIMETALLISM** (bĭ-mĕt'al-lĭz'm), the doctrine that both gold and silver should be adopted at the same time, in the same country, as standard money, and bear to each other a fixed ratio established and recognized by the government. It is opposed to monometallism, which is the doctrine of a single monetary standard. The two doctrines have caused political dissension in all civilized countries. The contention reached the culminating point in the United States in 1896, although much discussion was given to this phase of the money question from the early organization of the government. Bimetallists contend that the coinage of gold and silver should be alike free and unlimited, that the coined metals should bear to each other a fixed value, which, when so fixed, will be maintained by reason of the law and commercial necessity; both metals should be equally standard money, full legal tender for all debts private and public, and should be the basis of the entire monetary sys-



tem. The parity of both gold and silver has been disturbed by various causes, such as the adoption of the single gold standard in some countries, whereby the demand for gold was correspondingly increased; the discovery of large quantities of gold and silver, whereby the relative quantity of the world was varied; and the demonetization of silver in a number of countries, whereby the use of silver was materially limited.

The proper ratio of the coinage is generally held to be about sixteen to one by the advocates of bimetallism, for the reason that the production of silver in the world has been in weight about sixteen times that of the production of gold. However, other ratios are advocated and have been maintained. The *battle of the standards*, as the conflict between the two doctrines is called, owes its origin largely to the discovery of vast gold fields in California in 1849 and in Australia in 1851. The relative values of gold and silver from 1600 B. C. to the beginning of the Christian era stood about as one to twelve to each other, never falling below one to nine and never exceeding one to fourteen. From the Christian era to 1640 A. D. the ratio of the market value of gold and silver stood from one to ten to one to fifteen, while from 1640 to 1872 it stood uniformly from one to fourteen to one to sixteen. A legal ratio of one to fifteen and one-half was long maintained by a number of European governments. The greatest variations in ratio have occurred since 1872. The partial demonetization of silver in the United States in 1873 caused the ratio to be about one to twenty-three, and with the act of 1878, which partly restored silver, the ratio stood at one to seventeen. Since that time, owing to legislation and the discovery of vast quantities of gold in South Africa and the northwestern part of North America, the value of silver has fallen until it has reached about one to forty. See **Money**.

**BINDING TWINE**, an article of commerce which attained its greatest utility with the general use of the self-binding harvester. The best quality is made of Manila hemp produced in the East Indies, particularly that secured of the banana palm, which abounds in the Philippine Islands. Other hemp of use in its manufacture grows in Yucatan and Southern Mexico. The sisal twine is secured from the American aloes. The binding twine sold on the market is wound into balls of 650 feet each, so wrapped that they unwind from the inside.

**BINGEN** (bĭng'en), a city in the grand duchy of Hesse, Germany, on the Rhine, 20

miles west of Mainz. It is surrounded by a fertile country which produces a superior quality of grapes and cereals. The manufactures include wine, leather, woolen goods, and clothing. It has a number of fine public buildings and a growing trade. The Mäuse-thurm Tower rises from the middle of the Rhine, a little below the city. It was erected about the 10th century by Willigis, Archbishop of Mainz. It is celebrated on account of the legend that Bishop Hatto was eaten by rats, which were attracted to the tower by large quantities of grain stored by him during a famine. In legendry it is recited that the treasures of King Nibelung were sunk in the Rhine near Bingen, from which the name was given to the Nibelungenlied. The place is also famous for the popular school song, "Bingen on the Rhine." Population, 1905, 9,878.

**BINGHAMTON** (bĭng'am-tŭn), county seat of Broome County, New York, on the north branch of the Susquehanna River. It is on the Delaware and Hudson, the Lackawanna, and other railroads, and occupies a fine site overlooking the Susquehanna and Chenango rivers, which unite in the city. Bennett Park and Ross Park are fine public grounds. It has a modern courthouse, post office, high schools, opera house, and city hall. It is the seat of the New York State Asylum for Inebriates, Binghamton Academy, Susquehanna Valley Home, and Saint Mary's Home for Indigent Children. The manufactures include machinery, clothing, furniture, cigars, shoes, and farming implements. The city has electric street railways, waterworks, gas and electric lighting, and fine public schools. It was founded in 1787 by William Bingham, incorporated in 1818, and made a city in 1867. Population, 1910, 48,443.

**BINOMIAL** (bĭ-nō'mĭ-al), in algebra, an expression that consists of two terms, such as  $a+b$  or  $7-3$ ; a *trinomial* consists of three terms, as  $a+b+x$ , or  $5+3-2$ . An algebraic expression consisting of three or more terms is called a *polynomial*. Sir Isaac Newton was the first to employ the binomial theorem, using it to raise a binomial to any power or extracting any root of it by approximating series. The discovery is engraved on his tomb.

**BIOBIO** (bē-ō-bē'ō), the largest river in Chile, rises in the Andes, and after a course of 200 miles discharges into the Pacific near the city of Concepcion. At its mouth it is about two miles wide.

**BIOGRAPHY** (bĭ-ōg'rā-fy), the department of literature which treats of the lives of individuals. When written by the subject himself, it is called *autobiography*. Biography dif-



fers in its mode of treatment in that it assumes the form of descriptive criticism, or approaches the sphere of history or philosophy. Modern biography includes numerous criticisms and elucidations, and differs from the classic in that it is more acute, expansive, and lively. Modern biographies are very numerous, and many of them possess remarkable literary charms, partake of the eminent character of their subject, and throw a light of interest about men and the events of their times. Among the early biographies are Plutarch's "Parallel Lives," written in the 1st century after Christ; Nepos' "Lives of Military Commanders," and Suetonius' "Lives of the Twelve Caesars." Biographical literature of modern times originated in the 17th century, since which time it has multiplied extensively and entered largely into the popular writings. In 1671 the publication of biographical dictionaries was inaugurated by Moreri, who published "Dictionnaire Historique et Critique." In the last century numerous publications of merit were completed and extensively circulated. Many of them contain encyclopaedic treatises and constitute practically universal biographies. Dr. Johnson thought every man best fitted to write his own life, and yet the best biography ever written is, perhaps, that of Dr. Johnson, as written by Boswell.

**BIOLOGY** (bī-ōl'ō-jy), the science that embraces all phenomena of life. It includes the scientific inquiries into the first origin of life and its various changes from the earliest period until now. Some of the phenomena of life, including psychology, the study of the human soul, and sociology, the study pertaining to man in society, are often grouped apart, but these and all phenomena of life properly belong to biology. Biology was not recognized as an important science until the latter half of the 18th century, nor was it thought possible until comparatively recent times to deduce laws which would equally pertain to all forms and manifestations of vegetable life. By means of a general tendency to inductive reasoning and the work of some scholars, as Cuvier, Lamarck, Darwin, Kant, von Baer, and numerous others, it has become possible to define all life with one definition, and classify its laws uniformly, no matter in what shape or function we find it.

All living matter has three distinctive properties. The first of these is its *chemical composition*, which invariably contains one or more forms of a complex compound of oxygen, hydrogen, nitrogen, and carbon, called the *protein* and found only as a product of living bodies. The protein is united with a large pro-

portion of water and forms a kind of fluid called *protoplasm*. The next distinctive property is the *universal waste* by being oxidized, and its conjoined restoration to a whole state by the infusion of new matter. Life is always attended by the decomposition of molecules of protoplasm. The waste products consist largely of carbonic acid, while the other elements of protein enter into the composition of protoplasm. The new matter is supplied by some other living being, or contains elements of protoplasm which go to build up the living matter. The addition unites with the existing molecules of the living mass by *interposition*. While in the stage of infancy the reconstruction exceeds the waste, the two are balanced at a period of complete development, and later the waste exceeds the reconstruction. When reconstruction exceeds the waste, the living mass grows, but when waste exceeds it, it begins to decline and death eventually results. The third distinctive property is that all living matter tends to undergo *recurring changes*, or life proceeds from *preëxisting life*; in animals the new life is born from eggs, while in plants, from seeds. Varied forms propagate themselves by offshoots, which, like their predecessors, after a time cease to live and resolve into oxidated elements. New forms in life invariably partake of the characteristics of the forms from which they originated, although by a process of propagation changes to a higher or lower state may be effected.

All living matter depends upon a supply of heat and moisture, which dependence varies in kind with its organization and structure. Life forms cannot exist unless surrounded by a temperature suitable to their growth and development. Movement, nutritive growth, and reproduction are possible only within certain limits of temperature, which, when excessively raised or lowered, cause death. The minimum limit of temperature that living matter can bear is greatly variable, depending upon the nature of the life. Pasteur found that the spores of fungi, when dry, could be exposed to a temperature of 250° Fahr., while when moistened they were killed at 112°. Bacteria lose life at 14° above zero, while experiments with other forms of life show that the power to resist cold is very various. On the other hand, the maximum limit of heat at which living matter can exist is equally variable; some forms of marine life are able to withstand a temperature of only 95°. The simpler forms of vegetable organisms lose life at a temperature of 140°. However, there are thermal springs with a temperature of 168° to 208° in which living



plants are found. Scientists ascribe their ability to withstand this high temperature to habit, this having been formed by slow degrees through long periods of time. Life does not always cease with destruction of form, but often becomes extinct only with coagulation of certain substances in the protoplasm.

Numerous forms of life are invisible to the naked eye, in many of which the most powerful microscope does not reveal the vital parts. The living forms that are found to contain different parts, with distinct functions, when examined by the microscope, are said to be organized living bodies. However, life extends beyond organized forms. Besides, there are bodies of considerable size that manifest such a peculiar structure that it is difficult to determine whether they are plants or animals. The most important distinction among animals is in the food partaken. Animals feed upon plants and other animals, and breathe in oxygen; while plants take in food from the earth and the air by means of their roots and leaves. The divisions of biology are *morphology*, *distribution*, *physiology*, and *aetiology*. The first relates to the anatomy and history, the second to geography and geology, the third to organic functions, and the last to the causes and origin of life. The study of plant life is called *botany*; of animal life, *zoölogy*.

**BIRCH** (bĕrch), a genus of trees found in the colder regions of America and Eurasia, including no less than 25 species. In the temperate climates they attain a height of seventy feet, while in cold climates, as in Greenland, they dwindle down to a mere bush, known as the *dwarf birch*. The wood is tough, firm, and light in color; the bark is smooth, shining, and whitish or a chalky white. It is one of the most useful of woods. The bark is used by savages in building huts and canoes, and by civilized people for tanning and in the production of valuable oil. Birch wood enters into the manufacture of furniture, wooden shoes, barrels, and water wheels, and is used for construction purposes. It is found farther north in North America than any other tree, and is the only tree in Greenland. For this reason it serves a valuable purpose as fuel in the cold regions inhabited by the Laplanders and Eskimos. The *white birch* and the *yellow birch* are familiar trees in many parts of Canada and the United States.

**BIRD OF PARADISE** (pâr'â-dĭs), a bird of beautiful plumage allied to the crows, found chiefly in New Guinea and the adjacent islands. The family includes a number of species, some of which are remarkable for beauty in color and

plumage. The *king bird of paradise* has a magnificent plume of feathers, which comes up from under the wings and branches over the back. It is the most beautiful bird of this family and is quite rare. Other species include the *red bird of paradise*, the *golden bird of paradise*, and the *emerald bird of paradise*. Most of these birds are small; the largest species attain a length of about two feet. The plume is found only in the male, whose feathers form an article of commerce. It is used for ornamentation and for trimming hats. The plumage is so rich and varied that in this respect these birds excel all others, even the



KING BIRD OF PARADISE.

humming birds. Knowledge of these birds dates from 1857, when A. R. Wallace discovered them while on a voyage to Australasia.

**BIRDS**, the second class of the subkingdom of vertebrate animals, which stands between the mammals above and the reptiles below. They agree with the mammals in being warm-blooded and with the reptiles, amphibia, and fishes in being oviparous, that is, their young are born from eggs, while the mammals bring forth their young alive and suckle them for a time. They are



bipeds and are feathered, and wings are used by all but a few species in flight. The blood circulates rapidly and is warmer than in other vertebrates, and consequently they are animals of great energy. They breathe not only through the lungs, but have air cells in various parts of the body, which aid in respiration. The feathers essentially resemble hair of other animals, and are found only in the bird class. The plumage on the lower parts of the body of most birds is formed by a thick coating of feathers embedded in the skin, called *down*. The shape, the light feather coating, the powerful wings, the peculiar tail, the air cells, and the strong muscles are important factors in fitting them for flight. Their feathers are renewed periodically; the plumage of winter in many species differs from that of the summer time. The young change their plumage many times before they attain their full-grown shape.

The lightness of birds enables them to fly, swim, and move rapidly on land. Their bones are thin and contain numerous air cells, while air is also found in the feathers and in various parts of the body. The swift-flying birds have more air cells than those of slower flight, while birds that do not fly possess very few, as the ostrich, which has cells only in the thigh bones. In breathing, the air passes from the lungs into the cells at will; some birds have the capacity to fill even the quills of large feathers. All this and the long feathers of the tail and wings aid in carrying the birds through the air. Birds of colder regions are covered with much warmer coating than those of hot climates; this is necessary owing to a need of greater ability to withstand the cold.

The food of birds differs widely. Some live on a mixture of plant and animal food, while others live entirely on insects and some entirely on flesh. The food is swallowed in large particles, or whole, and passes through the gullet into the first stomach, or crop, in which it is softened by soaking. It then passes by another part of the gullet into the gizzard, a strong and muscular cavity, in which it is mixed with gastric juices. The grain-eating birds have a large crop into which the seeds swallowed by them pass, where they are moistened by a liquid secretion. The strength of the gizzard depends upon the kind of birds; those that eat flesh have a weaker gizzard than those that eat plants and seeds. It is to be noted that the gizzard has a grinding motion and crushes the food, and to facilitate this action many birds swallow small stones. The in-

testines are smaller and simpler than those in mammals, but in the main all the organs, like the kidneys, gall bladder, and other vital organs, are common to them.

Birds possess all the senses, more or less fully developed. The senses of touch and taste are quite dull in all the birds, while the senses of sight and hearing are highly developed. Birds of prey possess a strong sense of smell. Many birds have no song, but all are known to be able to make a noise or cry. Only the male birds possess the power of song, but females have ability to call other birds. When domesticated, the song is beautified and enlarged, but birds of the finest plumage are not the best singers; their richness in dress is compensated for by the song in the plainer birds, a truly admirable compensation. Many birds migrate in the spring to the colder regions and return in autumn, but there are also summer birds of passage.

In nest building there is a wide range of difference. Some lay their eggs on the warm sand of the seashore or on desert oases, while others build nests in trees and bushes, or burrow in the banks of rivers or oceans. The eggs are hatched by incubation; that is, by sitting on them and keeping them warm until young birds are produced, but there are some birds that lay their eggs to be hatched by the warmth of the sun or the heat generated by decaying vegetation. The mother bird guards the nest at short range, while the males are seen at some distance watching the enemy. Many kinds of young birds are able to leave the nests and gather food for themselves shortly after hatching, but the young of some species are fed for days and even weeks.

For the purpose of study there are various divisions of birds, but the following seven are those commonly given:

1. *Raveners (raptors)* are birds of prey. They have strong, curved beaks with sharp edges. Their feet possess claws with sharp hooks, useful in catching and destroying other animals, and their wings are well developed for flight. This class includes such birds as owls, vultures, hawks, and eagles.

2. *Climbers (scansores)* are birds that climb, such as the woodpeckers, toucans, parrots, and cuckoos. Their power of flight is not well developed, but they possess feet and toes well adapted for climbing and moving about on the limbs of trees.

3. *Perchers (insessores)* are the birds that perch habitually among trees. This class of birds includes all the birds of song and most



birds that live in trees. It constitutes the most numerous order.

4. *Runners (cursores)* include the emu, ostrich, and cassowary. Their wings are rudimentary and useless for flight, while their legs are powerful. They are otherwise distinguished by their breastbone being without a keel and their hind toes wanting.

5. *Scratchers (rasores)* embrace the domestic pigeons, fowls, and pheasants. The bill is short and thick, the legs are strong and large, and the feet are suitable for scratching.

6. *Waders (grallatores)* include the snipes, herons, sandpipers, cranes, and many others. Their legs are long and destitute of feathers above the heel, and their toes are usually half webbed. The bill is long and slender, adapted for fishing under water.

7. *Swimmers (natatores)* are web-footed birds, as gulls, geese, swans, and ducks. The feet are webbed; that is, the toes are connected by membrane and formed for swimming. Most species have flattened bills, and are expert divers.

**BIRDS' NESTS**, the habitations of birds, in which they lay their eggs and hatch their young. In the construction of nests birds differ largely, from the rude and simple to the wonderful and skillful. Two classes of birds are usually recognized by writers, including those that build their nests in trees and structures above the ground and those that build in cliffs or on the ground. Nearly all birds that swim and dive, and those that live along the shore, build their nests on the ground. Some birds lay their eggs on rocky cliffs or in the sand on the shore of the sea or inland lakes. The nighthawks and whip-poor-wills lay their eggs on dry leaves or on the roofs of houses. Many water birds build nests by means of sticks and leaves entwined among the reeds of swamps. This class usually feather their nests with the down taken from beneath the breast.

Writers have divided birds into different classes, using the kind of nests they build as a basis for classification. Such birds as the canary are called *felt-makers*, because they weave their material much like the fibers of felt are arranged. Some of the birds in India are classified as *tailors*, because they sew leaves together and build their nests in a pouch-like formation, hanging downward. Many species of birds, including the mocking bird, red-winged blackbird, and many others, are classified as *basket-makers*, because they construct basket-shaped nests that resemble the seed-vessels of

plants in which they build, to deceive those who chance to visit the locality in search of eggs. *Platform builders* are such as the pigeon and eagle, which arrange platforms on the branches of trees to utilize them for the nests and for perching. *Mining birds* dig holes in the ground, or use the holes made by other animals for the purpose of making nests. A small owl of the western plains is a good example of this class. It lives with prairie dogs and hatches its young in their holes, and is closely associated with snakes. *Mason birds* build nests in cliffs and under the eaves of houses, constructing them of mud in the shape of a flask. *Carpenter birds*, such as woodpeckers, chop holes into the trunk or limbs of trees and build their nests in airy tunnels. *Ground-builders* make their nests in small holes in the ground, usually under a tuft of grass or near a large stone. The subject of birds' nests is an interesting study. However, it is remarkable that birds of all classes, no matter where found, construct the same kind of nests, and that there is no change or improvement in the construction. Cuvier asserted that birds known to the Egyptians and Babylonians built identically the same kind of nests as those that live at the present time. Many birds can be induced to nest in small houses constructed for them and placed in a convenient locality of the barn or house yard.

**BIRDS OF PASSAGE**, the birds that migrate from warmer to colder climates, and from colder to warmer climates; these include two classes, known as *winter birds of passage* and *summer birds of passage*. Winter birds of passage migrate in the spring toward the polar regions to breed, and return toward the warmer zones in autumn, while the summer birds of passage pass toward the colder regions in the fall and return toward the warmer in the spring. These classes vary according to the different latitudes. The wild duck and the goose are familiar winter birds of passage, while the robin is a good example of the other class in some countries. Among the birds that do not migrate may be mentioned the quail, grouse, and snowbird.

**BIRKENHEAD** (bĕrk'en-hĕd), a seaport of England, on the estuary of the Mersey, opposite Liverpool. It has a large steamship and railway commerce and an immense jobbing trade. Engineering and shipbuilding are its principal industries. It has communication with Liverpool by a ferry owned by the municipality, and a railway tunnel under the Mersey 30 feet below the bed of the river. The tun-



nel is 36 feet wide and 22 feet high, and was constructed at a cost of \$6,250,000. The city has fine public baths and a public library, and is the seat of Saint Aidan's College. Among the chief buildings are the city hall, the market hall, and many villas and churches. The city dates from the 12th century, but its importance as a trade center began with the latter part of the last century. Population, 1907, 118,553.

**BIRMINGHAM** (bĕr'-mĭng-əm), county seat of Jefferson County, Alabama, 95 miles northwest of Montgomery, on the Southern, the Central, of Georgia, the Louisville and Nashville, and other railroads. It is located in a beautiful valley about 600 feet above the level of the sea. The city is surrounded by the richest iron and coal region of the State, contains blast furnaces and rolling mills, and has extensive interests in manufacturing. Steel products are made in large quantities from ore found in the vicinity. Among the general manufactures are cotton-seed oil, car wheels, engines, and boilers, cotton goods, earthenware, and machinery. It has many large buildings, such as the county courthouse, the Union Depot, the Jefferson Theater, and Saint Vincent Hospital. Lakeview and Capital parks are fine public grounds. The streets are paved with stone and asphalt. Other public improvements include electric street railways, sewerage, a public library, and city waterworks. Howard College, a Baptist institution, is five miles northeast of the city. Birmingham is one of the most prosperous cities in the South. In 1880 it had a population of 3,886; in 1890, 26,241; in 1900, 38,415, and in 1910, 132,685.

**BIRMINGHAM**, an important manufacturing city of England, in Warwick County, 112 miles northwest of London. It is celebrated for its immense production of metal ware. Over 10,000 workmen are engaged in the manufacture of brass products, while large numbers engage in manufacturing firearms, steam engines, sewing machines, railroad cars, gas fittings, swords, articles of papier-mache, and other products. It has connection by many lines of steam and electric railways. The Central Railway Station covers about thirteen acres of ground. Among the chief buildings are the post office, the city hall, the Anglican Church of Saint Martin, and the Baptist Wyclif Chapel. It is the seat of Mason and Queen's colleges and other educational institutions. Among the memorials are beautiful statues of Sir Robert Peel and Nelson. The city contains seven districts, from each of which a representative is sent to Parliament. Population, 1907, 553,155.

**BIRNAM** (bĕr'nam), a hill of Scotland, in Perthshire, twelve miles northwest of Perth. From its summit, 1,580 feet above the sea, a fine view of the Tay River and valley is afforded. Formerly it was covered by a royal forest made famous by Shakespeare in "Macbeth."

**BISCAY** (bĭs'kâ), a large bay on the western coast of Europe, forming the principal eastern boundary of France and the northern boundary of Spain. Its French coast is low, but the Spanish coast rises in rocky cliffs. Navigation is dangerous, owing to storms and breakers. The tide sweeps to a height of forty feet. The water from the Garonne and Loire flows into it. On its shores are numerous sea-ports, including Nantes, Brest, Bordeaux, and Gijón.

**BISCAY**, or **Vizcaya**, a province of Spain, in the northern part, one of the so-called Basque provinces. It has an area of 836 square miles. The surface is mountainous. Bilboa is the capital and largest city. Other cities include Orozco and Bermeo. Population, 311,361. See **Basques**.

**BISCUIT** (bĭs'kĭt), a kind of bread formed into small cakes, either fermented or unfermented, and made chiefly of wheat and rye flour. Many kinds of biscuits are made in large bakeries for the trade and sold on the market, both in bulk and in small packages designed for household use. The work of kneading, cutting, and stamping is done almost exclusively by machinery, and an oven serves to turn out about two thousand pounds of biscuit in a day of nine hours. Biscuits are baked so they become hard and dry, hence may be kept without spoiling for a long time. *Sea biscuits* are made of flour, water, and salt and keep easily for two years. The biscuits of the market are made chiefly of flour, butter, eggs, soda, and salt, the proportions of the ingredients used depending upon the kind and quality desired, and in making sweet biscuits sugar and flavoring are used. To make soft biscuits larger proportions of sugar and butter are required. *Meat biscuits* are made of wheat flour and the soluble parts of meat. In Scotland some varieties are called *bakes*, while *crackers* is the name usually applied in America.

**BISHOP** (bĭsh'ŭp), a title applied to the highest order of the clergymen in the Christian church. In the Roman Catholic, Protestant Episcopal, and Greek Catholic churches bishops claim apostolic succession. In the Methodist Episcopal and other churches less formal dignity is maintained and no claim is made to



apostolic succession. In Great Britain the bishops of the Church of England are called lord bishops. Two of the archbishops and a number of the bishops of Wales and England have seats in the House of Lords. The general duties of bishops vary greatly in different denominations, but usually include the power to appoint clergymen to churches, the dignity to preside at conventions of the clergy, and oversight over the churches and the clergy within the diocese.

**BISMARCK** (biz'märk), capital of North Dakota, county seat of Burleigh County, on the Missouri River. It occupies an elevated site on the Minneapolis, Saint Paul and Sault Sainte Marie and the Northern Pacific railroads. The chief buildings include the high school, the county courthouse, the State capitol, the State penitentiary, the State library, and the Saint Paul Seminary. It has electric lights, waterworks, and fine schools and churches. It is surrounded by a fertile region and is a market for large quantities of wheat, oats, potatoes, and merchandise. The industries include flouring mills, machine shops, and grain elevators. It was settled in 1873 and became the capital of the State in 1889. Population, 1910, 5,443.

**BISMARCK ARCHIPELAGO** (bis-märk), a group of islands in the Pacific Ocean, about 56 miles east of New Guinea. The principal islands were formerly known as New Britain, New Ireland, and Duke of York, but when the archipelago became territory of Germany, in 1884, the names were changed respectively to Neu Pommern, Neu Mecklenburg, and Neu Lauenburg. The possession contains a large number of islands, but those named are the principal land masses of the group, and the total area is about 18,500 square miles. Copper and trepang are exported, and the trade in fruit and merchandise is important. Matupi is the principal commercial town. The possession has a population of 212,000.

**BISMUTH** (biz'müth), a brittle metal of a reddish-white color and crystalline texture. It is somewhat harder than lead and can be reduced easily to powder when cold by means of a hammer. In a native state it frequently consists of crystallized rhombs, but also exists with other metals, especially gold, sulphur, arsenic, and oxygen. It is useful in making printers' type, ink, and medicines, and in assaying gold and silver by cupellation. A compound of three parts of tin, five of lead, and eight of bismuth is known as *fusible metal*. The medical properties of bismuth are tonical and antispasmodic.

**BISON** (bi'sön), the name of a kind of wild

cattle found in Europe and North America, and sometimes incorrectly called *buffalo*. The European bison, or *aurochs*, is now nearly extinct, being confined to parks and in a wild state to the forests of the Caucasus, and the total number now living is thought not to exceed 800. The American bison existed in large numbers in almost the whole of North



AMERICAN BISON.

America, but was most numerous in the Mississippi valley and the great plains of Central Canada. Herds of tens of thousands roamed across the plains, usually traveling in solid columns, traces of their tracks still remaining in the sod on the western prairies. They grazed upon the plains and traveled to watering places and alkaline licks, which is evidenced by the old trails which stretch for miles over hills and through valleys. They were one of the main sources of food supply for the Indians, and served a valuable purpose when the transcontinental railroads were in process of construction, since they were a prolific source of wholesome food for the workmen. The animal attains a height of about six feet, has short horns, a large hump back of the head formed of muscles, and shaggy hair of a dusky-brown color. It lives on grass, the bark of trees, and brushwood. Full development is reached at six years, and it attains to an age of thirty-five years. Only a few hundred still remain in the wild state, and these are protected by the government in Yellowstone National Park. A small remnant of the so-called *wood buffalo* has survived in the forests of Great Slave Lake. However, a number of buffalo ranches for the purpose of rearing them have been established in various sections. The skins of these animals are very valuable, while the hump is prized for its rich and delicate flesh. The small herd in Yellowstone Park is slowly increasing. Buffaloes, when tamed, are peaceful and docile, but their number and strength made them a terror to all other animals in the early history of America.



**BISSAGOS** (bis-sä'gōz), or **Bijuga Islands**, a group of small islands near the west coast of Africa, opposite the mouth of the Rio Grande. They are of volcanic origin and inhabited by Negroes. Orange and Bulama are the chief islands, and Bulama, situated on the latter, is the leading town. Maize and fruit are cultivated, and goats and cattle are reared. These islands were discovered by the Portuguese, who made a settlement on Bissao, one of the group. They are governed as a dependency of Portuguese Guinea. Population, 3,750.

**BITHYNIA** (bī-thīn'ī-ā), an ancient country of Asia Minor, separated from Europe by the Sea of Marmora and the Strait of Constantinople, then known respectively as the Propontis and Thracian Bosphorus. It extended east to Paphlagonia, and contained the cities of Prusa, Heraclea, Chalcedon, Nicomedia, and Nicaea. The Persians annexed it in 543 B. C., but it became an independent kingdom in 278 B. C. under Nicomedes I. Prusias II. was King of Bithynia at the time of the Punic Wars, when Hannibal sought refuge at his court. The Romans made it a province in 74 B. C., and it was governed under Pliny the Younger. In 1298 it was conquered by the Turks, and the seat of the Turkish government was at Prusa for many years.

**BITTERN** (bit'tēr-n), the name of several wading birds of the heron family, common to America, Africa, and Eurasia. They attain a



BITTERN.

length of 30 inches, and the wings, when extended, measure about 45 inches. Their color is yellowish-brown with bars and spots of black. They frequent low, marshy districts, remaining at rest during the day and

coming out at twilight to seek insects, reptiles, fish, and small quadrupeds for food. They are remarkable for their ability to stand on one leg, or hold their head in the same position for several hours. The male produces a curious bellowing cry, which booms like a drum and may be heard fully a mile.

**BITTERNUT.** See **Hickory.**

**BITTERROOT** (bit'tēr-rōot), an American plant found extensively in the Rocky Mountains, both in Canada and the United States. It has an edible root, sometimes called *tobacco root*, and in cooking gives off an odor much like that of tobacco. The root is long and fleshy and from it grow a fleshy stalk and numerous leaves. The flower is solitary, beautifully colored, and remains open only during sunshine. The Bitterroot Mountains and the Bitterroot River were named from this plant, and the flower was adopted by Montana as the State flower.

**BITTERWOOD**, the name of several trees and shrubs native to Brazil and the West Indies, so named from the bitterness of their wood. The fruit is aromatic and the wood is used in making furniture, being valuable because insects do not attack it. The name is applied to a tree native to Jamaica, nearly allied to the quassia, the wood of which is used in medicine. See **Quassia.**

**BITUMEN** (bī-tū'mēn), a mineral pitch of vegetable origin remarkable for its odor and inflammability. It is secured both in a fluid and solid state, and consists of about eighty-five parts carbon and fifteen parts hydrogen. The term is sometimes extended to include the hydrocarbons, as petroleum, naphtha, asphalt, and mineral tars. It is found more or less commonly in many parts of the earth, but the largest deposits of what may be classed as mineral pitch are in the vicinity of the Dead Sea. It is useful for building purposes to make floors, roofs, and arches water-tight, and in the construction of walks and pavements. The brick used in the walls of ancient Babylon were cemented with bitumen to increase their durability and solidity. See **Asphalt.**

**BITUMINOUS COAL** (bi-tū'mī-nūs). See **Coal.**

**BITUMINOUS SHALE** (shāl), a kind of clay found in the coal measures, so named from the carbon and volatile matter mixed with the clay. Large beds are quite common, and in some places the bituminous shales are used as fuel.

**BIVALVES** (bī'vālvz), the general name of mollusks having their shells in opposite portions, which open by elastic hinges and are closed by muscles. Among the bivalves are the cockle, clam, mussel, and oyster. With few exceptions, they are marine animals, while a number of univalves, single-shelled mollusks, are common to the land. The fossil remains of bivalves indicate the depth and extent of the ocean in early geological ages, and give



evidence of their existence in the former part of the age of invertebrates, the Silurian age.

**BLACKBERRY** (blāk'ber-rĭ), the name of a large bushy plant resembling the dewberry and raspberry, also called *brambleberry*. The bushes are armed with prickles, and the fruit is sweet and luscious. It is valuable for making jam, jelly, and preserves, and is eaten as a dessert. Blackberry wine is manufactured extensively, while astringent tonics derived from the berries are used largely in medicine. The fruit grows in the wild state, but it is greatly improved by cultivation. These plants are widely distributed in both hemispheres and thrive as far north as Central Canada. They are propagated from suckers and root cuttings. New varieties are secured by planting the seed.

**BLACKBIRD**, the name applied to a large family of birds of America and Europe, generally called *merle* in Western Europe. The *crow blackbird* and the *rustycrow blackbird* are of the starling family and nest largely in trees. *Red-winged blackbirds* constitute a widely dis-



CROW BLACKBIRD.

tributed species, ranging throughout Southern Canada and in the United States from Maine to the Pacific. They live in meadows, marshes, and swamps, where they nest and rear their young. In autumn they gather in flocks and delight to frequent meadows and stubble fields in large swarms. The food of blackbirds comprises worms, berries, and insects. Blackbirds are a protection to orchards in that they devour insects, but they also consume several kinds of fruit, such as cherries and grapes. A number of species are eaten by the Indians.

**BLACKBURN** (blāk'bŭrn), a manufacturing city of Lancaster County, England, about twenty-one miles northwest from Manchester. It is on the Leeds and Liverpool Canal and

has extensive railway facilities. The chief buildings include the town hall, the Saint Mary's Church, the Draper's Hall, the county courthouse, and the municipal offices. Corporation Park and Queen's Park are fine public grounds. The importance of Blackburn as a commercial city dates back to the 17th century, when it began to manufacture large quantities of cotton goods. It is the seat of many cotton mills, and has large facilities for manufacturing steam engines, hardware, clothing, and cotton machinery. The cotton factories employ about 15,000 men and 20,000 women, and the annual output of the cotton industry is valued at \$30,000,000. Blackburn maintains public baths, a public library, an art gallery, and many fine schools, including one founded by Queen Elizabeth. It has gas and electric lighting, street railways, pavements, waterworks, and two hospitals. Population, 1907, 134,980.

**BLACKFEET**, a tribe of Indians distributed more or less through the Rocky Mountains of Montana, Wyoming, and British America, and classed with the Algonquins. In early history they constituted a powerful tribe, but were quite peaceful. In 1865 they became involved in trouble with western miners, and for five years a number of skirmishes took place in which considerable life was lost. At present they number about 5,000, of which about one-half are in the United States.

**BLACKFISH** or **Tautog**, the name of a large fish common along the Atlantic coast, much valued as a food product. It is allied to the dolphin and somewhat resembles the perch. The skin can be slipped off like that of an eel. It is one of the leading food fishes of the Eastern market, being pleasant and nutritious for table use.

**BLACK FOREST**, or **Schwarzwald**, a chain of mountains in Europe, located in Baden and Württemberg, where it stretches almost parallel with the Rhine for ninety miles. It is the source of the Kingiz, Neckar, and Danube rivers. The highest summit is Feldberg, which attains a height of 4,900 feet. The mineral products include iron, lead, cobalt, copper, and silver. Numerous mineral springs abound. There is a fine growth of timber, consisting mostly of pines on the foothills. In the valleys farming is extensively carried on, while in the towns manufacturing abounds. The manufactured articles consist of furniture, toys, wooden articles, and clocks. About 50,000 persons are engaged in the manufactories in the regions, and there is a considerable trade in merchandise and cereals.



Railroads have been constructed along the mountain sides and through the valleys, and large centers of industry are building up rapidly.

**BLACK FRIDAY**, a term used to designate any Friday on which some great calamity occurred. In England it refers to Dec. 6, 1745, when Charles Edward, the pretender, reached Derby, and to May 11, 1866, when a general commercial panic reached its most oppressive phase. In the United States the name applies generally to Sept. 24, 1869, when a financial panic was caused by speculation in gold in the city of New York, and to Sept. 18, 1873, when a similar panic commenced.

**BLACK GUM**, or **Sour Gum**, a species of forest trees of North America, known in some localities as *tupelo* and *pepperidge*. The branches are crooked and bear tufts of leaves at the ends, and the wood is tough but not durable. Hubs of wheels are made of the timber. The tree has been introduced in Europe for ornamentation.

**BLACKHEATH** (blāk'hēth), a village and commons of seventy acres in Kent County, England, about seven miles from London. It is a favorite resort for pleasure parties, and is famous in history on account of insurrectionary gatherings. Among these are the gatherings of Wat Tyler, Jack Cade, and the Cornishmen. In 1011 it served as the camping ground of the Danes. Henry V. was welcomed on the Blackheath by the people of London, and the army of the Restoration was met in the vicinity by Charles II. while on his way from Dover. It is also famous as the scene of exploits of various highwaymen.

**BLACK HILLS**, a mountain group in the southwestern part of South Dakota and the northeastern part of Wyoming, which is crossed by the boundary line between these two states. It is about 100 miles long and 60 miles wide. Harney Peak, in South Dakota, rises 7,216 feet above the sea level and is the highest elevation. The region of the Black Hills was one of the best hunting grounds for the Indians, and was purchased of them in 1876. Agriculture is carried on in some districts under a system of irrigation, but in others the rainfall is sufficient to mature crops without artificial watering. Large portions of the Black Hills are covered with an abundance of timber, consisting largely of pine forests. The district is exceeding rich in thermal and mineral springs, which have been improved and now form favorite pleasure and health resorts. Mining is the chief industry and is carried on very extensively, producing lead, tin, gold, silver, copper, iron, limestone, and other minerals.

The annual production aggregates many millions of dollars. Gold is the most important product, aggregating about \$3,800,000 annually. The district contains a number of growing cities, among them Deadwood, Hot Springs, Lead City, and Rapid City.

**BLACK HOLE**, or **Black Hole of Calcutta**, a prison dungeon in the old fort of Calcutta, India, about twenty feet square, in which 146 men were confined by Surajah Dowlah on June 20, 1756, of whom all but 23 suffocated. A monument fifty feet high has been erected to commemorate their memory.

**BLACKING**, a preparation used to blacken leather. Numerous recipes for making blacking are in use, most of which are made of bone black with a small quantity of sugar, oil, and sulphuric acid. In some recipes the bone black has been displaced by lamp black or ivory black. Blacking intended for boots and shoes is usually put up in boxes as a paste, in which form it is applied with a brush, but some kinds are in the liquid form.

**BLACKLIST**, a list kept by business men on which the names of defaulters and delinquents are recorded, and by industrial societies to designate persons as untrustworthy. Such lists are prepared to warn others. Blacklisting has been included among the statutory crimes in some countries.

**BLACKMAIL**, a certain tribute levied, in early history, in the north of England and Scotland by robbers in consideration of which they promised protection from their attacks. The term is now used to designate the efforts made to secure hush money, or extort a valuable consideration by threats of public accusation, censure, or exposure.

**BLACK MOUNTAINS**, a group of mountains in North Carolina, belonging to the Appalachian system. Mitchell's Peak, its highest summit, is the loftiest mountain east of the Mississippi River; height, 6,710 feet. It was named in honor of Dr. E. Mitchell, of the University of North Carolina, who died here while making an exploring tour. Other high peaks include Clingman's Peak, 6,700 feet, and Guyot's Peak, 6,660 feet.

**BLACK SEA**, a large inland sea located south and west of Russia, north of Asia Minor, and east of the Balkan states. It has a superficial area of 173,000 square miles; its greatest depth is 6,420 feet, and its mean depth about 2,472 feet. The surface, including the Sea of Azof, is about 175,000 square miles, or more than five times larger than Lake Superior. It receives the water of the Dnieper, Dniester, and Danube from Europe, and of the Sakaria



and Kizil Irmak from Asia, while the outflow of the Don reaches it through the Sea of Azof. Its waters are less salty than those of the Mediterranean and not so clear, owing to the large inflow from these rivers. It is the site of an important commerce, largely because of its connection with the Mediterranean by the Sea of Marmora and the Bosphorus, and many navigable rivers and canals that are tributary to it. In the summer season the surface is at rest and secure for steamboat and ship navigation, but in winter fierce and dangerous storms sweep over it. However, this disadvantage is compensated for in part by its shores and interior being free from rocks and shallows. Oceanic currents are wanting, but the inflowing rivers cause a very similar effect upon its waters. The most important ports include Samsun, Batum, Trebizond, Sinope, Kherson, Odessa, Sebastopol, and Varna. It yields fish in large quantities. Subsequent to the Turkish conquest of Constantinople it remained under the exclusive control of the Turks until 1774, when joint control was ceded to Russia, and later the same rights were granted to Austria, Great Britain, and France. At present the waters are open to the commerce of all nations. In ancient times the Black Sea was known as *Pontus Euxinus*. On its eastern shore was Colchis, the goal of the Argonautic expedition.

**BLACK SNAKE**, or **Blue Racer**, a large snake widely distributed over North America, but most abundant east of the Mississippi River. The eyes are large, the head is oval and long, the nostrils lateral, and the body is slender. It attains a length of nine feet, is not poisonous, and lives on birds and small quadrupeds. It is especially fond of rats. The Australian black snake is closely allied to the cobra and is very poisonous.

**BLACKSTONE** (bläk'stôn), a town of Massachusetts, in Worcester County, on the Blackstone River, and on the New York, New Haven and Hartford Railroad. It is about two miles northwest of Woonsocket, R. I., and has electric railway conveniences. The manufactures embrace cotton and woolen goods, rubber shoes, and machinery. A public library and several schools and churches are among the chief buildings. It has a brisk trade in merchandise and fruit. The first settlement was made on its site about 1700 and it was so named from William Blackstone, who was the first settler at Boston. Population, 1905, 5,786.

**BLACKWELL'S ISLAND**, a narrow and rocky island of New York, so named from its former owner, located in the East River, and now a part of New York City. It has an area

of 120 acres. On it are situated an insane asylum, an asylum for the blind, a penitentiary, a charity and fever hospital, and several work and alms houses. A lighthouse about sixty feet above the sea is located at its northern end.

**BLADDER**. See **Kidneys**.

**BLADDER NUT** (bläd'dēr nüt), the name of several plants native to North America and Eurasia. They are so called from the fruit, which is an inflated bladder, and within are a number of hard seeds. In some localities the bladder nut is planted as an ornamental tree, and the seeds are used in medicine as a mild aperient.

**BLADDERWORT**, a genus of aquatic plants found in the marshes and lakes of most countries. In the tropics they grow luxuriantly, and their flowers, like those of water lilies, adorn the surface of ponds and other shallow bodies of water. Australia is exceptionally rich in plants of this kind and they grow abundantly in Great Britain and the United States. Most of the Canadian varieties have yellow flowers, and those of the United States have blossoms of violet, yellow, or purple. Little bladders or vesicles on the leaves and stems become filled with air about flowering time, causing those parts to be held above the surface, where the flowers expand, and afterward the air escapes and the plant sinks to the bottom, where the seeds ripen. In some species the bladders hold moisture after the air escapes, and the plant is kept fresh and alive even if the water in the pool or marsh sinks away.

**BLADENSBURG**, a village of Maryland, in Prince George County, six miles northeast of Washington, D. C. It is on a branch of the Potomac River, and is noted for a battle fought here Aug. 24, 1814, between the British under General Ross and a force of American militia under General Winder, in which the British were successful and shortly after captured Washington. Population 1900, 463.

**BLANC, Mont.** See **Mont Blanc**.

**BLANK VERSE**, a term generally applied to poetry without rhyme, and first adopted in English literature from the Italian by the Earl of Surrey. The classical productions of the Greek and Roman poets are composed in blank verse. It has never been popular in Spanish and French, but in English and German it has been largely followed. Bryant's "Thanatopsis" and Longfellow's "Hiawatha" are good examples of productions written in blank verse.

**BLARNEY** (blär'nī), a stone built in the wall of an old castle in the village of Blarney, Ireland, four miles northwest of Cork. There

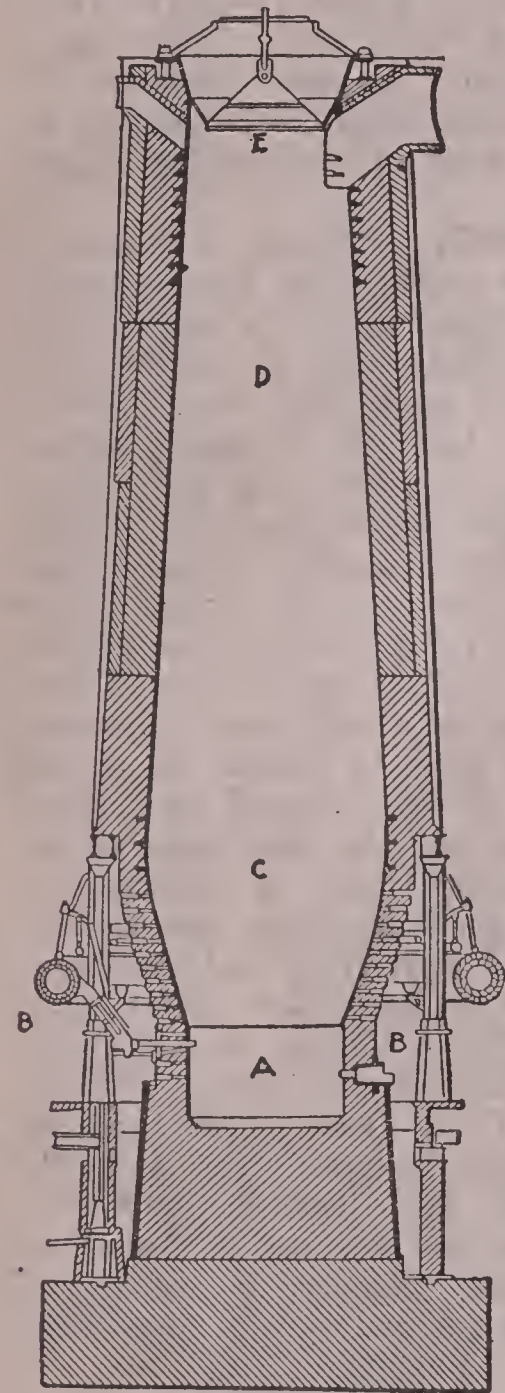


is a tradition that the kissing of this stone will confer the ability to use the peculiar flattering, persuasive speech known as *blarneying*. In Oliver Goldsmith's "The Vicar of Wakefield," the *Lady of Blarney* is represented as a bad character.

**BLAST FURNACE** (blást fûr'nâs), a furnace designed for smelting iron ore and extracting from it the iron by means of a powerful blast of air. The Egyptians are represented

in their early sculpture with a blowpipe to increase the current of burning fuel in furnaces, while the Indians and Oriental classes still use bellows for that purpose. Both the Germans and Gauls employed the hot blast in manufacturing lances and spears, while the Roman's, during their invasion of the British Isles, employed iron, secured by smelting in blast furnaces, which is evidenced by cinders still remaining as a result of their work. However, their process was so crude that iron was illy extracted from the ore. Large heaps of the refuse matter found in the Forest of

Dean furnished a good supply of ore for nearly



BLAST FURNACE.

a, hearth; b b, tuyères; c, boshes; stack; e, hopper for charging the furnace.

300 years, which clearly demonstrates that their process was inefficient. The furnaces used by the Romans were built largely on the top of hills, for the purpose of obtaining the best possible currents of air for heating the ore and extracting the iron.

Blast furnaces are used at present principally for smelting iron ores. They are constructed of solid masonry, sometimes to a height of

over 100 feet. This construction enables utilizing an upper current of air by assisting natural draft with artificial appliances, thus largely increasing the amount of oxygen necessary to a mineral under treatment. As seen in the illustration, the air-blast, which is propelled by a blowing engine, is injected into the furnace through the hearth by means of pipes called *tuyères*. Immediately above the hearth are the *boshes*, forming a conical wall, the upper part of which forms the *stack*. The *charges* are fed into the furnace from above so as to keep the receptacle completely filled as the layers within melt and are removed.

The process of smelting consists of pouring into the top, or at the mouth, of a heated furnace a proportional quantity of fuel, limestone, and ore. When the hot air is blown through a blast pipe it strikes the charges deposited in the furnace. As a result of the intense heat coming in contact with the charge gas is formed, which escapes upward, through the mouth, and the metallic iron, thus set free, drops into a lower and hotter part of the furnace, where it melts. On the application of heat the lime and earthy matter of the ore become united, thus forming cinder or fluid slag that floats on the top of the melted iron. When a sufficient quantity of molten matter has accumulated, the slag is thrown away and the iron cast into molds. Iron thus cast is called *pig iron*. The furnace is modified according to the amount of heat required for the purpose of melting the kind of metal smelted from ore, and the heat generated is governed accordingly. In the blast furnaces of newer construction the gas formed is conducted by pipes to be utilized in making steam or as fuel in heating the blast.

In recent years material improvements have been made in smelting. By means of these the daily output of blast furnaces has been vastly increased and the cost of iron and steel has been correspondingly lightened. These improvements, besides increasing the output, have made it possible to apply a greater intensity of heat, thus extracting a larger per cent. of valuable metals from the ores and bringing the products to a higher degree of utility. In the production of Bessemer pig, by the common furnaces, it has become possible to produce 540 tons in a day. The furnaces, as well as bosh walls, have been made more durable by the use of carbon to protect the parts coming in contact with the intense heat required in blasting, and also by the use of water cooling. Improvements in methods of constructing lining for blast furnaces have enabled manufacturers to produce



400,000 tons of pig by a single lining. Besides, with the use of natural gas and electrical appliances, material saving has resulted, although coke, anthracite, and charcoal furnaces are still generally used. Owing to recent and numerous improvements in machinery, it is likely that these materials will always continue to serve for smelting purposes to the best advantage, with possible exceptions in districts favorably located to natural gas and petroleum deposits.

**BLASTING** the process of disintegrating portions of rock, or other solid substances, by means of an air explosive agent, such as powder or dynamite. It is resorted to in mining, tunneling, and quarrying. The usual plan is to bore holes in the rock to be blasted, placing into them the explosive and tamping the hole with clay, sand, or broken stone, and then firing the charge by a time fuse or an electric spark. The discovery of new explosives and the invention of machinery useful in boring and firing have enabled rapid advancement in the art. Dynamite and gun cotton are used where rapid destruction is desired, but where a moderate cleaving or splitting effect is needed, as in blasting for building purposes, powder is superior. Rock-boring machines have been largely substituted for hand labor. By means of these compressed air is utilized to bore holes, in which the blasts are fired. The greatest enterprise in blasting ever undertaken was the removal of the Flood Rock at Hell Gate, New York City. This ledge of rock covered nearly nine acres. To effect the blasting about 240,000 pounds of powder, dynamite, and other explosives were used. The rocks broken up weighed millions of tons.

**BLEACHING** (blēch'ing), the art of rendering materials perfectly white or nearly so. The ancient methods of bleaching consisted of exposing the fabrics to the action of the sun. The fabrics were laid out and frequently wetted, and, after remaining exposed to the actinic rays of the sun, they became greatly whitened. A class of fine fabrics are known as *lawn*s from the methods of bleaching them by spreading the goods on plots of grass. Likewise, the best grade of linens are known as *hollands*, since the Dutch excelled in bleaching that class of fabrics. The present process consists of employing bleaching agents, as diluted sulphuric acid or chloride of lime. Some fabrics are bleached by alternately dipping them into a bleaching powder made of chloride of lime and sulphuric acid. The process is modified in accordance with the material bleached; calico, silk, wool, linen, and various other fabrics require a greater or less dilution of the chemicals and a varied number of dippings. Bleaching is

practiced to a considerable extent in treating paper, ivory, oils, and wax, which are greatly enhanced in value by whitening.

**BLLENDE** (blënd), or **Sphalerite**, the native sulphide of zinc, from which zinc is obtained. It occurs both massive and crystallized, either in primary or secondary rocks, and is yellow or brownish in color. Deposits occur in many parts of the United States and Canada. It is especially abundant in Missouri, Illinois, and Wisconsin. At Cornwall, England, it is found with lead ores and is worked for the zinc and sulphur, the latter being used in making sulphuric acid. The best grade contains about thirty per cent. of sulphur and sixty-five of zinc.

**BLLENHEIM** (blēn'īm), a village in Bavaria, Germany, about 23 miles northwest of Augsburg, on the Danube River. It is noted for the great battle fought here on Aug. 13, 1704, in which the allied forces of England and Germany gained a complete victory over the Bavarians and French. Each of the contending armies consisted of about 53,000 soldiers. The former were commanded by Prince Eugene and the Duke of Marlborough and the latter by Prince Rupert and Marshal Tallard. The defeated army lost 12,000 in killed and 14,000 prisoners, while the remainder retreated in disorder. The present Duke of Marlborough, Count of Blenheim, married the daughter of W. K. Vanderbilt, of New York City. In 1800 the French defeated the Austrians near Blenheim. The village has a population of 825.

**BLIND**, the state of being deprived of the sense of sight. Blindness is most prevalent in the tropical regions, and least common in the temperate. It is more general in the Eastern Continent than in the Western. A very small number of children are born blind, although there are hereditary tendencies more or less prevalent. By far the greater number of cases result from accident, smallpox, or diseases of the eye, such as inflammation, cataract, or defect of the optic nerve. Old age is frequently accompanied by blindness, owing to a drying of the lachrymal canal and humor of the eye, or to an impairment of the crystalline lens or other vital organs. Frequently some slight deformity of the parts of the eye or its surrounding lead to a loss of sight. Blindness is generally attended by an increased vitality of the other senses, thus in part compensating for the loss of the visual faculty.

Asylums for the blind were established in Germany and France as early as 1260, the prime object being to relieve the Crusaders who had lost their sight in the East. Subsequently asylums of this character were estab-



lished and are at present supported in all civilized countries. In the United States a large number of institutions are maintained, both for adult and minor blind, by the several states under a system of general taxation. Among a number of such schools in Canada may be mentioned the Ontario Institution for the Blind at Brantford. In these institutions the industrial arts are taught successfully, usually with a view to aid in making the students self-supporting. The courses of study generally include all the common and high school branches and industrial arts, such as knitting, sewing, weaving, rope making, broom making, and divers household duties.

Many systems of alphabets for the blind have been invented and are now in successful use. The print consists of characters raised above the surface of the paper and is read by means of passing the fingers over the characters, thus determining their signification by means of the sense of touch. The text-books used are made on this plan both for teaching and for general reading. Another method of teaching is by what is known as the *point system*. It consists of a number of dots instead of the letters of the alphabet, and has largely superseded all other systems for teaching both reading and writing. In writing the blind use a dotted or grooved appliance over which they lay paper and with a style dot on the surface. Raised characters then appear on the underside, the meaning of which can be determined by passing the fingers over the lines.

Books for the blind have been published on a very large scale, including works on the sciences, novels, romances, poetry, large portions of the Scriptures, and many other valuable literary productions. The system of writing used by the blind has been so perfected that by means of texts, and skill in determining the different characters, it is possible for those who have lost their sight to become quite as well trained as the more fortunate who have full use of the eye. Among the publications for the blind recently produced in large numbers are "Practical System of Tangible Music Notation" and "International Sunday School Lessons for the Blind." The Congressional Library at Washington, D. C., contains about 100,000 books and has a special reading room for the blind.

**BLIND FISH**, a class of fish common to the waters of caves. These fish have rudimentary eyes covered with skin, but are totally destitute of sight, and the body is covered with small sensitive projections, or papillae, which serve as organs of touch and partly compensate for

the absence of vision. Like all other cave animals, they are colorless or pale. The body ranges in length from three to five inches and has fully developed fins, enabling the fish to move about with facility. They feed upon small insects and crustaceans common to caves. Many species are found in the Mammoth Cave of Kentucky (q. v.), in the cave of Cacahuamilpa, Mexico, and the caves and wells of New Zealand.

**BLISTER** (blis'tēr), a vesicle of the skin, either the result of an injury or of certain medical applications, and filled with a collection of serous fluid. The term is applied to various compounds and applications employed in medicine, such as the Spanish fly blister. They are used in the treatment of ulcers and tumors, and for the relief of muscular pain. Among the common blisters, besides Spanish fly, croton oil, mustard, ammonia, and many others are used.

**BLIZZARD** (bliz'zērd), a fierce storm attended with falling or driven snow and a low temperature. Blizzards are common in the north central part of North America, especially in the great central plain of Canada and the northern portion of the Mississippi valley, where the thermometer frequently falls as low as from 10° to 50° below zero in the colder part of winter. The movement of the wind is usually from the northwest and storms frequently extend as far south as the Ohio River.

**BLOCK.** See **Pulley**.

**BLOCKADE** (blök-ād'), the act of closing all trade with certain seaports or the coasts of an enemy. It was the ancient practice of belligerents at the beginning of hostilities to forbid by proclamation all trade of neutral nations with the enemy, and to treat as enemies those who did not act in compliance with the proclamation. Since the 17th century it is required by the law of nations, to announce a blockade so neutrals may have notice of it, and any attempt on the part of a neutral merchant to ship supplies to the infested ports is regarded a direct interference with the operations of the war, and his vessels and cargoes are liable to confiscation if captured. It is now the general practice to refer the questions involved in the violation of blockades to prize courts for adjudication, and where the cargo does not belong to the owner of the ship it is released, provided the owners of the cargo had no knowledge of the blockade at the time the shipment was started, but the ship is subject to confiscation by the captors. The term *blockade* is sometimes used to describe the condition of a city surrounded by the enemy and with



which all outside communication has been cut off, but siege is the more common word employed to describe this condition.

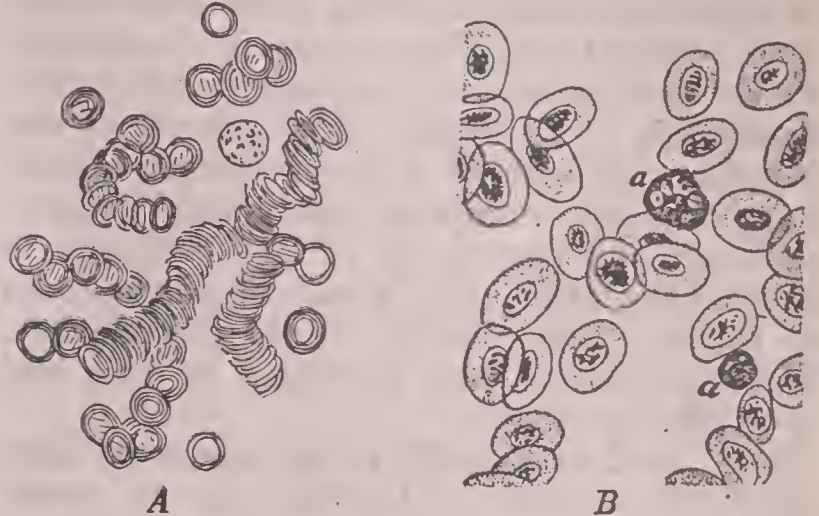
**BLOCKHOUSE**, a kind of fort used in early times as a means of protection against an enemy. It was constructed of timber, usually of heavy logs or blocks, and had openings for musketry on all sides to enable firing upon those making an attack. Originally it was built of one story, but later an upper story was constructed to overhang the lower and in the overhanging floors were holes to permit firing upon an enemy who might attempt to gain entrance or set the structure on fire. Blockhouses were used extensively in the early settlement of America, when timber was plentiful and attacks by artillery were not to be feared.

**BLOCK SYSTEM**, a system used in traffic on railroads by which signals are given so two trains on a single track may be kept a certain distance apart. The system owes its origin to Sir Charles Gregory of England, in 1841. It is now used by ninety-eight per cent of the double-track lines of England and most countries of Europe. In recent years all the great trunk lines of America adopted the block signaling system. It is in general use, not only on double-track railways, but by the principal single-track lines. By means of it the loss of property and human life is largely overcome.

**BLOEMFONTEIN** (bloom'fön-tin), a city in South Africa, capital of Orange River Colony, 95 miles east of Kimberley. It is located on a plateau about 4,500 feet above the sea, on the Modder River, and is surrounded by a fertile region. Among the chief buildings are several schools, the Dutch Reformed church, the Anglican cathedral, the public library, and the government building. It is the seat of a hospital, an asylum for the insane, and a number of educational institutions. The trade is chiefly in wool, cereals, and merchandise, and the manufactures consist of utensils, machinery, and clothing. It has modern facilities, such as gas and electric lights, and is on the main line of the Cape-to-Cairo Railroad. At the time of the war between Great Britain and the Boer republics it was a center of hostilities, but in 1900 surrendered to Lord Roberts. Population, 1904, 33,883.

**BLOOD**, the fluid that circulates through the arteries and veins of animals and is essential to the growth of the tissues and to the preservation of life. In the human body it varies from a brownish-red to a bright red color. It constitutes by weight one-thirteenth of the body; thus, a man weighing 169 pounds has about thirteen pounds of blood. Under the micro-

scope it appears as a pale yellowish fluid, called *plasma*, in which float a large number of discs, called *corpuscles*, some white and others red, of which the red are more numerous. The red discs are circular, with rounded edges, and concave on the upper and lower surfaces. These discs are so small that if 3,500 were placed



A  
CORPUSCLES (HIGHLY MAGNIFIED).

A, Human Blood. B. Non-Mammal Blood.

side by side they would measure a linear inch, and about 15,000 placed one upon another would make a column about one inch high. It is estimated that about eighty-three million are contained in one cubic inch of blood. The size of the discs in human blood differs somewhat from that found in other animals, but it is uncertain whether microscopists can determine the difference with accuracy. They have a well known tendency to collect in piles like rolls of coins. With every breath about twenty million new discs are formed in the blood and the old as constantly die.

The plasma contains *fibrin*, a form of albumen which resembles the white of an egg, and various mineral substances, including potash, lime, phosphorus, magnesia, and iron. In the blood are all the materials required for the growth and maintenance of every organ. It is rich in albumen for the muscles and mineral matter for the bones. The red discs are the *air cells*. They carry the essential oxygen necessary to every operation of life, and it is carried to all parts where repairs are made and growth takes place. It stimulates action and tears down worn-out parts. In serving its purpose the muscles and tissues are burned much like fuel in a stove. Made impure by this action, the blood is caught up by the circulation and carried back to the lungs, where it is purified and again thrown back into the system. The vessels carrying the blood from the heart are called *arteries*, those carrying the blood back to the heart are called *veins*, and the two are connected by minute tubes about  $\frac{1}{2000}$  to  $\frac{1}{5000}$  of an inch in diameter, called *capillaries*.



When blood is exposed to the air, it forms clots; the process is called *coagulation*. This serves a useful purpose in many ways. It checks bleeding in ordinary cases by the fibrin forming a temporary plug, which is later absorbed when the healing process is finished. *Transfusion* is the process of restoring vigor in feeble persons by infusing healthy blood into their veins. In the 17th century it was thought to be the means of prolonging indefinitely human life. The blood of dogs and calves was experimented with by infusing certain quantities into the circulation of human bodies. It was found possible to restore breathing in animals and in one case a maniac was restored to reason. The practice proved objectionable in many respects, was forbidden by law, and later fell into disuse.

The blood of animals is an important commodity of commerce. It is used as an article of food, and for making blood sausage and blood cake. To prepare it a pan is placed at the mortal wound of the animal slaughtered, in which it is caught and whipped rapidly to gather the fibrin. The remaining parts, consisting of *albumen* and *serum* are the portions used as food. In large packing houses blood is one of the most important products of commerce. It is caught in large pans and carried to drying vats, where the albumen is coagulated into a thick mass. This mass is compressed by means of great hydraulic presses and sold for fertilizing. It is valued at \$30 to \$40 per ton. Blood is also valuable in the manufacture of buttons and Japanese lacquer work. Many of the richly colored buttons sold in the market are made of blood, which has been compressed by means of hydraulic machines, and afterward cut in shape by edged instruments.

**BLOOD CIRCULATION**, the movement of the blood in living bodies, consisting of the *systematic* and *pulmonic*. The blood is propelled from the left ventricle, thence passes through the aorta and its arterial branches, and reaches the capillaries in all parts of the body; it then passes into the small veins and from them into the larger ones, and is carried to the right auricle; this is the *systematic circulation*. The *pulmonic circulation* consists of its passage from the right ventricle into the pulmonary artery and its branches in the lungs, thence flowing through the capillaries, it collects in the pulmonary veins, and passes from them through the left auricle into the left ventricle from which it again enters the systematic circulation. The heart is the cause of circulation. It is aided by the chest movement in breathing, the elastic and muscular walls of the arteries, and

the intermittent muscular pressure on the veins. Harvey (q. v.), an English physician, discovered the circulation of the blood in 1628, but how the blood passes from the arteries to the veins was not known to him. The capillaries and their functions were not discovered until three years after his death.

**BLOODHOUND**, a kind of dog distinguished for its keen scent and the persistency with which it follows the track of game. The ears are long and smooth, and both the ears and lips are pendulous. It is a trustworthy animal in the chase, and is employed to track escaped prisoners and suspects of recently committed crimes, though its value for the latter purpose is not generally conceded. The Cuban, English, and Russian bloodhounds are among the best known species.

**BLOODROOT**, a plant of the poppy order, native to many parts of North America. It takes its name from the sap of the root, which is a deep orange color, and contains the alkaloid *sanguinaria*, used in medicine as a stimulant and expectorant. The plant grows wild in many parts of Canada and the United States, has heart-shaped and deeply lobed leaves, and flowers early in the spring.

**BLOOMFIELD**, (blōm'fēld), a manufacturing city of New Jersey, in Essex County, five miles northwest of Newark, on the Erie and the Lackawanna railroads. It is situated on the Morris Canal and has a large trade in merchandise and produce. The chief buildings include the Jarvie Library, the Westminster and First Presbyterian churches, and the German Theological Seminary of Newark. The manufactures are paper, ironware, machinery, textiles, cigars, and musical instruments. Many New York business men reside here. It was settled in 1675 and was incorporated in 1812. Population, 1905, 11,668; in 1910, 15,070.

**BLOOMINGTON**, county seat of McLean County, Illinois, 125 miles southwest of Chicago, on the Illinois Central, the Chicago and Alton, and other railroads. It is located on the highest land in the State and almost in the geographical center. It is surrounded by a rich agricultural country. The county courthouse, the public library, the city hall, and the central high school are among the chief buildings. It is the seat of the Major Female College, a Roman Catholic academy, and the Illinois Wesleyan University, and at Normal, two miles north, are the State Normal University and the State Soldiers' Home. The city has large railroad shops, flouring mills, a meat packing establishment, brickyards, foundries, and fruit canning interests. Waterworks, elec-



tric street railways, and gas and electric lighting are among the improvements. It was settled in 1831 and was incorporated in 1850. Population, 1900, 23,286; in 1910, 25,768.

**BLOOMINGTON**, county seat of Monroe County, Indiana, 50 miles southwest of Indianapolis, on the Chicago, Indianapolis and Louisville Railroad. The chief buildings include the county courthouse, the central high school, and the Indiana State University. Among the manufactures are leather goods, machinery, and clothing. In its vicinity are productive limestone quarries. The municipal improvements include waterworks, sewerage, and electric lighting. It was settled in 1818. Population, 1900, 6,460; in 1910, 8,838.

**BLOOMSBURG** (blōomz'bērg), a town of Pennsylvania, county seat of Columbia County, 40 miles southwest of Wilkesbarre, on the Philadelphia and Reading, the Lackawanna, and other railroads. It is nicely situated on the Susquehanna River and the Pennsylvania Canal. The surrounding country has extensive iron mines. Among the industries are flouring mills, carriage works, foundries, and textile works. It has a State normal school, several fine churches, and substantial county and public school buildings. Population, 1900, 6,170.

**BLOWFLY** (blō'fli), or **Flesh Fly**, a class of large flies, usually green or dark blue, which lay their eggs upon meat or dead animals. The eggs hatch in from 20 to 24 hours, and the young larva buries itself in the flesh for two weeks, when it transforms into the pupa stage, and develops into the matured blowfly about two weeks later. The eggs are called *fly blows* and are invariably laid on the lean meat. While in the larva stage the insects are known as *maggots*, and play an important part in the removal of the decaying carrion. However, the blowfly is somewhat dangerous to living animals in that it lays its eggs in fresh wounds, in which case the maggots may cause harmful effects.

**BLOWING MACHINE**, a mechanical contrivance for producing blasts of air. The earliest form was a bag made of skin or leather, from which the bellows used by blacksmiths was developed. Now blowing machines are very important in manufacturing and for various purposes, and they range from the simple fan blowers used in ventilation to the complicated piston blowing machines employed in driving rock drills and other machinery. The *piston-blower*, or *Chinese bellows*, has been displaced largely by more powerful machinery. It has a square chamber of wood, fitted with a piston, which, when drawn back, admits air through a valve at the end, and the air is com-

pressed and forced out through a nozzle when the piston is moved forward.

A modern blowing machine in which steam is used as a propelling force has two cylinders, one for steam and the other for air, usually set side by side, and has reached a high degree of perfection both in power and the efficiency with which it is used in different classes of machinery, especially in blast furnaces. Another class is known as *disk blowers*, which consist of several blades, usually six, fastened to an axle much like the blades of a screw propeller, and a swift current of air is secured when the axle turns rapidly inside of a cylindrical casing. The propelling force is either steam or electricity. It is used extensively in securing continuous currents of air in ventilating buildings, while the *fan blower*, which resembles it, is employed more generally in supplying air for mines. *Jet blowers*, in which steam creates a current of air in the direction of the escaping jet, are used to produce a draft in the smokestacks of fire engines and locomotives.

The *trompe* is a water jet blower, in which a current of air is created by streams or jets of water falling through a vertical pipe, the air being admitted at the top and forced by the falling water into an air-tight reservoir, from which it is piped for use, while the water gathers in a reservoir below and is drawn off through suitable openings. It has been superseded in most countries by newer machines. Recently a *rotary blower* has come into extensive use and with it greater pressure can be secured than is possible with either the disk or fan blowers. It has two devices known as *revolvers* set on horizontal shafts, which are moved by gear wheels outside of the casing, and when set in motion the air is drawn from below the casing in which they revolve and is forced out through an opening at the top.

**BLOWPIPE**, an instrument for blowing, used to direct the flame of a lamp, candle, or jet of gas against a spot on which is placed a body designed by the operator to be subjected to more than ordinary heat. While there are various kinds of blowpipes, the ordinary form consists of a conical tube of metal, open at the narrow end, which forms the mouthpiece, and closed at the lower part. From the side of the lower end projects a small brass tube, about an inch long, which serves for the passage of a fine current of air. When the operator blows into the open end, a current of air passes out through the air passage and causes the flame to be blown into a long point, much hotter than the common flame, owing to a



greater supply of oxygen. Blowpipes are of great antiquity; a man using one is shown in an ancient Egyptian painting found at Thebes. They are used by chemists, jewelers, and gold and silver smiths.

**BLUBBER** (blüb'bēr), the fat which lies just beneath the skin of the whale and other large sea animals. In some whales it is from eight to ten inches thick, and under the lip it is sometimes three feet in thickness. A single whale often furnishes thirty tons of blubber, from which about twenty tons of oil are extracted. Blubber is eaten by the Eskimos and many inhabitants of the Japanese Islands. It is highly esteemed as a food by the natives because it contains elements that protect against severe cold.

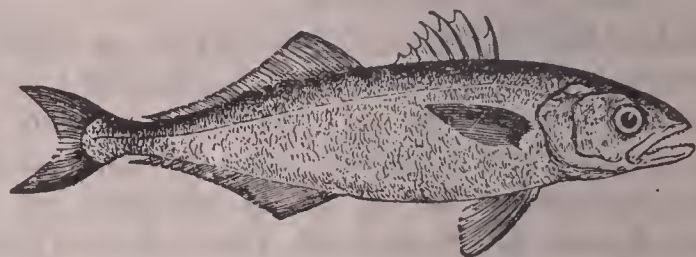
**BLUE** (blū), one of the seven colors into which the rays of light are divided by refraction through a glass prism. The various shades of blue are seen in their highest perfection in the sea and sky, and are most brilliantly displayed in the sapphire and the turquoise. It is derived for dyes, in the arts, from various products of the vegetable and mineral kingdoms. Indigo, derived from the indigo plant, is the most common vegetable dye. Logwood blue is an extract of logwood. The minerals that yield blue coloring matter are very numerous. They include those known as aniline blue, cobalt blue, Prussian blue, and ultramarine. Cobalt blue, Berlin, and Bremen are the principal blues used in painting.

**BLUEBIRD**, or **Blue Warbler**, a well-known and favorite American bird, which appears in the northern part of the United States and Southern Canada in early spring, especially in populated regions. It is a common bird in the Bermudas, West Indies, Mexico, and Northern South America, and in some sections is known as a summer bird of passage. The plumage is sky-blue above and yellowish-brown below, and in size the bird resembles the robin. Bluebirds are fond of little boxes in which to nest, and frequently build close to houses and barns. The eggs number five or six, and several broods are reared each season. Both the male and female show much courage in protecting the nest.

**BLUE BOOKS**, the official papers and reports published by order of the British Parliament, so called because they are usually stitched up in blue covers. The practice of making published reports began in 1681, when the succession of the Duke of York to the throne of England was agitated. At present the blue books contain information relating to state matters, statistics of trade, and reports of com-

mittees. In Germany the corresponding official books are called white; in France, yellow; in Italy, green; and in Spain, red. In the United States the name *blue book* is applied to a report of the names and salaries of persons in the government employ.

**BLUEFISH**, a fish common off the northeastern coast of North America, closely allied to the mackerel. The upper parts are of a bluish color and the lower parts are white. At the base of the pectoral fins is a black blotch. It attains a length of one to three feet, and a weight of two to fifteen pounds. In the winter it goes southward and in the spring moves toward the north. It feeds upon other



BLUEFISH.

fish, especially the mackerel and menhaden, which it pursues with much greed. It is caught by trolling and angling. As an article of food it takes high rank and is considered one of the best fish for table use.

**BLUE GRASS**, a permanent grass found in America and Eurasia. It is valuable for pasture on account of its growth both early and late in the season and its remarkable ability to bear pasturage. The Mississippi valley is especially celebrated for its prolific growth, where it has taken the place of native grasses in many pastures and meadows. It was first grown extensively in Kentucky, which is known as the Blue Grass State. This grass, though cut for hay in some places, is of greatest value for the lawn and pasture.

**BLUE ISLAND**, a city of Illinois, in Cook County, two miles south of the city limits of Chicago. It is located on the Calumet River and on the Grand Trunk, the Illinois Central, the Chicago, Rock Island and Pacific, and other railroads. It is the residence of many Chicago business men, having rapid transit facilities by electric lines and steam railway trains. Smelting works, brickyards, breweries, and machine shops are among the principal industries. It is important as a commercial and railroad center and has a brisk trade in merchandise and manufactures. It has many fine churches, schools, and business buildings. The first settlement was made on its site in 1833 and its incorporation dates from 1872. Population, 1900, 6,114.

**BLUE LAWS**, the name often applied to



laws adopted in the middle of the 17th century for the early colonies of New England. Being stringent in their regulations of social life, much opposition to them was aroused among the more liberal colonists. The name is now applied to any legislation whose aim is to interfere with the personal and domestic liberties of an individual. Among the blue laws of New England were included the prohibition of a mother kissing her child on the Sabbath or on a fasting day, They provided a penalty for shaving on the Sabbath, an imprisonment of married persons not living together, a penalty for furnishing food or lodging to a Quaker, an imprisonment for debt, and a long list of other similar prohibitive measures.

**BLUE MOUNTAINS**, a range of mountains in New South Wales, Australia, which lie eighty miles inland and trend parallel to the coast. The highest point, Mount Beemarang, is 4,100 feet above the sea level. The same name is applied to a range of mountains in the eastern part of the island of Jamaica, which includes peaks 8,000 feet high. Another range of the same name are the Blue Mountains in Pennsylvania, New Jersey, and New York, which lie east of the Blue Ridge, but they are more properly called the Kittatinny Mountains. A range in Oregon and Washington known as the Blue Mountains separates the Great Basin from the basin of the Columbia River.

**BLUEPRINT**, in photography, a picture obtained by the use of a cyanide. To make a blueprint, the sensitive paper is prepared by brushing it with a solution of iron and oxalic acid, and afterward treating it with a solution of potassium ferricyanide. The drawing is made on a very translucent paper, such as vellum, under which the sensitive paper is exposed to light and receives a photographic imprint. It is then washed in pure water and the blue print is developed, after which it is dried. The cyanide is protected from the action of the sun by the lines of the drawing, and is dissolved and removed by washing, hence the black lines in the drawing appear as white lines in the picture. Blueprints may be developed either in sunlight or electric light. They are used extensively by architects and engineers for copying plans since any number of duplicates can be made with little expense.

**BLUE RIDGE**, the most easterly range of the Appalachian Mountains, bordered on the east by the Piedmont Plain. The range is known as Blue Ridge from the extreme northeast until it crosses the James River, thence to North Carolina as the Allegheny Mountains, and in North Carolina again as

the Blue Ridge. This mountain range trends through Pennsylvania, Maryland, Virginia, North Carolina, and Georgia, and was the seat of the most important battles of the Civil War.

**BLUSHING**, a sudden reddening of the face, due to a rush of blood into the capillary vessels of the skin. The cause is chiefly mental confusion, which results from surprise or apprehension, especially when accompanied with a feeling of modesty or shame. The passions and emotions influence the nervous system so they do not act regularly on the muscular coat of the capillaries, hence they enlarge and permit the entrance or passage of more blood than ordinarily, giving the cheeks a flushed or reddish appearance. On the other hand, fear and terror cause the face and lips to become pale by exciting the nerves to the extent that they cause the capillaries to contract, hence the flow of blood is diminished.

**BOA** (bō'á), a genus of large serpents found in America, including the *chevalier boa*, the *emperor boa* of Mexico, and the *boa con-*



BOA CONSTRICTOR.

*strictor*. The last mentioned is so named because it entwines its prey and swallows it whole. Indeed, many of the species are equipped with jaws so constructed that the mouth may be dilated sufficiently to enable them to swallow bodies much thicker than themselves. These snakes are devoid of poisonous fangs. Their length is usually from twelve to twenty feet, but specimens fully sixty feet long have been captured. They have a red-



dish-gray color with broad stripes on the head and the body is covered with small scales. Their food consists chiefly of small quadrupeds, which they capture by leaping from trees or while hanging suspended from the branches. The true boas are distributed throughout tropical America, but are found most abundantly in Brazil and Guiana. Some species inhabit dry localities, others dense forests, while others frequent banks of lakes and streams, often living partly in the water. The water boa is known as the *anaconda* and attains a length of fully forty feet. It feeds on fishes and animals that come to the banks of the streams to drink, often lying in wait for them hidden away under water. It attains a great strength and is able to carry off poultry, swine, and young cattle. The *python* is found in Africa and Eurasia and is allied to the *anaconda*.

**BOAR** (bōr), the name applied to either sex of the wild swine found in Africa, Asia, and Europe. These animals attain about the same



WILD BOAR.

size as the domestic hog, which is thought to have descended from the wild boar. They have coarser bristles and larger tusks than the domestic stock, and are vicious when attacked. In the swamps of Turkestan they abound in large numbers and in size exceed those of Africa. In Europe they are found chiefly in the forests under government protection. The flesh of the wild boar is valuable for food. Some regard it even superior to that of the domestic swine, as the animal feeds mostly on fruits and roots and is cleaner in its habits. The wild boar of India is a favorite animal of the chase and is pursued by mounted men, who look upon *pig-sticking* as a favorite sport.

**BOARD OF TRADE**, or **Chamber of Commerce**, an association of traders, merchants, or persons engaged in commercial pursuits to promote trade by a union of action, or attain advantages in trade by combinations which are beyond the reach of individuals acting separately. The first board of trade was

established at Marseilles, France, and it was promoted partly for political advantages as well as to stimulate trade. The Chamber of Commerce organized in Paris in 1700 corresponded to similar institutions in other cities of France. In London, the Chamber of Commerce is the center of a general trade, while similar organizations at Liverpool, Hull, Leeds, and Manchester exercise a marked influence on the commerce of Great Britain. Associations to promote trade are maintained in Berlin, Hamburg, Copenhagen, Stockholm, and other European cities. Among the larger boards of trade in the United States are those of New York, Chicago, Boston, Baltimore, Philadelphia, Saint Louis, and San Francisco. The leading exchanges of Canada are at Montreal, Toronto, Quebec, Winnipeg, and Vancouver.

A custom long established and extensively practiced on boards of trade is to deal in margins by putting up with brokers an amount sufficient to cover the ordinary fluctuations of the market, while the other capital necessary is furnished by the brokers. Transactions on the board of trade are often intensely exciting, since large quantities of produce are frequently involved and even a very small rise or fall in the market price is an important factor. Many men follow trading and exchange as an occupation, while others engage in it as a speculation or side line to other business. Fortunes are sometimes made or lost in a day, especially when men of much experience and capital succeed in securing an artificial scarcity in a commodity of trade and sell when prices are abnormally high. Such a scarcity is said to be a *corner* on the market. The commodities handled on the board of trade include many lines, but cereals, live stock, lumber, and food-stuffs are the most common.

**BOAT**, the name of a small open vessel, usually propelled by oars or paddles. Boats are variously made for pleasure riding and for draught service, usually without sails, but some have one or more sails. A large class of boats of newer construction are propelled by electric motors and steam and gasoline engines. These boats have a capacity to move at the rate of ten to forty miles per hour. All steamships and passenger vessels carry boats to provide some degree of safety in case of accidents or shipwreck. They are variously named, as, for instance, launch, long, barge, pinnace, yawl, galley, skiff, gig, cutter, jolly, and dingy. Ships of war carry, among others, the first four named.

**BOATBILL** (bōt'bīl), a bird of the heron family, native to South America. It was so



named from the large bill, which is broad and shaped somewhat similar to a boat, the keel being uppermost. The lower mandible has a pouch to retain food. This bird frequents marshy places and the banks of rivers. It frequently perches on trees overhanging water, whence it darts to catch fish and crustacean animals for food.

**BOBBIN** (bōb'bin), a small spool or roller used in spinning. At each end is a flange or border, and through it is an opening to receive a pivot. The bobbin used in weaving has a flange on one end only, but the small metallic bobbin which holds the thread in the shuttle of a sewing machine has a flange on both ends. The common spool on which thread is wrapped is an example of a wooden bobbin.

**BOBOLINK** (bōb'ō-link), a migratory bird of America. It is seen most frequently in the southern part of the United States, whence it passes northward in summer and to the West



BOBOLINK.

Indies and south in the winter. It is known in various sections as *ricebird*, *reedbird*, and *ricebunting*. The bobolink feeds on rice and other cereals, and is extensively used for food. In the Carolinas and other states of the South it is dreaded on account of its ravages in the fields of rice. When passing north from the rice fields of the South to the section farther north and to Canada, it is rich with fat and almost incapable of enduring long flights. The male is mostly black, sprinkled with white and yellow, and the female is largely marked with shades of brown. The song of the male is merry, quick, and musical.

**BOCHUM** (bōk'ōm), a city of Germany, in the province of Westphalia, 30 miles north-east of Düsseldorf. It is surrounded by a coal-producing country and is the seat of extensive iron and steel works. The general manufactures include woolens, hardware, machinery,

cigars, and paper hangings. It owns and operates the municipal slaughterhouse, waterworks, and sewage system. Bochum is a modern city and its recent growth is due to the rapid development of its manufacturing enterprises. It has a public theater, a gymnasium, electric street railways, and stone and asphalt pavements. Population, 1905, 118,464.

**BODLEIAN** (bōd'lē-an) **LIBRARY**, the library of Oxford University, England, organized by Sir Thomas Bodley in 1598 and opened in 1602. For rare collections it is excelled only by a few of the great libraries, although it is surpassed greatly in that respect by the Vatican in Rome. In it are copies of all the works published in Great Britain, and in addition to the English publications it contains numerous works issued in other countries. At present there are about 1,500,000 volumes in the library.

**BOEHMERIA** (bē-mē'rī-ā), a genus of plants native to China and the East Indies, important for the tough fiber used in making twine and rope. The plants belonging to this genus are related to the nettle, but do not possess the stinging properties. They yield the valuable rhea fiber, or grass-cloth fiber, known in commerce as *ramie*. The species from which



BOEHMERIA.

this product is obtained principally is the Chinese grass. This plant is perennial, grows best in shade and moisture, and yields three crops in a season, new shoots coming up after each harvesting. It is cultivated in the south-



ern part of the United States and the warmer parts of Europe. Species known as false-nettles are annual plants and grow in waste places in Canada and the United States.

**BOEOTIA** (bĕ-ō'shĭ-à), one of the ancient divisions of Greece, situated south of Phocis and west of the Euboean Sea, and now united as a province with Attica. The two as now organized contain an area of 2,475 square miles. Boeotia has an area of 1,635 square miles. It was one of the most progressive and celebrated divisions of ancient Greece, and is noted as the birthplace of the historian Plutarch, the general Epaminondas, and the poets Hesiod and Pindar. It was the seat of fourteen cities that formed the Boeotian League. The surface is quite level, but near its boundaries are chains of mountains. In the time of Alexander the Great a vast tunnel was constructed through the mountains to drain the district of the interior that was subject to overflow by the waters of the Cephissus, which discharges into Lake Copias, but later it became damaged and failed to discharge the water, thus rendering the district marshy and unhealthful. Extensive canals and tunnels were made in 1886, and now the district is rendered productive, though the atmosphere still remains heavy.

**BOER** (bōōr), meaning farmer, the name applied to the descendants of the Dutch, German, and French who settled in South Africa in the 16th century and since. Their first settlements were made in the vicinity of the Cape of Good Hope, from which they spread over the territory now known as Cape Colony. Owing to English encroachments and annexation in 1795, many of them removed farther north to Natal, later to the Orange Free State, and still later across the Vaal River, where they organized the Transvaal Republic. They constructed railroads, built cities, developed agriculture and mining, and gave to South Africa a civilization and commerce never before known in that portion of the earth. Their governments of Cape Colony, Natal, Orange, and Transvaal were at all times constitutional republics. The Boers rank as a people of industry, splendid marksmanship, sober habits, and Christian devotion. See **Cape Colony**.

**BOG** (böğ), a morass or quagmire in which the soil is composed largely of decayed and decaying vegetable matter. Some bog districts yield large quantities of peat for fuel, while others are reclaimed by drainage and converted into the most productive soil. Large basins and lake beds have been redeemed in this manner. The soil, often from twelve to fifty feet deep, is enriched for production by decayed

vegetable matter that has gathered for ages. In the Chatmos bogs of England and the Allen bogs of Ireland the deposits vary from ten to forty feet, and yield large quantities of peat and fuel materials. The largest lowland bog in the United States is known as the Great Dismal Swamp, in Virginia and North Carolina, which has an area of about 950 square miles and is 25 feet deep.

**BOGOTÁ** (bō-gō-tä'), the capital of the United States of Colombia, South America, and the largest city in that country. It is located on a table-land 8,695 feet above the Andes, near Mount Guadalupe. The surrounding table-land district is fertile and produces large quantities of cereals and fruit. The climate is healthful, partaking of the nature of perpetual spring. Vast quantities of salt, coal, iron, gold, silver, and other minerals are mined in the mountains tributary to the city. The national capitol is a fine edifice, and, besides it, there are other public buildings, including national and provincial structures. A free library, an astronomical observatory, several theaters, a university, and a museum are among the public institutions. While the city does not have the thrift of North American cities, it is supplied with many modern conveniences, among them telephones, gas and electric lights, street railways, waterworks, and railroad facilities. However, the pack mule and other evidences of southern life are still largely manifest. The manufactures include soap, leather, clothing, cordage, porcelain, and machinery. Near the city is the cataract of Tequendama, in the Funeha River, where the water falls over a precipice 650 feet high, which furnishes an abundance of power. Bogotá is popularly called the "Athens of South America." Population, 1905, 112,580.

**BOHEMIA** (bō-hĕ'mĭ-à), a crown land of Austria, bounded on the northwest by Saxony, on the northeast by Prussian Silesia, on the southeast by Moravia and Lower Austria, on the south by Upper Austria, and on the southwest by Bavaria. It extends from latitude 48° 34' to 51° 3' north latitude and from 12° 7' to 16° 50' east longitude. The area is 20,060 square miles.

**DESCRIPTION.** The surface consists mostly of a high table-land surrounded by mountains. In the southwestern part is the Bohemian Forest, in the northwest are the Erzgebirge, and in the northeast the Riesen-Gebirge. The principal drainage is toward the north. Among the chief rivers are the Elbe, the Moldau, the Eger, and the Luschnitz. It has a continental climate, mild in the valleys and cold in the highlands,



but it is healthful throughout the year. At Prague the temperature varies from 16° to 76°, and the average is about 49°. Snow covers the higher peaks most of the year. The rainfall is sufficient and abundant for agriculture.

The mines yield copper, iron, coal, alum, arsenic, sulphur, and antimony, though mining has not been developed to the extent of its possibilities. Coal is mined most extensively and supplies fuel for manufacturing enterprises. A fine grade of sand abounds, useful in the manufacture of glass, and granite, marble, and sandstone quarries are worked. Famous mineral springs abound at Carlsbad, Teplitz, and Marienbad. The forests are extensive and furnish valuable timber for export.

**INDUSTRIES.** Agriculture is the chief occupation and about ninety-eight per cent. of the surface is fertile. Most of the land is divided into small holdings and farming is conducted on a careful and economic basis. Fully sixty-four per cent. of the arable land is cultivated in cereals, such as wheat, rye, and maize, and potatoes, sugar beets, hops, fruit, and vegetables are grown profitably. All the domestic animals common to Europe thrive well, but special attention is given to cattle raising for flesh and dairy products. Sheep, goats, and horses take rank with swine in the value of the products, and large investments in poultry are maintained. Silk culture and bee-keeping receive careful attention in the districts adapted to these enterprises.

Bohemia has made rapid strides of advancement in manufacturing the past two decades. Glass is an important product and large quantities of glassware are manufactured for export. The textile industries and the manufacture of beet sugar have developed materially, and large steel and iron works are operated. Carlsbad china and Pilsen beer are made in large quantities for export. Clothing, cigars, paper, and machinery are other manufactures that take high rank. The knitting industry and the manufacture of toys and musical instruments receive considerable attention. Transportation is facilitated by navigation on the Elbe and Moldau and a network of canals, and a considerable mileage of steam railway and electric lines is operated.

**GOVERNMENT.** Bohemia is classed as a crown land of Austria, hence is an integral part of the Austro-Hungarian monarchy, which has its executive head in the emperor. Legislative power is vested in the Diet, consisting of an upper and lower chamber. Representation in the upper chamber is vested in the Archbishop

of Prague and representatives from the universities, the sees of the church, the large landowners, the towns, the chambers of commerce, and the rural communities, and in the lower chamber by members elected by direct vote of the people, who are restricted by a small property qualification. In the lower house of the monarchy Bohemia is represented by 110 members. At Prague are two noted universities, a German and a Czech. The system of schools include those classed as elementary, preparatory, commercial, and real gymnasia.

**INHABITANTS.** The inhabitants number 315 to the square mile. About two-fifths are Germans and the balance are largely Czechs, including a small per cent. of Jews. Roman Catholic is the religion of most of the inhabitants, but some Protestant and Jewish churches are maintained. Prague, the capital, on the Moldau, is the most important city. Pilsen, Reichenberg, Eger, Budweis, Teplitz, and Aussig are commercial centers. Population, 1900, 6,318,697

**HISTORY.** Bohemia was occupied at the beginning of the Christian era by a Celtic people called *Boii*, and in the 1st century they were made tributary to the Germans. In the 6th century the region came into the hands of a Slavic race, who became known as the Czechs. They were warlike and held sway for several centuries against the attacks of the Goths and other people of Central Europe. Christianity was introduced about the year 900 by the Germans, while the Moravians, who resided in adjoining territory, were converted to the Greek Church. Powerful invasions were made by the Alemanni and other Germanic tribes, and Bohemia became a part of the Moravian kingdom of Svatopluk, who was vanquished by the Magyars in the early part of the 10th century. It remained a powerful kingdom from 1278 until 1305, extending from the Elbe to the Adriatic, and in the latter year became subject to the house of Luxemburg and later to the emperors of Germany. It was the seat of religious wars in the time of and subsequent to the Hussite movement, in 1400, and for many years remained Protestant. In 1526 it was merged with Austria and since has been governed by the house of Hapsburg. In 1848 a well-organized effort was made to secure independence and reestablish its former position among the nations, but the bombardment of Prague and several decisive battles ended the insurrection. The feeling of antagonism between the two chief elements, the Germans and the Czechs, has been sharply drawn at different times, but educational and commercial progress has exercised a wide influence in



developing the resources and making stable the government of the house of Hapsburg, which has done much in promoting the material welfare of Bohemia.

**BOHEMIAN FOREST**, a chain of mountains in Central Europe, between Bavaria and Bohemia, and extending from the Danube to the Fichtelgebirge. It separates the basins of the Elbe and the Danube and culminates in Mount Arber, which is 4,650 feet above the sea. Granite, iron ore, and gneiss deposits occur.

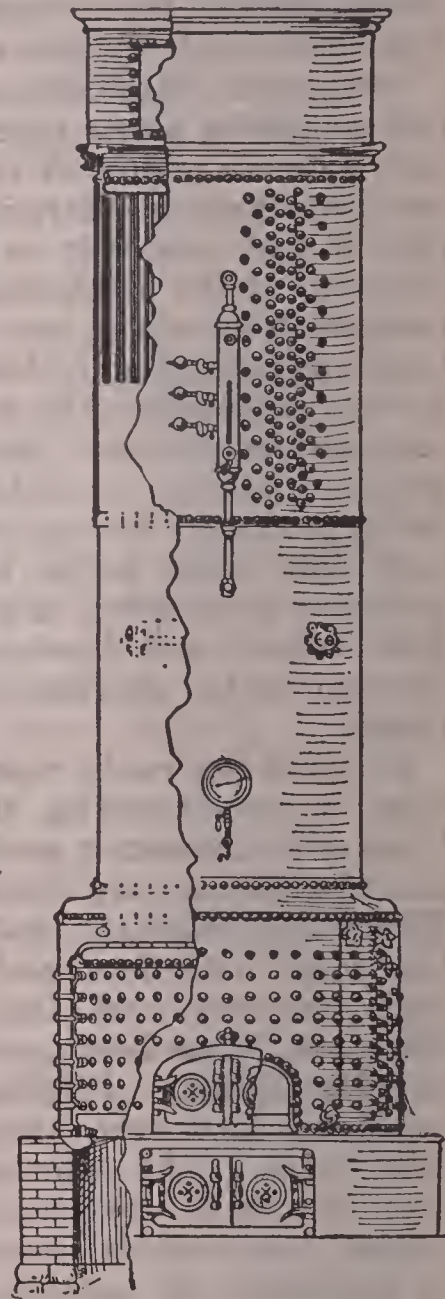
**BOHOL** (bō-hōl'), an island of the Philippines, located north of Mindanao and southwest of Leyte. It has an area of 1,440 square miles. The distance across it from east to west is about forty miles, and, from north to south, thirty miles. Groups of mountains and forests make up the principal part of the surface, but the soil is fertile and produces rice and many kinds of fruit. Gold and silver are mined. Population, 1903, 243,148.

**BOIL**, a swelling of the epidermal tissues, due usually to a change of diet and the habits of living. It starts in a small pimple, caused by poisonous bacteria under the skin, and becomes hard at the base and quite soft at the apex as it develops. For several days it is quite painful and highly inflamed, and when it opens a pus is discharged. The maturity of a boil may be hastened by the use of a poultice or the application of sulphide of calcium, and in some cases it is advisable to open it by lancing.

**BOILER** (boil'ēr), a vessel for boiling liquids, usually constructed of iron or steel, and named from its particular use. In the list are included household boilers, used in the arts of cookery and for laundry purposes. The larger boilers employed in the industries are variously constructed. Those used for stationary steam generators are usually enclosed in brickwork, in order to prevent a loss of heat by radiation. In all modern stationary and portable engines the water is subdivided by a number of tubes, thus allowing free contact of the heat with the boiler surface, by which it is more rapidly and effectually distributed to the water. In recent years tubular or water-tube boilers have grown in popularity for the reason that they allow more grate area as well as heating surface, and facilitate a greater concentration of power within a small space. Boilers of this construction are used quite generally in steamboats and for warming buildings, as well as in factories and for portable purposes.

The *tubular boilers* as now made are mostly cylindrical in form and in regard to position are either *horizontal* or *vertical*. In these boilers the water is in small tubes instead of a

single large one, as in the *flue boilers*, which have one or more large flues passing through the center. This causes a rapid generation of steam, as the fire and burning gases come in contact with a large surface area. The vertical boiler shown in the illustration is constructed on this plan. At the bottom are the *ash pit* and the *grate*, above which is the *furnace*, in which the fire burns. The *tubes* contain the water, which is brought to the boiling point as the fire surrounds them, and the steam collects at the upper part in the *steam dome*. A *steam gauge* indicates the pressure of steam and a *water gauge* shows the height of the water, while the *safety valve* permits the steam to blow off when the maximum pressure is reached. Wrought iron and steel are used in constructing the shell, the different parts of which are carefully fitted and securely riveted together to insure safety against explosions. Other materials used are brass, bronze, copper, cast iron, and malleable iron. Most small boilers and those used in the marine service are vertical, while the large boilers on land are chiefly horizontal. In the last mentioned the grate or furnace is located beneath the front end of the boiler or shell, hence the hot gases pass along the inner tubes to the rear end of the shell.



VERTICAL BOILER.

**BOILING**, an important operation in the preparation of food. It has the effect of softening nutritive articles, causing a solution of sugar and starch grains, and making them more easily digested. In boiling meats they should be suddenly plunged into boiling water so as to cause a coating or protective layer of coagulated albumen to form on the surface. This serves



to retain the more nutritious portions within. After a few minutes the temperature may be considerably lowered. For soups and broths the meats should be heated gradually so as to allow the more nutritious elements to escape from the meat into the soup. Boiled food is more digestible than when stewed, roasted, or fried.

**BOILING POINT**, the degree or point at which any liquid boils. This depends upon the constituents of the liquid and the conditions of the atmospheric pressure. The boiling point is always the same, if the physical conditions are the same. It is highest at the level of the sea, and is lowered one degree Fahr. with every 597 feet of ascent; this is due to a decrease of atmospheric pressure as we ascend. After liquids begin to boil, their temperature is not raised. The following is the boiling point of the liquids named below; the degrees given are according to Fahrenheit's thermometer:

Mercury .....	662°	Water .....	212°
Sulphuric acid .....	610°	Nitric acid .....	210°
Olive oil .....	600°	Alcohol .....	173°
Phosphorus .....	554°	Bromine .....	145°
Iodine .....	347°	Sulphuric ether .....	113°
Naphtha .....	320°	Muriatic ether .....	52°
Oil of turpentine .....	314°	Ammonia .....	28°

**BOISE** (boi'zâ), the capital of Idaho, county seat of Ada County, on the Boise River and on the Union Pacific Railroad. It occupies a fine site at the head of the Snake River valley, about 3,000 feet above the sea, and has a delightful climate. The chief buildings include the State capitol, the high school, the Soldiers' home, the United States assay office, and the penitentiary. It has manufactures of flour, lumber products, and machinery. Water power is secured from the river for irrigation and manufacturing purposes. The thermal springs furnish hot water for heating the buildings. Gold, silver, and other minerals are obtained in the vicinity. It was first settled in 1863, incorporated in 1865, and made the capital of the State in 1890. Population, 1910, 17,358.

**BOJADOR** (böj-ä-dör'), a cape on the west coast of Africa, in north latitude 26° 7'. It is southeast of the Canary Islands, a projecting point of the Sahara, and is dangerous for navigation. It was discovered by the Portuguese in 1433.

**BOKHARA** (bö-kä'ra), meaning "treasury of science," a khanate of Central Asia, belonging to Russia. It is bounded on the north by Russian Turkestan, east by the Pamir region, south by Afghanistan, and west by the Trans-Caspian Territory. The area is 93,850 square miles. The Russian railroad from the Caspian Sea passes through the district from Charjui

on the Oxus River to a point near Bokhara, and thence to Samarkand. Much of the surface is fertile, but arid, and large tracts of land are irrigated by water taken from the Zerafshan River. The mineral wealth embraces alum, sulphur, gold, and slate. The silk production aggregates over 1,000 tons annually, and the yield of cotton is about 30,000 tons. Other products include cereals, domestic animals, minerals, and various Eastern manufactures. The important cities are Bokhara, Karshi, Hissar, and Charjui. The military forces consist of a standing army of 25,000 men. They are armed with Russian rifles and instructed in Russian military drill. The government of Bokhara is under an emir, who, in 1873, acknowledged Russian supremacy and granted concessions to the czar. In ancient times the district was called Sogdiana. It was conquered by the Arabs in the 8th century, and in 1220 by Genghis Khan, in 1370 by Timur, and in 1505 by the Usbeks. Bokhara is the capital, located near the Oxus River, southeast of the Aral Sea, and has a population of 92,350. It is surrounded by a mud wall, which was built anciently for the protection of the city against invaders. It contains 350 mosques and a number of other interesting edifices. Population, 1907, 2,563,500.

**BOLAN PASS** (bö-län'), a defile in the Hala Mountains of Baluchistan, on the highway between the table-land of Afghanistan and the Lower Indus River. It consists of a succession of ravines along the course of the Bolan River and is about 60 miles long. This river rises in the mountains and flows through the ravines with a rapid descent, about 90 feet per mile, and the eminences on each side rise abruptly 500 feet above the stream. The British constructed a military railroad through this pass to connect Sind with Kandahar.

**BOLIVIA** (bö-liv'ĩ-ä), a republic of South America, in the western part of the continent. It is bounded on the north and east by Brazil, south by Paraguay and Argentina, and west by Chile and Peru. It extends from south latitude 8° to 22° 50', and from west longitude 58° to 73° 20'. The area is 557,430 square miles, exclusive of some territory held by Chile since the War of 1879-80.

**DESCRIPTION.** In the southwestern part are some of the most elevated summits of the Andes, including Mount Sorata and Mount Illimani, the altitude ranging from 15,000 to 21,000 feet above the sea. The western part has two parallel ranges of the Andes, which traverse the country from southeast to northwest. The general surface slopes toward the



east and north, forming a large part of the central plain of South America. On the western boundary is the wonderful Lake Titicaca, with an area of about 3,250 square miles and a depth of 120 fathoms. In the north is Lake Rogagus, in the east is Lake Oberaba, and in the central west is Lake Poopo Choro. Most of the rivers rise in the western and central parts and belong to the Amazon and La Plata river systems. Among the chief rivers are the Pilcomayo, a tributary of the Paraná, and the Mamoré and Beni, which discharge through the Madeira into the Amazon. The Bermejo is an important river in the southern part of the country.

Bolivia has three climatic regions, the eastern llanos, the highland region, and the mountain region. In the eastern llanos the climate is humid and hot, in the highland region it is temperate, and in the mountain region it is cold. A favorable climate prevails in the region of the Medio Yunga, which embraces an elevated plateau. At La Paz, elevated 12,500 feet above the sea, the temperature averages about 50°.

**NATURAL RESOURCES.** The forests are of incalculable value, cover a vast extent of the surface, and have many varieties of useful trees. Here thrive the mahogany, ebony, cork, cedar, rosewood, and many species of palm. A treeless region occupies the Bolivian highlands, where large areas are covered with nutritious grasses. The mineral resources are especially noteworthy. In the extent of productive silver fields Bolivia takes high rank, and gold deposits are likewise extensive. Other minerals found in paying quantities are copper, lead, tin, zinc, borax, coal, and manganese. Many wild animals infest the unpopulated regions, such as the puma, jaguar, tapir, and armadillo, and the birds of song and plumage, including the toucan, parrot, and pigeon, are very numerous.

**INDUSTRIES.** Mining continues to be the leading industry of Bolivia, but agriculture is gaining a larger foothold on account of the favorable conditions in the development of trade. It is known that gold was mined by the Incas long before the Spanish conquest, and interests in gold, silver, and tin mining have received special attention for a long period of years. In the output of silver Bolivia takes from third to fourth rank. The government has granted liberal concessions to those who open and operate new mines, and has extended appropriations to promote the construction of railroads as a means of securing transportation facilities to convey the ore to smelters and elsewhere.

Much of the land fitted for agriculture is owned by large investors and by the Indians. Farming is primitive, especially in the matter of cultivating the soil. It yields little more than is needed to supply the local demand, although the country is susceptible of large production. Many varieties of fruit are cultivated, especially the banana, pineapple, peach, lemon, fig, and the vine. All the cereals, such as wheat, corn, and barley, are grown, and considerable interest is taken in the cultivation of alfalfa, coffee, sugar cane, and vegetables. Stock raising is largely in the hands of Indians, who have herds of cattle in the grazing districts, and give some attention to the rearing of horses and sheep. Other animals reared to a considerable extent are mules, swine, alpacas, llamas, and vicuñas.

Little progress has been made in manufacturing, and the output consists mostly of wearing apparel and utensils. The exports embrace hides, rubber, coffee, wool, metals, lumber, and products derived from medicinal plants, such as cinchona and sarsaparilla. Germany has the largest share of foreign trade, and the trade with the United States and Great Britain is making a steady growth. Among the leading imports are cotton goods, furniture, and manufactures of iron and steel. Bolivia has no seaport, and foreign trade is carried on largely by the Peruvian port Molliendo and the Chilean port Antofagasta, from which railroads are operated to the inland points of the eastern part of Bolivia. The highways are in a bad condition and are improved only to a limited extent. Few railroads are operated, and most of the mileage is made up of narrow gauge lines, but telegraph and telephone connections are quite common. Much of the inland trade is carried by pack animals, and rivers furnish an outlet to the Atlantic, but the distance across the continent is so great that the river trade has not been developed to any great extent.

**GOVERNMENT.** Bolivia is a republic and its government is organized as a representative democracy. The president, elected by direct vote for four years, is the chief executive, and is assisted by a vice president and five ministers. The legislative authority is vested in a congress of two houses, the senate and chamber of deputies. In the former are eighteen members, elected for six years, and the latter has 64 members, elected for four years. The system of department courts includes judges of district and supreme tribunals. The national supreme court is the highest judicial authority. Local government is administered by the eight departments, and these are divided into prov-



inces and cantons. Education is free and obligatory, but the public schools do not provide sufficient facilities to accommodate those of school age and the compulsory school attendance law is not well enforced. The common schools are maintained by municipalities and cantons, and in addition there are eight colleges and six universities. Several theological seminaries and a number of missionary and parochial schools are maintained.

**INHABITANTS.** The white inhabitants are largely of Spanish origin, but immigration from Europe, especially from Germany, is adding quite a number of whites. Mestizos and Indians make up a large per cent. of the population. A number of the Indians are still uncivilized, especially the Guarani tribe. Roman Catholic is the religion of most of the people, but there is no restriction as to religious worship, and a number of Protestant churches and missionary schools are maintained. Sucre is the capital and La Paz is the largest city. Oruro, Cochabamba, Santa Cruz, Potosi, and Huanchaca are the leading cities. The population has not increased materially for twenty years, but there has been a steady growth, especially in the towns. Population, 1906, 2,267,935.

**HISTORY.** The history of Bolivia is characterized by many wars and insurrections. It was a part of the ancient empire of the Incas, and was conquered by Hernando Pizarro in 1538 for Spain. At that time it was made a part of Peru and later of the government of La Plata, but in 1825 was organized as a separate state and named in honor of Simon Bolivar (q. v.), who became its first president under a constitution drawn by him and adopted in 1826. In 1836 it was annexed to Peru under President Santa Cruz, but the union was soon set aside and Bolivia has been the scene of many revolutions and civil wars. Chile declared war against Bolivia and Peru in 1876, and as a result the port of Antofagasta and adjacent territory were lost to the Bolivians, thus cutting them entirely off the Pacific coast. A revolution took place in 1898, when a change was brought about in the administration by force of arms.

**BOLOGNA** (bō-lōn'yà), an ancient city in Italy, capital of a province of the same name, located in a fertile plain near the Apennines, about eighty miles north of Florence. It is surrounded by a brick wall and penetrated by canals, which serve as arteries of commerce. The city is adorned by many palaces in which are historic paintings of the leading artists of Italy. As a whole the general architecture is

massive and substantial, but the styles are mediaeval in appearance, since the façades of most of the buildings overhang the second story. A number of monuments adorn the parks and squares. The principal buildings include the Palazzo del Podestà, the Palazzo Pubblico, and the basilica of Saint Petronio, the largest church in the city. The leaning towers, Degli Asinelli and Garisenda, built in the 12th century, are among the noted structures in the city. There are over one hundred churches remarkable for beauty and wealth. Near the city is the church of Madonna di San Lucca, at the foot of the Apennines, which is reached by an arcade of 640 arches. Other noted buildings include the university, the Academy of Fine Arts, the city hall, and many schools and hospitals. It has manufactures of clothing, macaroni, silk and linen textiles, leather, canned fruit, and machinery. Among the modern facilities are steam and electric railways, gas and electric lighting, and pavements of stone and asphalt.

Bologna was founded by the Etruscans and is counted one of the oldest cities in Europe. It became a Roman colony in 189 B. C. In 728 A. D. it was taken by Longobards, but later was held by Charlemagne, who made it a free city. Since 1860 it has been a part of Italy. It contains some of the most interesting and beautiful edifices and adornments of antiquity and is visited by many who travel for study. Population, 1906, 152,009.

**BOLOGNA, University of**, an institution of higher learning at Bologna, Italy, noted as one of the most famous centers of education in the world. It is thought that the foundation was laid at the beginning of the Christian era, but its early history is obscure, and, according to some writers, it was founded by Theodosius in 425. Subsequently it was destroyed as a result of wars and insurrections, but Charlemagne restored and enlarged it. In point of attendance it reached its greatest prosperity during the Middle Ages, when it had about 8,000 students, but with the rise of the great universities in Germany the attendance began to decline and at present the enrollment is about 1,500. The scholars who made this institution famous include Luigi Galvani, Vesalius, Mme. Mazzolini, and the female professor Clotilda Tambroni. It is coeducational, and is equipped with a library of 260,000 volumes and excellent chemical and physical laboratories. The faculties include those of mathematics and sciences, philosophy and letters, medicine and surgery, jurisprudence, pharmacy, engineering, drawing and



architecture, politics, criminal law, and veterinary surgery.

**BOLOMETER** (bō-lōm'ē-tēr), an instrument used to measure minute quantities of heat, especially in different portions of the spectrum. It is sometimes called *actinic balance* and *thermic balance*. The essential part is an electrical apparatus known as Wheatstone's Bridge, which has two arms, one of which consists of three strips of platinum blackened and exposed to the rays of the sun, and the other arm is connected with a small but sensitive galvanometer. A current of electricity is developed as soon as the platinum area is exposed to the sun, owing to the fact that it is highly sensitive, and the degree of heat is indicated by the needle of the galvanometer. This instrument, though so delicate that it is influenced by minute changes of temperature, is the most useful and reliable device for studying radiation.

**BOLTON** (bōl'tūn), or **Bolton-le-Moors**, an important manufacturing city in Lancashire, England, on the Croal River, about ten miles northwest of Manchester. The chief buildings include the town hall, two museums, the church of Saint Peter, the public baths, and five public libraries. Large quantities of coal are mined in the vicinity. It was noted for its manufacture of cotton and woolen goods as early as the 14th century, when Flemish merchants stimulated the industry. The opposition of the laboring classes long prevented the adoption of the machinery invented by Arkwright, and thereby retarded its growth to some extent. It now has some of the largest and finest cotton mills in the world. The manufactures, besides cotton goods, include ironware, paper, chemicals, clothing, machinery, and pottery. It has electric street railways, waterworks, and a large trade. Population, 1907, 182,917.

**BOMA** (bō'má), the capital of the Congo Free State, on the Congo River, not far from its entrance into the Atlantic. It is regularly platted and has a number of fine buildings, including those erected by the government. The largest vessels enter its port, giving it direct steamship communication with Ostend, Antwerp, and other cities of Europe. It has a large interior and foreign trade, manufactures of utensils and clothing, and is the political center of the district of Boma and the country lying inland. Population, 1906, 4,360.

**BOMB** (bōm), an agent of destruction used in war. It is usually a large iron ball or shell filled with explosives and fired from a mortar or howitzer. Bombs are provided with a time or percussion fuse. They were first used at

Naples in 1434. The conical shells fired from rifled cannon have largely supplanted the older bomb. A class of bombs to be thrown by hand are sometimes used with murderous effect. The most noteworthy instances of such use in the latter part of the last century were at Saint Petersburg, Madrid, and Paris. They are constructed of a shell filled with high explosives, together with nails, scraps of iron, and bullets. The explosives used are nitroglycerin, fulminate of mercury, or chlorate of potash and picric acid. The explosion in the common bomb is effected by concussion, and in those depending wholly upon chemical action, as in one containing picric acid and chlorate of potash, it is effected by a coming together of the two liquids.

**BOMBARDIER BEETLE** (bōm-bēr-dēr'), a kind of beetle found in temperate and tropical countries. Many species have been described. Fully 25 species are found in different parts of the United States and Mexico. These beetles are remarkable for the secretion of a pungent fluid in the anal glands, which, when they are attacked by an enemy, is discharged with explosive force as a means of protection. This fluid somewhat resembles nitric acid in that it leaves a stain and has a burning sensation when applied to the skin. Immediately on making the discharge, the insect makes good its escape, but, if needed as a means of defense, the fluid can be thrown out several times consecutively.

**BOMBARDMENT** (bōm-bārd'ment), the act of attacking a city or fort by throwing bombs and shells to destroy the buildings and fortifications. This manner of attack is made chiefly on the larger cities and more important fortresses, usually on those that occupy a strategic point or in which a powerful army or valuable stores are kept by the enemy. In modern times most bombardments involve both naval and military operations. The attacking party usually gives notice of the impending attack 24 hours before opening fire in order that noncombatants may protect their lives and property by moving out of the range of the guns, though in some cases the enemy is surprised by a sudden attack, when no notice is given. In many cases excavations are made underground or bomb-proof masonry is built as a means of protecting life. Sebastopol, in the Crimean War, is an example of heavy bombardment, and Port Arthur, which the Japanese captured after repeated assaults, is an instance of combining the naval and military operations to good advantage.

**BOMBAY** (bōm-bā'), the chief seaport city



of India and capital of a province of the same name. It is located on a small island in the Arabian Sea, which was visited by the Portuguese in 1509 and annexed by them in 1532. It was ceded to Charles II. as a part of the dowery of his bride, the Infanta Catharine. In 1668 it was transferred to the East India Company, and in 1685 became the principal presidency of their possessions. There is a closer resemblance between it and European cities than is seen in any other city of Asia. The harbor is one of the finest in the world, and is both commodious and sufficiently secure for the heaviest ironclads. It has many substantial business blocks and magnificent homes in the newer suburban districts, where the larger numbers of its European inhabitants reside. The public buildings include the customhouse, the city hall, the public mint, several cathedrals, the offices of public works, the government courts, and the university. It has a well-organized and liberally patronized public school system, which is supported by taxation and government grants. Bombay has extensive manufacturing enterprises. The products include machinery, clothing, earthenware, textiles, and utensils. Its export and import commerce is very extensive, each aggregating about \$175,000,000 annually. The city has railroad connections with the country in all directions, is lighted by electricity, has street railway service, and is extensively connected by telegraph and telephone lines. Although the city presents elements of prosperity, it contains many poor and destitute. The life of the native laborer is one of misery and destitution, often reaching the point of starvation. Large numbers of the poor die in consequence of the famines that are quite frequent in western and northwestern India. Population, 1906, 786,806.

The province of which Bombay is the capital lies in the western part of India. It is bounded on the north by Baluchistan; east by Rajputana, Central India, the Central Provinces, Besar, and Hydenabad; south by Mysore and Madras; and west by Baluchistan and the Arabian Sea. The area is 184,235 square miles, of which 122,778 square miles are under direct British administration. The climate at Bombay is unhealthful, owing to its low and moist location, but toward the northeast the district is favorable to Europeans. The chief rivers include the Indus, Tapti, and Nerbudda. Among the mineral deposits are gold, iron, coal, salt, and petroleum. The rainfall is very heavy in the coast district, sometimes reaching 300 inches, and heavy monsoons are frequent. Large areas still contain valuable forests, but

in some regions deserts and saline lakes abound. The agricultural products embrace rice, wheat, barley, millet, cotton, and many varieties of tropical fruits. Railroads have been built through all the fertile districts, on which are located numerous cities with large populations. In 1907 the lines in operation had a length of 6,890 miles. The government of the district is administered by a resident governor, appointed by the crown, and a local legislative council. For administrative purposes it is divided into the four divisions of Central, Northern, Southern, and Sind. Population, 1906, 18,840,520.

**BONA** (bō'nà), or **Bône**, a seaport city of Algeria, on a bay of the Mediterranean, 85 miles northeast of Constantine. It has a good harbor and a large interior and foreign trade, and is connected with Constantine, Algiers, and other cities by railway. The chief buildings include those erected by the government and a number of mosques and churches. It has manufactures of tapestry, clothing, saddlery, and earthenware, and its trade is chiefly in live stock, wool, cereals, wax, fish, and tobacco. Iron mines and marble quarries are worked in the vicinity. The French have occupied Bona since 1832, from which time it has been growing steadily in commercial importance. Population, 1906, 42,934.

**BONANZA** (bō-năn'zà), a term applied originally to the discovery of a vein of rich ore in a mine. It came into use in connection with the Comstock Lode in Nevada, where a number of rich deposits were found. Now it is used in speaking of any successful enterprise or good fortune. The term is one of the popular Americanisms (q. v.).

**BONE**, the hard material that constitutes the skeleton or framework of mammals, reptiles, and birds. Its three purposes are to preserve the shape of the body, to protect the delicate organs and to serve as levers on which muscles may act to produce motion. In the early stages of life bones consist of *cartilage*, that is, cells massed together, except in the flat bones of the skull and shoulder blade, which consists largely of *fibrous tissue*. At maturity they contain about one part of animal and two parts of mineral matter. The proportions vary with the age; in early life they consist of nearly one-half to one-half, while in old age the mineral matter is greatly in excess. The mineral matter may be dissolved by soaking the bone in weak muriatic acid, which will make it possible to bend it like rubber. The animal matter may be burned in fire, the remaining portion forming a brittle mineral



mass. From this it may be seen that bones obtain their elasticity from animal matter and their hardness from mineral substances.

The cartilage found in young persons or animals turns gradually into bone by a process called *ossification*, but the portions near the joints are long delayed in ossifying, as a means to overcome to a great extent the shock of a fall or sudden jar. For this reason the bones of children are tougher than those of older people, and are less readily fractured and heal much quicker. In the body bones are moist, pinkish white in color, and covered with a tough membrane called *periosteum*. The interior is filled with marrow and permeated with blood vessels. All portions contain little cavities, from which tiny tubes radiate that serve as passages for the blood vessels to nourish the bones. These vessels permit the blood to circulate as freely through the bones as any part of the body, supplying new material when needed and carrying away the worn out parts. From the broken ends of a bone the blood oozes and soon forms a gristly substance, which holds them in place. The blood then slowly deposits bone matter, and in about six weeks a broken bone becomes united.

The bones of the human system resemble those of other animal organisms, but in shape and structure are peculiarly adapted to serve the human body. For convenience in study they are considered as bones of the three divisions: the *head*, the *trunk*, and the *limbs*. In form they are flat, as the shoulder blade; long, as the bones of the limbs; and short and irregular, as those of the wrist and ankle. The bones of the head are classified as eight skull and fourteen face bones. These bones form a cavity for the protection of the brain and the organs of hearing, taste, smell, and sight. All these are immovable, except the lower jaw, which swings on a hinge. The bones of the trunk include eight in the cervical region, thirty-seven in the thorax, five in the lumbar region, and four in the pelvis. The bones of the limbs include sixty-four in the upper extremities, and sixty in the lower extremities. The total number of bones in the body is about 210, these differing somewhat according to age, since several bones unite later in life. The size, form, and structure of the bones depend entirely upon the purpose they are to serve. Some are round and hollow and add lightness and strength; others are flat and broad to admit of large muscular attachment; while still others are short and solid to enable rapidity and facility in movement and to supply sufficient strength.

The bones of animals are gathered from

slaughter houses and converted into articles of commerce. Ground into powder, they supply a valuable fertilizer for the production of cereals, vegetables, and fruits. In some localities their fats are first extracted, which are used in the manufacture of soap and lubricants. In powdered form they are prescribed as medicines and add largely to the elements that build up a system wanting in material strength. They also serve for making handles in cutlery, for sugar refining, and for making boneblack.

**BONEBLACK**, or **Animal Charcoal**, a commercial product obtained by heating bones in closed retorts, until the gases escape and the residue is carbonized. The portions remaining in the vessel weigh about half as much as the original bones. They are reduced by passing them between rollers and separated by means of sieves into different grades, the sizes ranging from small grains to particles as large as navy beans. Boneblack is used to decolorize liquids, such as the syrup of sugar, and is employed to deodorize and to separate mineral substances from their solutions. Animal charcoal serves to remove the chemical impurities from water, but its use in refining sugar is the most important. Deodorization and decolorization take place by allowing the substances to be purified to percolate through layers of the charcoal, and in some cases the liquids are filtered several times to secure the best results. After using the boneblack a number of times it becomes saturated, when the ability to absorb may be restored by reheating it.

**BONESET**, or **Thoroughwort**, a perennial plant of America, distinguished by large hairy leaves, light purple flowers, and a stem from three to five feet in height. The leaves and flowering tops have a bitter taste and are used as a tonic. Boneset tea is made by steeping the leaves in hot water, and, when taken in this form, as warm as possible, it produces perspiration. It is recommended for ague, influenza, and muscular rheumatism.

**BONHAM** (bōn'am), a city in Texas, county seat of Fannin County, about thirty miles east of Sherman, on the Denison, Bonham and New Orleans and the Texas and Pacific railroads. It is surrounded by a fertile region and is a market for tobacco, cereals, and cotton. Among the chief buildings are the county courthouse, the Carlton College, and the Bonham Masonic Institute. The manufactures include cigars, flour, machinery, vehicles, and textiles. It has waterworks, electric lighting, and a large trade in farm produce. Population, 1900, 5,042; in 1910, 4,844.

**BONN** (bōn), an important city of Germany,



in Rhenish Prussia, on the Rhine River, about fifteen miles southeast of Cologne. It is connected by railroads with all parts of Germany and carries on a large manufacturing and jobbing trade. The chief buildings include the railway station, the museum, the city hall, and the Münster Church, which dates from the 11th century and is in the Romanesque style. It is the seat of the famous University of Bonn (q. v.), in which Schlegel, Niebuhr, Brandis, and Ritschl were leaders in educational thought. The Beethoven House, in which the composer was born, now contains the Beethoven Museum. In its burial grounds are the graves of Schlegel and Schumann. Many tourists visit the city, being attracted by its pleasing villas and historical surroundings. Bonn was the seat of the electors of Cologne, and by the virtue of the Congress of Vienna it passed into the hands of Prussia in 1815. The city is beautifully improved with monuments, parks, electric railways, and waterworks, and is celebrated for its sanitary regulations. Population, 1905, 81,996.

**BONN, University of**, an institution of higher learning at Bonn, Germany, which ranks next to that of Berlin among the German educational institutions. The foundation was laid in 1777 by Maximilian Frederick, Archbishop of Cologne, who established an academy, but this was changed to a university in 1818 and removed to its present location in Bonn. The departments are law, medicine, philosophy, and theology. In its library are 280,000 volumes and many valuable manuscripts. The chief buildings include the university proper, and the laboratories, the observatory, and the physiological institute. Niebuhr, Arndt, and Schlegel were connected with this institution. The attendance 2,550, including a number of students from foreign countries.

**BONY PIKE**, a ganoid fish native to North America, found chiefly in the brackish waters of rivers and lakes. It is covered with hard, bony scales and the vertebrae are completely ossified. It breathes atmospheric air, coming to the surface for that purpose, and feeds on other fishes. Several species are found in Central America and the United States. These fish are interesting because they represent a fossil species and their type is almost extinct. The *gar pike* and the *alligator gar* belong to the same genus. The average length is three feet, but sometimes specimens six feet long are found.

**BOOBY** (bōō'bŷ), a swimming bird closely allied to the gannet, whose name was derived from its apparent stupidity. Audubon as-

serted that several specimens studied by him learned to be upon their guard and that they became difficult to approach after they had been harmed and frightened several days in succession, but usually this bird has neither fear nor apparent desire to flee from danger. It inhabits the eastern coast of North America as far north as Cape Hatteras. The nests are rudely constructed on rocky ledges, usually near the sea, and two or three eggs are laid at a time. While its flesh is not agreeable, it is sometimes eaten, though mostly by natives.

**BOOK**, the common name applied to a written or printed composition forming a single volume. The early writings were preserved largely on monuments, on the walls of buildings, and on ledges of stone. These were chosen because of their endurance against the corrosions of time. The Egyptians used the papyrus, a plant native to Egypt, to prepare writing material as early as 2000 B. C. It was prepared by cutting the stem of the plant into longitudinal slices, which were then pressed and gummed together. The Babylonians and Assyrians used either papyrus or preserved their writings on a kind of clay tablets that were hardened by baking. It is claimed that the Koran was written on the shoulder blades of sheep, and there are numerous instances in which pieces of beechen boards were used in making books. The early books made of papyrus and skins of animals were in the form of a roll, written on both sides, and when used in study or for reference were wound back and forth. In Ezekiel ii, 9-10, reference is made to this form in these words: "Lo, a roll of a book was therein; and he spread it before me; and it was written within and without." Books made in this form and transcribed by hand were very expensive. Plato paid \$1,560 for a book; Aristotle, \$2,900 for another; and Alfred the Great, about the year 872, gave an estate for a single volume.

The invention of paper and the printing press greatly cheapened books, but enormous prices are still paid for rare and copiously illustrated works. A copy of Machlin's Bible, illustrated by Tomkins, was valued at \$2,625 when the first edition was published. Another Bible in fifty-four large folio volumes with 7,000 illustrations, some of them hand-drawn, was sold for \$25,000. Formerly the size of a book was taken from the number of leaves it contained. A fine example of this is found in the library of the University of Göttingen, which contains a Bible that has 5,373 leaves. The leaves were represented in number by the folio,



quarto, and octavo, and the page by the size of the paper, designated as royal, demy, or crown. Now the size of the page depends upon the number of leaves into which the sheet of paper that enters the book is folded. However, to express the size definitely, it is necessary that the size of the sheet be given in inches. A sheet of paper folded once, such as makes two leaves and four pages, is called a folio; folded twice, making eight pages, is called a quarto; folded three times, making sixteen pages, an octavo. The common sizes used are 8vo for large books and 12mo and 16mo for ordinary sizes. Folio and quarto books are rare, owing to their size being too large and difficult to handle. Illustrations have been used in books from an early date. The books now commonly sold in the market contain illustrations of the two kinds known as half tones and zinc etchings, these having largely superseded the wood engravings used early in the printer's art, and the finer and more expensive steel engravings of recent times.

When the Alexandrian Library became generally known, a market for books originated, and since that time the bookstore has been a common institution. The book trade is now one of the most important industries, employing large numbers of men and women and involving investments of enormous sums of money. When papyrus and parchments constituted the books in use, the printer's ink of the present time was unknown, but instead vegetable inks were made. Others were secured from animals, especially from the cuttlefish. These were applied to the permanent material, after the writing had been temporarily placed on the leaves of the palm and the inner bark of the elm, ash, and maple, which were used instead of tablets. When the manuscript writing was completed, it was coated over with a durable and transparent varnish. This served to protect the writings, whether on vellum, parchment, or any other material used in writing.

The subject-matter of a book is called the *text*. It is preceded by the *title page*, on which are the title of the contents, the name of the author and publisher, the date of publication, and sometimes the notice of copyright, but the last mentioned usually follows the title page. The *preface* is a statement of the author or editor in chief, explaining the plan and scope, after which is the *table of contents* and the *text*. Some books have an index, which may either precede or follow the text. A collection of books constitutes a *library*.

**BOOKBINDING**, the art of stitching or fastening together the leaves of a book for convenient use and covering them with a suitable cover. When books were rare and costly because of great patience and time required for writing them, the binding was done and the covers decorated on the most elaborate plans obtainable. The type-setting machines and high-speed printing presses are modern, but even with the invention of rude printing in the first half of the 15th century the production and cost of books were revolutionized. To prepare a page in type form and take off impression after impression was a vast improvement over the slow work of the Egyptian vassal and the Roman slave, who were employed to do much of the copying in ancient Egypt and Rome. In those early ages the books in common use were inclosed in a binding of boards with corners plated and sides clasped. The books of the wealthy and noble were encased with ivory, embellished with gold, and ornamented with costly gems. Not only were the bindings elaborate, but the title pages were very costly. The rolls included in the writings on scrolls were richly carved and finished in ivory and costly gems.

Binding has become a separate industry in the larger cities, and in many instances it is entirely apart from the printing institutions. The printed pages are sent to the binder, where much of the folding and other essentials in binding are done by machinery. The chief processes in binding are the following: Folding the printed sheets; gathering them in consecutive order; pressing them to secure compactness; setting the back for cords and sewing them; rounding the back edges and applying glue; trimming the edges; binding the book to the sides in the binding material, whether paper, cloth, or leather; lettering back and sides; and completing edges by gilding or otherwise. Books may be *full*, *half*, or *quarter* bound. A full-bound book is with the back and sides leather; half-bound is with the back and corners leather, and the sides cloth or paper; and quarter-bound is with the back leather and the sides cloth or paper. Many books are bound entirely in paper, cloth, and cloth-vellum. Books of law and medicine are bound largely in sheepskin, and the finer library books are in calf, morocco, or russia.

**BOOKKEEPING**, a system of recording the mercantile or pecuniary transactions so as to exhibit the condition and progress of business in a plain and comprehensive manner. It is an important branch of instruction in all commercial schools and business colleges and



is studied by both sexes. Bookkeeping is taught in many institutions in connection with arithmetic and penmanship, and quite uniformly enters into the course of study in the evening schools of the larger cities of Canada and the United States. The institutions which teach it regularly conduct exercises that nearly approximate the operations of actual business. Thus, students carry on business correspondence, make and receive formal consignments of merchandise, buy and sell exchanges upon the different sections of the country, and become quite well informed in the business methods of banking. The functions of students are changed from time to time, hence they take the place of the shipper for a brief time, later that of a bookkeeper, afterward that of a collector, etc., and in this way learn to transact the business in various lines of trade and industry.

Bookkeeping as now taught is of two kinds, *single entry* and *double entry*. The terms *debit* and *credit*, meaning debtor and creditor, usually marked Dr. and Cr., are employed arbitrarily. The books used include a *daybook*, a *journal*, and a *ledger*. In the daybook are entered the transactions on the date and in the order of their occurrence, while the ledger contains the accounts. The journal is used to separate each transaction so as to simplify its transfer to the ledger. On the left-hand side of the ledger are the items of debit, as cash received, and on the right-hand side are the items of cash disbursed, and the difference is known as the *balance*. A payment in cash is called a *liquidation*. When the items are transferred from the journal to the ledger, they are said to be *posted*. An examination to verify the two columns of an account is known as taking a *trial balance*. In a large business establishment, where the double entry system is used, several account books are employed to permit checking different phases or departments with the view of knowing the condition of each. Such books include the *bill book*, *stock book*, *invoice book*, *cashbook*, and *account sales book*.

Single entry bookkeeping involves less labor than double entry, but does not provide the same degree of safety against errors. Accounts are usually kept in two records, the daybook and the ledger. The customer is charged on the debit side with debts he is to pay, and is credited on the credit side with cash or merchandise he may turn in for value received. To find the balance, the sum of the credits are compared with the sum of the debits. Double entry requires that a much more com-

plete record be kept, and under this system every transaction is entered in two places, in a debit and a credit column. In this system a daybook, a journal, and a ledger are used. The transactions are entered in the daybook the same as in single entry, but from it they are transferred to the journal, classified according to the names or titles of the ledger account, and afterward are posted in the ledger.

**BOOK OF MORMON**, the book held sacred by the Mormons and by them regarded as a part of the Holy Scriptures. It assumes to contain a record of a chosen people in America, from the confusion of tongues at Babel until the time of Maroni, the last survivor of his race, who is thought to have died about 420 A. D. See **Mormons**.

**BOOKPLATE**, the name of a label used to indicate the ownership of a book or its place in a library. In recent years many wealthy persons have collected these plates and much has been written in current literature in regard to the different styles used by various persons and organizations. It is thought the first bookplates were made in Germany, whence they were taken to England, and subsequently brought from that country to America. They were plain and rude until about 1516, when Albrecht Dürer began to design and engrave many artistic forms. Others of much beauty are those made by Hans Holbein and Jost Amman, who gave special attention to selecting quotations from the classics, which were engraved in artistic forms and accompanied with the name and coat of arms of the owner. The best known designs of England are those in the Chippendale style, characterized by graceful effects instead of the somber designs, and in them were introduced pictures of flowers, fruit, landscapes and human figures. Many of these plates have been commanding high prices and are listed by sellers of old and rare books.

**BOOM** (bōom), a word frequently used to denote rapid development in a particular industry or locality. When shares in business enterprises are increasing in value, or the development of a city or state is progressing rapidly, it is said they are *on a boom*.

**BOOMERANG** (bōom'ēr-äng), a missile weapon invented and used by the natives of Australia. It is made of a curved stick, flat on one end and round on the other, about two feet long, two inches wide, and half an inch thick, and rounded at the ends. The savages grasp it at one end and throw it upward or forward. When thrown forward it has a skipping motion until it strikes the object aimed at or falls to the ground. When



thrown upward, it slowly ascends and in its backward flight falls to the ground behind the thrower, near its starting point. It is a powerful weapon in war and in the pursuit



BOOMERANGS.

of wild game. A similar missile was used by the Assyrians and Egyptians.

**BOONE** (bōon), a city of Iowa, county seat of Boone County, forty-two miles northwest of Des Moines, on the Chicago and Northwestern, the Chicago, Milwaukee and Saint Paul, and other railroads. The chief buildings include the post office, the Boone National Bank, the Eleanor Moore Hospital, the high school, the Ericson Library, and the county buildings. About two miles west of the city the Des Moines River is crossed by the famous Boone viaduct, the highest double-track railroad viaduct in the world, 185 feet above low-water mark. In the vicinity are extensive deposits of coal and fire and pottery clay. Among the industries are brick-making, railroad machine shops, coal mining, an artificial ice plant, and grain and live stock shipping. The city has systems of gas and electric lighting, waterworks, sewerage, pavements, and electric urban and interurban railways. It was incorporated as the town of Montana in 1866, but the name was changed to Boone two years later, when it became a city. In 1887 the town of Boonsboro was annexed. Population, 1910, 10,347.

**BOOTH** (bōoth), a stall or tent erected at fairs. In early times trade in Europe was carried on chiefly by fairs. The huts or temporary movable structures in which the traders exposed their goods for sale were called booths. The term is also applied to the stalls or apartments used by voters in the Australian voting system.

**BOOTHIA FELIX** (bōō'thī-à fē'līx), a peninsula of North America, the most northerly point of that continent, located between Boothia Gulf and McClintock Channel. Its length from north to south is 150 miles and the width is fifty miles. Bellot Strait, on the north, separates it from North Somerset Island, and in the south it contracts to a narrow isthmus, which connects it with the mainland. Sir John Ross discovered it in 1829 and named it after Sir Felix Booth, who had contributed to the expe-

dition. The northern magnetic pole was located on this peninsula in 1831, near the west coast and not far from Cape Adelaide.

**BOOTLE** (bōō't'l), a city of England, in Lancashire, on the Mersey River. It has transportation facilities by the Leeds-Liverpool Canal and several railroads, and is a manufacturing center of flour, clothing, and machinery. Many business men of Liverpool, near which it is located, reside in Bootle. Its institutions include a gymnasium, a public library, a museum, and a technical school. Population, 1907, 67,114.

**BOOTS**, the articles of dress worn to protect the feet and lower legs. They are a variety of *shoes*, but differ from them in that they extend higher up the leg, sometimes above the knee. They were developed from the *sandal*, which is the simplest and oldest kind of foot protector, and are used more commonly by men than by women. The boot was worn by the Greeks and Romans, who made ornamental designs, both on the part covering the foot and the portion extending above the ankle. In Greece buckskin was used in making the principal upper parts, and the soles were heavy so as to apparently increase the stature of the wearer. An elaborately adorned boot with wide tops came into general use in continental Europe in the 14th century, and subsequently the matter of regulating the styles was a subject for legislation by various governments.

The introduction of machinery in the manufacture of all classes of boots and shoes has greatly revolutionized the trade in these articles. A combined lasting and sole-nailing machine was invented in 1810 and soon began to be used with marked success in England and America. It was followed by the discovery that wooden pegs can be utilized in fastening the uppers and soles together, which was the common method until 1860, when the McKay sewing machine came into general use for this purpose. Another important invention is the Goodyear machine, which fastens the uppers and soles together by means of a welt. Later screw-wire machines, heeling machines, and other inventions followed, enabling the work of cutting, sewing, trimming, and polishing to be done almost entirely by machine labor. Now the work is greatly diversified, each part being done by different workmen on machines designed specially for particular purposes. The facility with which boots and shoes of all kinds are made has been demonstrated many times at the great expositions, where exhibits of the complete routine of work were made and the machines exhibited in their working capacity.



The manufacture of footwear is a vast industry in America, both in Canada and the United States. In the number of articles and the value of the product, the New England States take a high rank in the manufacture of boots and shoes, including those made of rubber and leather. Chicago, Saint Louis, and many cities of the Mississippi valley, and the cities of Montreal and Toronto, are centers of boot and shoe manufactures. According to the census of the United States in 1900, the annual product was valued at \$261,028,580 and the laborers employed numbered 142,922, about one-third of whom were women. See **Shoes**.

**BORAX** (bō'rācks), a crystalline salt found native in certain mineral springs and on the shores of many lakes. The chief supply is derived from Tibet, Peru, Chile, Tuscany, Germany, and several sections of North America, especially Nevada and California. It is prepared for commerce by washing the tincal, the crude material, with a solution of sodium hydroxide, and after dissolving in water it is treated with caustic alkali, after which the solution is evaporated and the borax crystallizes in six-sided prisms. The treatment varies somewhat with the condition in which the deposits are found. At Alameda, Cal., are refineries which treat the product secured from Clear Lake and other localities. There the crude material is dissolved in water and then treated with sodium carbonate, and the resulting solution is cooled in tanks, in which the borax forms on steel rods. Borax is used chiefly in soldering metals, glazing pottery and china-ware, preserving milk and meat, treating ulcers and skin diseases, and loosening dirt, and as an antiseptic and disinfectant.

**BORDEAUX** (bōr-dō'), an important city in France, capital of the department of Gironde, on the Garonne River, about sixty miles from its mouth, but accessible by all vessels. It has railroad connection with the leading cities of France, electric urban and inter-urban railways, and finely paved streets and public drives. Shipbuilding is an extensive enterprise. It is important as a commercial center on account of its location and large manufacturing interests, especially its ropeworks. It produces large quantities of woolen goods, paper, earthenware, wine, clothing, and machinery. Bordeaux has some of the most noted cathedrals, palaces, libraries, theaters, and other edifices of Europe. Its museum, observatories, and art galleries have been famous for ages. It is the birthplace of Montesquieu, Montaigne, and other celebrated scholars. In the Roman period it was known as Burdigala, when it

ranked as a commercial emporium. It was taken by Charles Martel in 735, captured by the Normans in the 9th century, transferred to the English crown in 1152, and restored to France in 1451. In the latter part of the war of 1870-71 it was the seat of the French general assembly, which had been driven there by the German army of invasion. Population, 1906, 251,917.

**BORDENTOWN**, a city of New Jersey, in Burlington County, six miles southeast of Trenton, on the Pennsylvania Railroad. It is on the Delaware River and the Delaware and Raritan Canal and is important as a manufacturing point for the production of worsted goods, ironware, machinery, and clothing. Its public institutions include a convent, a school for girls, and the Bordentown Military Institute. The city was incorporated in 1849. Near it is "Ironsides," the home of Charles Stewart, and a number of fine estates, including the former residence of Joseph Bonaparte. Population, 1900, 4,110.

**BORDER**, **The**, the territory lying immediately on both sides of the frontier between England and Scotland. The region is noted for many historical battles and invasions important in the history of the Scotch and English. Among the noted forays of the Border is the Chevy Chase (q. v.). The writings of Sir Walter Scott commemorate the history of the Border warfare.

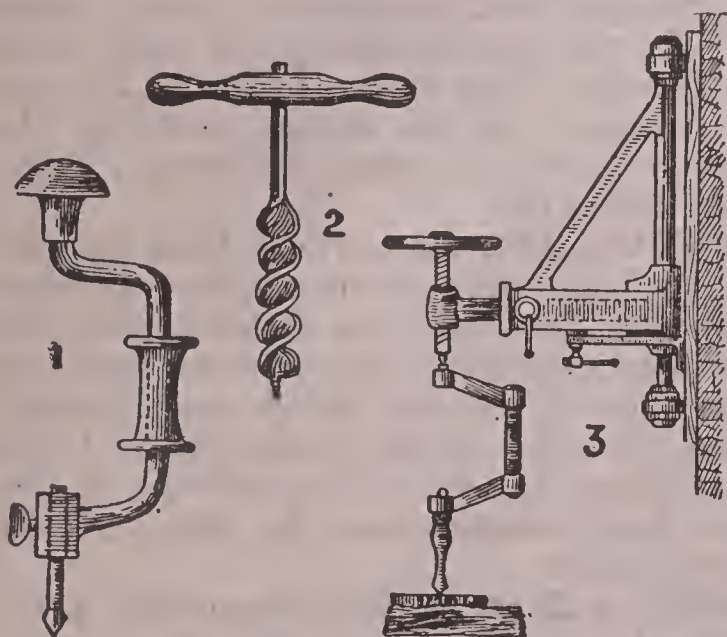
**BORE**, or **Eagre**, a tidal phenomenon at the mouths of certain rivers. Bores are common to rivers that gradually expand toward a wide mouth, and in which high tides occur. The spring flood tides drive great quantities of water from the sea into the river and form a kind of watery ridge, which rushes upward with great violence. The most celebrated bores are those of the Indus, Ganges, and Brahmaputra, of Asia, but the phenomenon is observable in other streams. In one of the branches of the Ganges the bore travels seventy miles in four hours, sometimes forming a wall of water ten feet high. In the Amazon it rises from ten to twelve feet. The bore of the Petitcodiac River extends from the Bay of Fundy to Moncton, N. B., about 95 miles.

**BORIC ACID** (bō'rīk), a compound of boron, oxygen, and hydrogen. It is found native in Tuscany, the Lipari Islands, California, and elsewhere. The first discovery of this substance was made in 1777 in the lagoons of Tuscan, which are still the principal source of supply. Several lakes in California and Nevada yield borax in combination with various elements. It is derived from hot vapors which come naturally from thermal lakes and springs,



and these vapors, which are largely boric acid, are absorbed by being passed through water. The acid turns blue litmus purple. It is used chiefly in the manufacturing of borax, in glazing porcelain, and in preparing certain pigments.

**BORING MACHINE**, a mechanical device used in boring holes in wood, rock, and metals. The *auger* (q. v.) is a simple tool for making holes in wood, while the *gimlet* and *awl* are used where smaller openings are required. *Drills* are used in piercing stone and metal. The *diamond drill*, constructed of a hollow tube with diamond cutters at one end, is the most effective in boring rock. The larger boring machines are operated by steam or compressed air. They do the work quickly and without danger of loss from obstructions that



1, Brace with bit; 2, auger; 3, adjustable bitstock.

usually prevent the lighter apparatus from cutting through to the depths desired. Boring machines intended to be operated by hand usually have a metallic framework mounted on a wooden base, and the bit is turned by means of a handle or brace acting upon small cog-wheels, one of which turns horizontally with the bit or auger.

**BORNEO** (bôr'nê-ō), one of the largest islands of the world, located in the center of the East Indies. It has an area of 290,000 square miles. A large number of small islands are located near the coast, of which Labuan, off the coast of Brunei, is the most important. Darwin considered Borneo and the East Indies to be the elevated portions of a vast continent submerged in the Pacific, which is probable. The surface is mountainous, attaining its culminating summit in Mount Kini Balu, in the northern part, which has a height of 13,690 feet. While the island has no active volcanoes, it is frequently subject to earthquakes, however, not of a serious nature. It is watered

by numerous rivers, among them the Barram, Limbang, the Rejang, and the Batang Lupar. Many of the rivers are navigable and add largely to the transportation facilities of the island. The rivers and lakes are infested by crocodiles and various animals common to swampy and marshy districts. Other wild animals include the tapir, elephant, deer, leopard, rhinoceros, buffalo, many varieties of monkeys, and birds of song and fine plumage.

The productions of Borneo consist of sago, rice, tobacco, pepper, gambier, coffee, cotton, and many varieties of tropical fruits. The forests yield an abundance of excellent timber and edible birds' nests. It has extensive mineral deposits, including zinc, gold, quicksilver, tin, antimony, and diamonds. The manufactures are not extensive, the most important being cotton fabrics, utensils, matting, and fancy baskets. A large part of the interior is inhabited by the Dyaks, a native race mixed more or less with the Malays, and other races include the Chinese, Japanese, and Europeans. Moham-medan is the principal religion. The exports are large and greatly exceed the imports. General fertility of the soil, good climate in the larger portions, and growing European influence are collectively a potent factor in widening commerce and increasing wealth. Both the Dutch and British have constructed telephone, telegraph, and railroad lines to connect the interior parts with the coast.

The history of Borneo dates from 1578, when it was discovered by the Portuguese, but the first European settlement was not made until the seventeenth century, by the Dutch, who visited the island in 1598. British North Borneo includes the extreme northern peninsula of the island. It has an area of 31,106 square miles. The north central part is called Brunei, which consists of about 3,000 square miles, and is under the semi-independent government of a native sultan, who is subject to Great Britain. The capital of the state is Brunei, located on a river of the same name, and has a population of 10,500. To the south and west of Brunei is the English possession Sarawak, which has an area of 42,000 square miles, with the seat of local government at Sarawak, a city of about 18,000 inhabitants. The larger part of Borneo belongs to Holland. The Dutch possessions contain an area of 213,894 square miles. The region belonging to Holland is divided into two districts, that of the South and that of the East. Pontianak, population 9,500, is the capital of the former, and Ban-germasin, 30,380, of the latter. British North Borneo has a population of 250,000; Brunei,



25,000; Sarawak, 500,000; and Dutch Boreno, 1,225,000.

**BORNU** (bôr-nō'), a kingdom of Negroes, in the central part of the Sudan, Africa, with an area of 50,000 square miles. It extends southwest from Lake Tchad, which forms its north-eastern limits. The two principal rivers are the Shari and Yeou, which flow into Lake Tchad from the west. The district is more or less included in the German possession of Kamerun and the British Niger Territories. It is exceedingly fertile and produces rice, indigo, cotton, tobacco, corn, cocoa, palm oil, ivory, and fruits for export. Domestic animals, including horses, cattle, sheep, elephants, and buffaloes, are reared extensively. The religion is Mohammedan and the labor is largely based on a system of slavery. Kuka is the capital and chief trading point. It has a population of about 60,500. Other cities include Bundi, Yola, Birni, and Gummel. The army of the reigning sultan numbers about 30,000 men. Population, about 5,250,000.

**BORODINO** (bâ-râ-dyê-nô'), a village of Russia, in the government of Moscow, on the Kologa River, a tributary of the Moskva. It is celebrated as the site of a battle on Sept. 7, 1812, between the Russians under Kutusoff and the French under Napoleon. The French army consisted of about 150,000 men and the Russian army was somewhat smaller, and the struggle was chiefly an attempt of the French to capture the lines of redoubts and press on to Moscow. Napoleon made three assaults and remained in the field, while the Russians retreated in good order, but Moscow was soon after occupied by the French. Both sides claimed the victory, but it was disastrous to the French in that the Russians burned Moscow and destroyed the stores. About 75,000 were killed and wounded in the Battle of Borodino, which is called the Battle of Moskva by the French, from the river of that name.

**BORON** (bō'rōn), a chemical element discovered by Sir Humphry Davy in 1808. It is not found native, but occurs in combination with *borax*, *ulexite*, and *sassoline*. It fuses only at a very high heat and has a specific gravity of about 1.84. Its principal commercial use is in making boric acid and certain borates.

**BORROMEAN ISLANDS** (bôr-rō-mā'an), a group of four small islands in northern Italy. They are rocky and famed for their beauty. Isola Bella, the most celebrated of the group, has a beautiful palace of the Borromeo family, from whom they were named. Isola Madre, the largest island, has fine groves of orange trees and gardens of tropical flowers. These islands

were improved in 1671 by Count Borromeo (1538-84), a celebrated Roman Catholic cardinal.

**BOSNA-SERAI** (bōs'nâ-sēr-ī'), or **Serajevo**, the capital of Bosnia, on the Miljacka River, 120 miles southwest of Belgrade. It has extensive railway facilities, potteries, dye works, machine shops, and silk-weaving establishments. In the vicinity are iron mines and mineral springs. The chief buildings are those erected by the government, including the governor's residence. Other buildings of note are the seminary, a Catholic cathedral, and the mosque of Husref Bey. Many fine bazaars are maintained and the trade is important, owing to its location between Turkey and Austria-Hungary. Population, 1905, 38,083.

**BOSNIA** (bōz'nī-ä), a province of Austria-Hungary, transferred with Herzegovina and Novibazar from Turkey by the Treaty of Berlin in 1878. The area, including Herzegovina and Novibazar, is 19,702 square miles. In Bosnia the surface is mountainous, including ranges of the Dinaric Alps, but toward the south, in Herzegovina, it is level or gently undulating. A large part is fertile and well adapted to agriculture. It is well watered by the Bosna, Save, Drina, and Verbas rivers and is rich in forests and minerals. The products are wheat, barley, tobacco, hemp, rye, buckwheat, and domestic animals. Copper, iron, antimony, chromium, and salt are mined profitably. It has manufactures of sugar, matches, chemicals, woolen and cotton goods, iron products, firearms, machinery, leather, and dairy products. Bosna-Serai (q. v.), or Serajevo, is the capital and largest city. The principal cities, besides the capital, are Mostar, population 15,500, and Banjaluka, 14,380. The district is well traversed by telephone, railway, and telegraph lines. For the purpose of government (Landesregierung) it is divided into four departments and these are subdivided into six district (Kreis) and fifty-four county (Bezirk) authorities. The chief religious affiliations are with the Mohammedan, Greek Catholic, Roman Catholic, and Jewish faiths. A Servian dialect is spoken chiefly, but German is the official language and is taught in the schools. The territory included in the province was a part of Dalmatia and Pannonia in the time of the Romans. It belonged to Turkey from 1463 until it was given to Austria-Hungary in 1878. Francis Joseph annexed it in 1908 by proclamation and it is now a crown land of the dual empire. Population, 1905, 1,698,375.

**BOSPORUS** (bōs'pō-rūs), a strait connecting the Black Sea with the Sea of Marmora,



and separating Europe from Asia. It was so named because, according to legend, Io was transformed into a cow and swam across it. It is about nineteen miles long, 190 feet deep, and from one-third to two miles wide. To distinguish it from the *Cimmerian Bosphorus*, which is between the Black Sea and the Sea of Azov, it is properly called the *Thracian Bosphorus*. It is under the control of Turkey and is defended by a series of forts. On its shores are many lighthouses, especially at its northern and southern ends, and it is improved for extensive commercial activity. In ancient times the kingdom of Bosphorus was located on both sides of the strait. It was founded in 502 B. C., became tributary to the Scythians in 290, and was vanquished by Pontus in 116. The region was long under Roman dominion, when it formed a part of the Eastern Empire.

**BOSTON** (bôs'tūn), the capital of Massachusetts, chief city of New England, and fifth in size of the American cities. It is located in Suffolk County, of which it is the county seat, on Boston Bay, and at the mouths of the Mystic and Charles rivers. It is 232 miles by railway northeast of New York, and is the focus of many steam railway and electric lines. The principal railroads include the Boston and Maine, the Boston and Albany, the Fitchburg, and the New York, New Haven and Hartford lines. On Boston Harbor, an arm of Massachusetts Bay, is the older part of the city, situated between it on the east and the Charles River on the west. Originally large tidal marshes occupied a considerable area along the shore, but these were filled in and many acres were added to the area of the city, for which purpose a number of elevated points, such as Beacon and Fort hills, were cut down.

The city has an area of about 43 square miles. This is made up of the original site and the additions annexed from time to time. East Boston, on Noddle's Island, was added before the Revolution; South Boston, annexed in 1804; Roxbury, in 1868; Dorchester, in 1870; and Brighton, Charlestown, and West Roxbury, in 1874. Practically all the streets are paved substantially, including pavements constructed of Belgian blocks, macadam, gravel, and asphaltum. Scollay Square is located near the center of the peninsula, between Boston Harbor and the Charles River, and from it radiate the streets in the compactly built business portion. Many of the streets do not extend uniformly with the cardinal points of the compass, but the main thoroughfares have a direction approximately north and south to a point nearly opposite Fort Point Channel, whence they turn

to the southwest. State Street is the important financial center, corresponding to Wall Street in New York, and Tremont, Hanover, and Washington streets are among the business thoroughfares. Commonwealth Avenue, 240 feet wide, is one of the finest boulevards in America. The Fenway, Massachusetts Avenue, and the Strandway are boulevards of much beauty. Many cross streets facilitate intercommunication, and an efficient street railway system has lines extending to all parts of the city, except East Boston, which is connected by ferry. A subway and an elevated railway carry a large portion of the travel in the crowded part of the city.

Northwest of the peninsula, across Boston Harbor, is East Boston, connected by ferry with the main business section. Charlestown is located north of the peninsula and Cambridge is west, across the Charles River, and South Boston lies east of South Bay and Fort Point Channel. The fashionable residential section is in the southwestern part, extending to Roxbury.

**BUILDINGS.** The architecture is generally substantial and commodious and the buildings include many of historical interest, both from the style of construction and their association with great events. On Beacon Hill is located the State House, built in 1795, and in its vicinity are statues of Daniel Webster and Horace Mann and Saint Gaudens' Shaw Monument. The city hall, on School Street, and the customhouse, on State Street, are fine structures, and near the former is the county courthouse, erected at a cost of \$2,500,000. In the vicinity of Copley Square are many of the larger buildings, including the museum of fine arts, the public library, and the Second Unitarian Church. Here also is the New Old South Church, a fine Gothic architectural structure. The First Church of Christ (Scientist), the First Spiritual Temple, and the Roman Catholic Cathedral of the Holy Cross are among the finest ecclesiastical buildings. Boston has fully 300 churches, representing the leading Christian denominations, and its public library is the largest free circulation library in America.

Many of the office buildings, department stores, and public institutions are models of substantial construction and convenient architectural design. These include the Massachusetts General Hospital, the Chamber of Commerce, the Masonic Temple, the Sears and Ames building, the Tremont Temple, the Natural History Museum, the New England Conservatory of Music, and the Youth's Companion building. Boston has many theaters and other

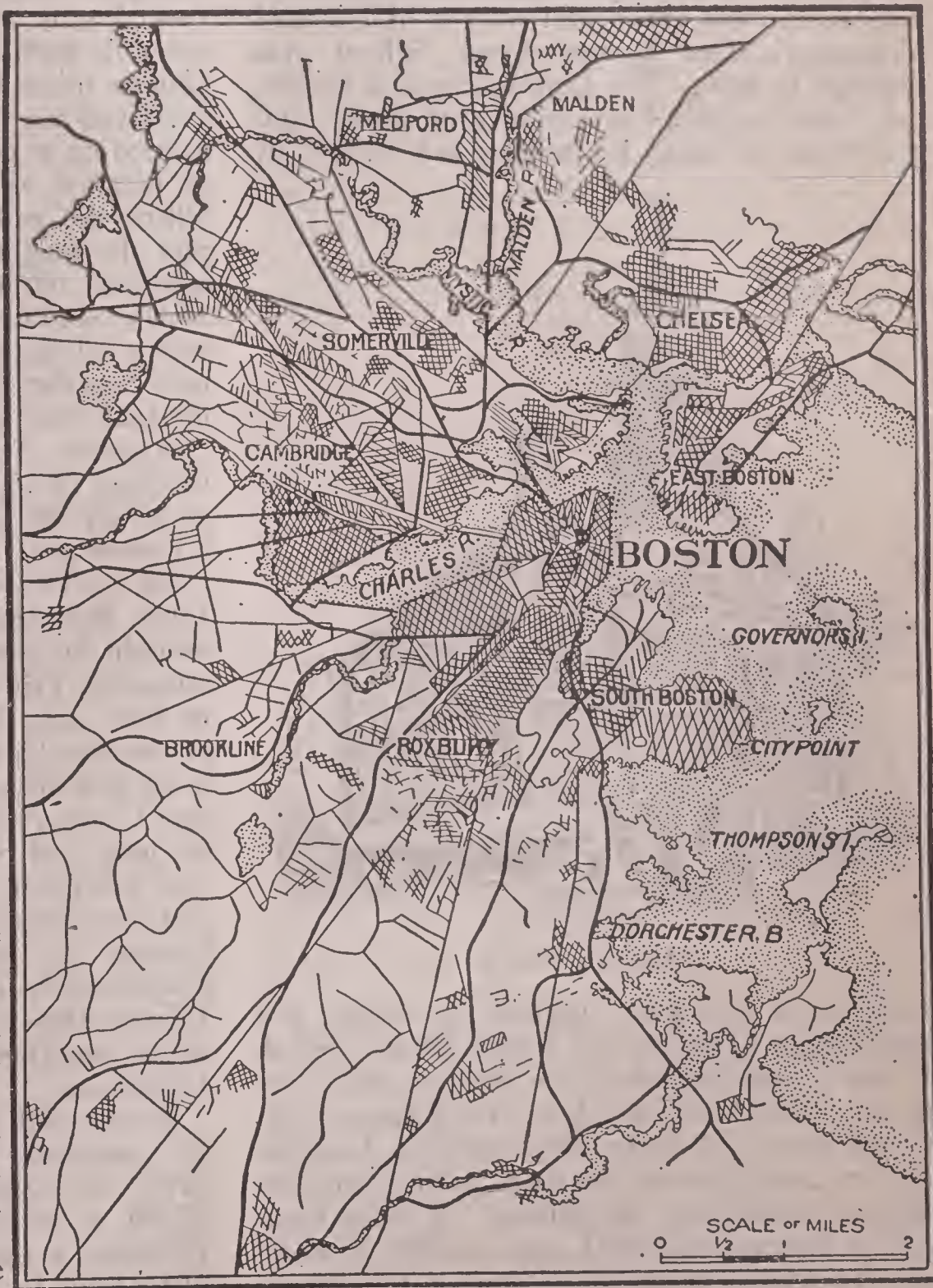


places of amusement, foremost among which is the Boston Theater. The Vendome and Touraine are residential hotels, and the Quincy House, the Adams, the Parker House, the Lenox, and the United States are among the larger commercial hotels.

Foremost among the historical buildings is the Christ Church, known as Old Church North, erected in 1723, in whose spire were hung the lanterns for Paul Revere. The Old State House, on Washington Street, at the head of State, dates from 1748. It was restored to its provincial appearance in 1882 and it contains a collection of interesting relics and paintings. King's Chapel, at the corner of School and Tremont streets, established in 1689 and rebuilt in 1754, was attended during the colonial period by the royal governors and has the oldest cemetery in Boston. At the corner of Milk and Washington streets is the Old South Meeting House, built in 1729. Other noteworthy structures are the Faneuil Hall, known as the "Cradle of Liberty," and the Old Corner Bookstore. Among the old cemeteries are Old Granary Burying Ground, containing the graves of Paul Revere and Samuel Adams; Central Burying Ground; and Copp's Hill Burial Ground, which contains the graves of Irving Cotton Mather and others of his family. King's Chapel Burying Ground contains the graves of John Winthrop and many early colonists.

**PARKS.** Foremost among the public grounds is The Common, one of the oldest and most interesting public parks in America. It is located in the heart of the city, containing 48 acres, and has been preserved for public use since 1674. The "Great Elm" stood near the center until 1876, when it was blown down, and at nearly the same place now stands the Soldiers' Monument, erected to the soldiers who fell for their country. The Boston Massacre is commemorated by the Crispus Attucks Monument, which stands near the Tremont Street Mall. The Public Garden, containing 24 acres, is near The Common, and in it are an artificial lake and

statues of Washington, Charles Sumner, and Edward Everett. Commonwealth Avenue, the finest boulevard of Boston, extends from the Public Garden into the Back Bay district, which is famed for its beautiful lawns and fashionable buildings. Marine Park, which includes Castle Island, North End Park, at the northern extremity of the peninsula, and the beautiful park of "The Fens" district are other points of interest and beauty. In the Arnold Arboretum are all the shrubs and trees that can be grown in the climate of Massachusetts.



Boston is noted for its many fine monuments, some of which have already been named in this article. Charlestown is the site of Bunker Hill monument (q. v.), a granite obelisk, and here also are a soldiers' monument, a monument to John Howard, and statues of Colonel



Prescott and General Warren. A statue of Beethoven is in the Music Hall; one of Governor Winthrop, in Scollay Square; one of Leif Ericson, in Commonwealth Avenue; one of Samuel Adams, in Adams Street; one of Admiral Farragut, in Marine Park; and one of Columbus, near the Roman Catholic cathedral.

**INSTITUTIONS.** Many educational and charitable institutions are maintained and liberally patronized. They embrace the Boston University, Massachusetts Normal Art School, Boston College, Massachusetts Institute of Technology, Perkins Institute, Tufts College Medical School, and the medical and dental schools of Harvard University. The Boston Latin School was founded in 1635. The Lowell School of Design, the New England Conservatory of Music, and a number of other institutions are centers of



FANEUIL HALL.

training in the arts. Besides the books and manuscripts in the Boston Public Library, which is one of the largest in the country, there are noted collections in the Boston Athaeneum, the Congregational Library, the American Academy of Arts and Sciences, the State Library, and the leading educational institutions. A large number of literary, historical, and scientific societies are maintained and much is done in the way of charity. Boston holds high rank in the maintenance of reformatories. The principal almshouses and penal institutions are on the islands in the harbor.

**INDUSTRIES.** Boston is preëminently a center of manufacturing, but many of the factories

owned and operated by citizens are located in towns of the surrounding country. The extensive transportation facilities make it possible to reach these factories, and the products are handled largely through the business houses of the city. The census of 1900 places the value of the manufactured product within the city at over \$205,000,000 per year.

The terminus of important railroads are located on a safe and commodious harbor. Boston is noted as the financial center of New England. Its foreign commerce ranks next to that of New York, and as a wool market it is exceeded only by London. The largest vessels enter its harbor, which is eight miles wide and sixteen miles long, and is protected by strong fortifications. Lighthouses and beacons are located on a number of the islands. The trade is handled at a system of freight terminals, where the railroads and ships come together, and the passenger traffic is cared for at two terminal stations, the South Station and the North Station. The export and import trade carries all articles of manufacture and production familiar to the American people, and the internal revenue collected annually is \$8,500,000.

**HISTORY.** The history of Boston may be said to begin in 1626, when the first settlement was made on the peninsula, and a few years later a company of colonists removed from Charlestown to join the settlement. These included John Winthrop and a number of colonists brought by him to Salem. The place was first known as Trimontaine, but was renamed Boston in 1630, and two years later the first meeting house was built. It soon became the principal town and business center of the Massachusetts Bay Colony, and was the chief seat of Puritan learning and religious life. In the movement for American independence, it took a leading and aggressive part. Here occurred riots following the Stamp Act, the skirmishes at Charlestown, the Battle of Bunker Hill, the Boston Massacre, the Boston Tea Party, and many important events following the Battle of Lexington.

Its material growth in wealth and as a center of commerce dates since the Revolutionary War. In 1822, when it had a population of 47,000, it received its charter as a city. The *Brittania*, a Cunard liner, was the first steamer of that line to enter the harbor, in 1840. William Lloyd Garrison and others did much to promote sentiment in favor of the abolition of slavery, and the city was enthusiastic in its support of the Federal government during the Civil War. A destructive fire swept over it in 1872, when about fifty acres of its business section were



laid waste. However, it was rebuilt to much better advantage and substantial modern structures replaced many of the older ones dating from colonial times. As a literary center it has taken a prominent place in learning and culture. In or near it lived Hancock, Motley, Thoreau, Lowell, Whittier, Longfellow, Prescott, Holmes, Parkman, and Emerson. The inhabitants are largely American, but include many Irish, Germans, English, and Italians. It is exceeded in population only by New York, Chicago, Philadelphia, and Saint Louis. Population, 1900, 560,893; in 1905, 593,598. and in 1910, 670,585.

**BOSTON MASSACRE**, an affray at Boston, Mass., on March 5, 1770, between seven British soldiers under Captain Preston and a mob of citizens. Several minor riots had taken place from time to time, owing to opposition by the people of Boston to the stationing of troops in the city. It took place on State Street, formerly King Street, where the soldiers were attacked with stones and other missiles. One of the soldiers who received a blow fired, and his companions, mistaking an order, followed in shooting at the mob. Three of the populace were killed and seven were wounded. The mob retreated and the bells of the city rang an alarm, causing several thousand people to gather, but no further hostilities took place. Several of the soldiers were tried on a charge of murder, but were acquitted. This affray did much to create a sentiment in favor of treating the colonists with consideration, and the garrison was removed to Castle Island.

**BOSTON TEA PARTY**, a popular name of an occurrence in Boston Harbor on Dec. 16, 1773. The American colonies had protested to Parliament against placing a tax on articles imported, and the American merchants entered into an agreement not to import from Great Britain while such tax was collected. However, that body declared their right to tax the colonists without their consent, and, when the English East India Company sent cargoes of tea to the port of Boston, the Americans resisted the collection of the duty. A conference was held in the Old South Meeting House, after which sixty men, disguised as Indians, boarded the vessels in the harbor and threw 342 chests of tea into the water. To retaliate, the government closed the port against all commerce and navigation.

**BOSTON UNIVERSITY**, an institution of higher learning at Boston, Mass. It was chartered in 1869 and is under the auspices of the Methodist Episcopal Church. The foundation was laid by Isaac Rich, who bequeathed a large part of his great estate for that purpose. It

offers both college and graduate courses, and has departments of liberal arts, agriculture, theology, law, and medicine. The post-graduate department is known as the School of All Sciences, which is affiliated with the University at Rome and the National University at Athens. Its agricultural department is at Amherst, Mass., known as the Massachusetts Agricultural College. The faculty consists of 150 professors and instructors, and the attendance is about 1,500 students.

**BOSWORTH** (böz'worth), a small town of Leicestershire, England, noted for the Battle of Bosworth Field, on Aug. 22, 1485. The battle was fought between Richard III. and the Earl of Richmond, afterward Henry VII. The former was deserted by his troops and rushed into the camp of the enemy, crying "Treason! treason!" and was slain. His death ended the Wars of the Roses. The town has a population of 1,150.

**BOTANY** (böt'ä-nÿ), the science that treats of plants—their structure, the functions of their parts, and the conditions governing their growth. It embraces a general description and classification of plants. The three kingdoms of nature are designated as *animal*, *vegetable*, and *mineral*. Life is a condition common to animals and plants, but the representative species of the two kingdoms are marked by a wide range of difference in form and structure. There are three main physical characteristics by which animals differ from plants. These consist in their food, the ability to move some or all of their parts, and the power of volition or will. Plants subsist on water, earth, and air, which they take in by their roots and leaves, while animals feed upon other animals and plants. The principal uses of plants are for animal food and protection, and to preserve the fertility of the soil and the purity of the atmosphere. The elements necessary for plant growth are light, heat, and moisture, and, since the requisite amount of these varies with different kinds of plants, we find in every climatic zone a flora peculiarly adapted to local conditions. Plants are propagated by seeds, spores, or particles of the main stock.

Botany treats of plants as wholes and also as consisting of various organs. The organs of vegetation are the *roots*, *stems*, and *leaves*. The roots grow downward and gather moisture and nutrition from the soil. They commonly divide into many small branches or fibers called *rootlets*. The part which grows upward and bears the leaves and blossoms is called the stem. It usually has many branches and branchlets, each having leaves in various proportions, but



in some species the leaves are wanting. The leaves are green or brownish, and grow mostly from the upper part of the stem. They are of different forms and sizes, with one side toward the sky and the other toward the ground. The foliage of plants is constituted of leaves. Plants and their organs and functions are treated under plants, which see.

**CLASSIFICATION.** The classification is now based on the particular species of plants and their principal affinities. By *species* is meant an assemblage of individual plants having characteristics in common, coming from the same original stock, and having seeds or spores that produce similar individual plants. The view is held that species of the same kind may exhibit differences which are characteristic of distinct plants, but this is true only after long periods of time and under vastly different conditions. Study is now generally confined to the affinity of plants of the same and different regions; to the cells and tissues by means of the microscope; to the growth of new species from different kinds; and to the relation of plants to their environments. The four principal divisions of botany now are: Structural or morphological, dealing with plant-structure; physiological, treating of the function and vital actions of plants; descriptive or systematic, relating to classification and arrangement; and paleontological, treating of fossil plants. Phanerogamic botany treats of flowering plants, and cryptogamic botany, of flowerless plants. See **Plants**.

**HISTORY.** The study of botany is not as old as astronomy or geography, but some branches of it were taught as early as the time of King Solomon, who spoke of plants "from the cedar in Lebanon even to the hyssop that springeth out of the wall." The first work on botany dates from Theophrastus, a pupil of Aristotle, who lived in the 4th century B. C. His classification of plants is unsatisfactory, but he showed much greater skill in the description of plant organs than scholars who lived in the centuries immediately following his time. In the 1st century of the Christian era Dioscorides, of Asia Minor, described about 600 plants in a work that was considered good authority until the revival of learning. About the same time Pliny the Elder described more than 1,000 species of plants. His work contains numerous errors and bears evidence of having been compiled from various sources, rather than written from personal investigation.

The Arabians gave much attention to this science in the 8th century, but material progress was not made until the 16th century, when Otto

Brunfels, a German writer, published an extended work in two volumes with able descriptions and cuts, under the title "History of the Plants of Strasburg." Other German writers soon followed with publications, and the store of knowledge was largely extended through works in the Dutch, Italian, and French. Before the end of the century the principal universities of Europe established chairs of botany and organized botanical gardens. Many scholars traveled throughout the latter part of the 16th and 17th centuries for the study of plant life and structure in both hemispheres. The microscope opened a new epoch in the science about the middle of the 17th century and led to the study of minute portions and sap pressure, and brought vegetable philosophy forward as a very important branch of knowledge.

Linnaeus, a Swedish naturalist, prepared and published a classification of plants in 1735, which was speedily adopted in place of those formerly used and served the purpose of study for many years, although it has long since been displaced. It is based largely on the characteristics and the production of the flowers and the seed. In the 18th century scholars investigated large groups or families of plants, and added many valuable discoveries to the science. The system promulgated by Bernard Jussieu (1699-1777), a French scholar, is based on previous discoveries and natural affinities of plants. He devoted much time to the culture of plants in gardens, took personal observation of their growth, and lectured extensively in the leading universities of Europe. His system is now the basis of the classifications that are generally approved. The system is set forth in his "Elementary Principles of Botany," published in 1804. He taught the subject according to this classification at Montpellier as professor of botany and later at Geneva. Other writers contributed valuable publications and lectures on the subject; those of Darwin rank among the highest.

**BOTANY BAY**, an inlet five miles south of Sydney, on the east coast of Australia. It was discovered in 1770 by Captain Cook, and so named on account of the large number of formerly unknown plants found there. The first English penal colony was founded at Botany Bay in 1788, and later it was removed to Port Jackson, near the site of Sydney. It was long known as Botany Bay Settlement. A monument was erected on the place where Captain Cook landed.

**BOTFLY** (böt'flī), a large, yellowish fly, parasitic in its early stages upon certain animals. The fully developed fly is more than



a half inch in length, and the female has an extensile abdomen. They lay their eggs upon the hair of the horse, which the animal removes to the stomach by the tongue. There they are hatched and the larvae hang to the coats of the stomach, where they remain about a year, when they are discharged with the excrement, and after a brief time become perfect flies. The bots are very injurious to the horse, when a large number infest the stomach. Botflies are likewise troublesome to sheep, cattle, and some of the wild animals, but the species differ, and those that infest sheep bore through the skin, under which the larvae mature.

**BOTHNIA** (bōth'nĭ-à), **Gulf of**, the northern extension of the Baltic Sea, between Sweden on the west and Finland on the east. It is about 430 miles long, 85 to 135 miles wide, and from 100 to 130 feet deep. The water is but slightly salty, owing to the inflow of numerous rivers and the limited evaporation due to its location in a cold region. It contains a number of good harbors and is the seat of much activity in the summer season for lumber, mineral, and fish exports by water navigation. In the winter it is frozen over and is crossed on the ice. It yields large quantities of fish, including herring, salmon, and mackerel.

**BO TREE**, or **Peepul**, the sacred fig tree of India and Ceylon. Trees of this kind are planted by the Buddhists near their temples. They yield a small edible fig, which is of little value, but the sap yields caoutchouc and the lac insect makes the tree its abode. At Anarajapura, in Ceylon, is a famous bo tree that was planted about 288 B. C. It is venerated by the Buddhists, since it is said that Vishnu was born under this tree. In 1887 it was partly destroyed.

**BOTTLE**, a vessel with a small neck, usually made of glass, and used to contain liquids. In ancient times bottles were made of leather, especially by the Egyptians and Greeks, and bottles of this class are still used in Spain, Sicily, Africa, and the East. Glass bottles have been found in the ruins of Pompeii similar to those in common use at present. They are manufactured by a process of glass molding. The small bottles are made of flint glass and the large ones of a cheaper grade of glass. In manufacturing a blowtube is used, and the molten material is placed in an iron mold.

**BOULDER** (bōl'dēr), a city in Colorado, county seat of Boulder County, on Boulder Creek, 5,835 feet above the level of the sea. It is situated twenty-five miles northwest of Denver, on the Union Pacific, the Colorado and Southern, and other railroads. The surround-

ing country is fertile, yielding considerable quantities of cereals, vegetables, fruits, and live stock. There are vast mining interests, especially those devoted to the production of gold and silver. Its manufacturing establishments include iron foundries, flouring mills, and smelting works. The climate is pleasant and healthful. It is a favorite resort for tourists and invalids, who come here on account of numerous thermal and mineral springs. Among its public institutions are a large sanitarium, the county courthouse, and the University of Colorado. It was incorporated in 1871. Population, 1900, 6,150.

**BOULDER**, a large rock found at a distance from the formation to which it belongs. The term *erratic boulder* is generally applied to rocks found lying detached on the surface, and *boulder clay* is used to describe the glacial drift, usually a compact blue or red clay, in which the boulders are found. These formations belong to the early quaternary times and are widely distributed. Boulder clay has been traced over vast regions of British America and the northern part of the United States. In Scotland it is known as *till*. Boulders belonging to the rocks of the Scandinavian peninsula are scattered over the plains of Denmark and northern Germany. Rocks of this class are abundant in the central section of North and South Dakota. It is thought that they were deposited from icebergs and glaciers.

**BOULOGNE-SUR-MER** (bō-lōn'sur-mâr'), a seaport city of France, at the mouth of the Liane River, on the Strait of Dover, about twenty miles southwest of Calais. The city is divided into the older and the newer parts, or the old and new districts, and has a castle which dates from 1231. It has vast commercial interests, owing to its fine harbor, extensive wharves, and excellent steamboat and railroad facilities. The manufactures include linen and woolen goods, machinery, earthenware, soap, clothing, and canned fish. It has a large export trade in coal, wine, dairy products, fish, corn, and various manufactured articles. Municipal facilities include waterworks, electric lighting, and a system of electric railways. Population, 1906, 51,201.

**BOULOGNE-SUR-SEINE** (-sân), a town of France, in the department of Seine, five miles west of Paris. It is on the Seine River, a suburb of Paris, with which it is connected by a fine stone bridge. The celebrated park and promenade in Paris, Bois de Boulogne, was named from this town. Population, 1906, 49,969.

**BOUNTY** (boun'tĭ), in economics, a pre-



mium paid by the government to the producers, exporters, or importers of certain articles. This is done to aid in fostering a new enterprise during its infancy, or protecting one long established, owing to its special benefit to the country. In 1890 the Congress of the United States authorized the payment of a premium to producers of sorghum, cane, and beet sugar by way of a bounty. This was done with the view of eventually increasing the production of sugar to equal the annual consumption. By reason of this encouragement large investments were made in sugar-producing interests and the production has been correspondingly increased. The term is applied to a government grant made to induce enlistments in the army, as at the time of the American Civil War, when from \$50 to \$900 was paid as an inducement for men to enter the service. Men serving in the British army in India receive a bounty as an inducement to extend the time of service.

**BOUNTY JUMPERS**, a term applied during the Civil War to persons who volunteered to secure a bounty and then deserted to enlist again in some other locality, under a different name, in order to secure another bounty. The government applied a severe penalty, but a number of persons took great risks, owing to the bounty being quite large.

**BOURGES** (bōōrzh), a city of France, capital of the department of Cher, 135 miles south of Paris. It is located at the junction of the Auron and Yèvre rivers, and is the focus of important railroad lines. In the old part the streets are crooked and poorly improved, but the newer section has many fine public and residential buildings. It is the seat of a college, a public library, a normal school, and a magnificent Gothic cathedral, known as the Cathedral of Saint Etienne. The trade is chiefly in wine, cereals, and live stock. Among the manufactures are clothing, leather, wine, and machinery. Julius Caesar captured it in 52 B. C., when it was known as *Avaricum*. Charles VII. of England made it his capital when Orleans was in the hands of the English. Population, 1906, 44,133.

**BOW** (bō). See **Violin**.

**BOW**, a weapon used in the chase and in war from remote antiquity, and still employed by savages in warfare and in many countries as a means of amusement. Two forms of the bow are in use, the *longbow* and the *crossbow*. The former is the earlier kind and the more celebrated, having been used as the weapon of archers in the Middle Ages. It passed out of use as a military weapon with the improve-

ment of firearms. The crossbow is now used in some field sports. It is made by attaching a bow to a stock resembling a musket, and discharges a short and stout arrow called a *quarrel*. The longbow is about five feet long, and discharges an arrow three feet long, furnished with a steel head. Wood is used most generally, such as yew, elm, and wych-hazel, though steel and other elastic materials make good bows. The savages usually poison the end of the arrows used in war.

**BOWDOIN COLLEGE**, the oldest seat of learning in Maine, and one of the earliest educational institutions established in the United States. It was incorporated at Brunswick by the General Court of Massachusetts on June 24, 1794, and received an endowment of six townships of wild lands in the then District of Maine. It bears the name of Governor James Bowdoin, a friend of Washington and Franklin, and who was eminent in the councils of his native State. His son, Hon. James Bowdoin, United States minister to France and Spain, was its earliest individual benefactor. His paintings, drawings, and private library were donated to the institution, and the last mentioned is now in Hubbard Hall, a fire proof building erected at a cost of \$300,000.

Upon the foundation of the traditional four years of classical and disciplinary studies, there have been added the numerous elective courses in history, modern languages, and the social sciences, so arranged that the well prepared student of more than average ability can complete the requirements for the degree of A. B. in three years. Special facilities for the study of natural sciences are afforded by the laboratories of the Searles Science Building. Throughout the curriculum all the teaching is done by professors in distinction from temporary instruction. The present endowment is about a million dollars and its plant is estimated at as much more. In 1820 the Medical School of Maine was established under the control of the president and trustees of Bowdoin College and its graduates now number several thousand. The first two years of the course are pursued at Brunswick and the last two at Portland, on account of clinical advantages from the hospitals. Bowdoin is remarkable in the number of its alumni, who have won national prominence. They include Chief Justice Fuller, Nathaniel Hawthorne, Henry W. Longfellow, and Thomas B. Reed. The average attendance is about 400 students.

**BOWER BIRD** (bou'ēr), the name of certain birds belonging to the bird of paradise family, native to Australia and New Guinea.



They were so named from the remarkable bowers or galleries which they construct. In size the different species vary somewhat, but the representative class is about the size of a jackdaw, and the plumage in the males and females is dissimilar, being a satin black in the former and a grayish-green in the latter. The bowers, built of twigs and leaves, are decorated with shells, flowers, bones, feathers, and other



SATIN BOWER BIRD.

conspicuous objects. They are not nests, but places of amusement, and in them the male performs queer antics to attract its mate. Both in architecture and ornamentation, these birds show remarkable skill and taste.

**BOWLING** (bōl'ing), an athletic game and popular amusement originated in England by the Anglo-Saxons. It is played chiefly indoors, though formerly it was an outdoor amusement and was played on a level piece of greensward. No game is more popular now at the practice rooms of athletic societies and in the gymnasiums of social and commercial clubs. In many cities the game is played in halls built especially for the purpose, and in which it is the only form of amusement. Each hall has one or more platforms called *alleys*. The alleys are carefully fitted with a hard floor, slightly convex in the center, and on each side is a gutter to catch the ball if it is not accurately rolled. At the further extremity ten pins are set up by an attendant, usually a boy. The pins are in most

cases of ash wood, about a foot in height and about two pounds in weight, and are arranged in the form of a pyramid, with the apex toward the bowler. A slanting roadway at one side of the alley serves to return the balls to the player. Each player may roll two balls, which are about twenty inches in circumference and sixteen pounds in weight. The balls are provided with thumb holes to enable the player to secure a firm hold. A *strike* is made when all the pins are knocked down with a single ball, and a *spare*, when all are knocked down with the two balls. Ten *innings* or *frames* make the game, and the one who knocks down the largest number of pins is the winner. The sizes of the pins and of the balls vary somewhat, and various games or matches are played, but these are too complicated to admit of full description except in a book of rules.

**BOWLING GREEN**, the county seat of Warren County, Kentucky, on Barren River, about seventy miles north of Nashville. It is on the Louisville and Nashville Railroad. The city has electric lights, waterworks, a fine courthouse, and two parks. It is the seat of numerous factories, including iron foundries, saw mills, flouring mills, and distilleries. The surrounding region is agricultural and has natural gas deposits. Besides having good schools, it is the seat of a Catholic academy and of Ogden College. It was incorporated in 1812. Population, 1900, 8,226.

**BOWLING GREEN**, a city in Ohio, county seat of Wood County, twenty miles south of Toledo, on the Toledo and Ohio Central and the Cincinnati, Hamilton and Dayton railroads. The chief buildings include the city hall, the county courthouse, and the central high school. It has manufactures of cut glass, canned fruits, ironware, and machinery. The municipal improvements include waterworks, gas and electric lighting, and a central heating system. It has a large trade in grain and farm produce. Bowling Green was settled in 1832 and was incorporated in 1854. Population, 1900, 5,067.

**BOX-ELDER**, or **Ash-Leaved Maple**, a small tree of North America, widely distributed in Canada and the United States. It is planted very extensively as a shade tree and for wind-breaks, because of its ability to withstand almost any extremes in climate. It grows rapidly and begins to bear seed in four or five years. The wood is of little value, but is used as fuel where timber is scarce.

**BOXING**, a match between two persons who strike each other with the fists. Formerly this art of amusement or exercise was an exhibition of pugilistic skill, in which the participants



sought to punish each other, but modern boxing has partaken form among the athletic exercises. When conducted under recognized rules, such as the *Queensberry Rules*, the elements that enter into a prize fight are eliminated and it is placed among the more meritorious amusements. The participants are classified according to their weights in six divisions, known as bantam, feather, light, welter, middle, and heavy. The maximum weights in each class are: *Bantam*, 105 pounds; *feather*, 115 pounds; *light*, 135 pounds; *welter*, 145 pounds; *middle*, 158 pounds; *heavy*, over 158 pounds. Boxers wear, as a means of preventing injury, thickly padded gloves, made of soft and pliable leather, to cover the back of the hand, the fingers, and the thumb. The rules are very numerous and provide regulations for matches of different kinds. In 1866 the Amateur Athletic Club was founded in England, and later the Amateur Athletic Union was organized in the United States. Contests for championships have been numerous, and the art of boxing will likely be maintained as an active and healthful exercise, but pugilistic contests in the nature of prize-fights are prohibited by law in most countries.

**BOX TREE**, an evergreen tree, from 12 to 15 feet high, native to Europe and Asia. It was cultivated by the ancient Greeks and Romans as an ornamental shrub in their gardens, and the wood was used for making boxes and ornaments. It is native to England and thrives in the countries bordering on the Mediterranean. The wood is hard, heavy, and yellowish in color, and takes a high polish. Most of the boxwood of commerce comes from the regions adjoining the Caspian and Mediterranean seas, where it is cultivated.

**BOYCOTTING** (boi'köt-ing), the name generally applied to a system under which a society or class decline to buy or sell to some individual or class of individuals. The name came from Captain James Boycott, who was the land agent at Mayo, Ireland, for Lord Erne, an Irish nobleman. On account of gross offenses to the people no one would assist in gathering his crops. The case was publicly reported and resulted in a *Boycott Relief Expedition* by which the crops were secured and the owner protected. Boycotts are prohibited by law in many states of the Union and have been a subject for legislation in most countries.

**BOYNE** (boin), a river in Ireland, rises in the Bog of Allen, and flows into the Irish Sea, after a course of about sixty miles. Along its banks are many institutions of learning, which has caused it to be called the "Boyne of Science." It is not only celebrated for magnifi-

cent scenery, but also for great events occurring near it. The adherents of James II. and William III. fought a battle on its banks in 1690, in which the former were utterly routed and compelled to flee in disorder. The anniversary of this victory, July 12, is still celebrated by Irish Protestants. The scene of the battle is marked by a monument 150 feet high.

**BOZEMAN** (böz'man), a city of Montana, county seat of Gallatin County, 95 miles southeast of Helena. It is located on the Gallatin River and the Northern Pacific Railroad, and has a large trade in agricultural products, merchandise, and live stock. The surrounding country has gold, silver, coal, and iron ore deposits, and large interests in farming and stock raising. Among its industries are flouring mills, brickyards, stone quarries, and machine shops. It is the seat of the State College of Agriculture and Mechanic Arts. Among the public buildings are a library, the county and municipal buildings, and several schools and churches. Population, 1900, 3,419.

**BRABANT** (brä'bant), a district in the central lowlands of Holland and Belgium. It formerly constituted an independent duchy, but has had many rulers and alliances in the past four centuries. In 1648 it was incorporated with the United Provinces, after the famous revolt of the Netherlands against King Philip. It was divided by the Peace of Utrecht in 1714, when a portion passed to the Spanish crown. It became a part of the Netherlands in 1814, and was again divided in 1830 into the provinces of Antwerp, North Brabant, and South Brabant. In the same year Antwerp and South Brabant were made a part of Belgium. North Brabant has an area of 1,980 square miles and a population of 605,420, and belongs to Holland. The province of Antwerp has an area of 1,093 and a population of 860,150; and South Brabant, an area of 1,268 square miles, and a population of 1,375,490. The southern portions are inhabited by Walloons, the central by Flemish, and the northern by Dutch. South of Brussels the language is chiefly French, and in the northern part it is Flemish, Dutch, and German. The subdivisions are all densely populated. The soil is fertile, producing cereals, sugar beets, vegetables, and grasses, and large interests are vested in manufacturing. Among the large cities included are Antwerp and Brussels.

**BRADDOCK** (bräd'dük), a borough in Allegheny County, Pennsylvania, on the Monongahela River, ten miles southeast of Pittsburgh. It is on the Pennsylvania, the Baltimore and Ohio, and other railroads. Among the



chief buildings are the public hall, several schools, and the Carnegie Library. The manufactures include ironware, cement, plaster, boilers, steel rails, and railway cars. It has waterworks, street pavements, and electric street railways. It is noted as the scene of the Battle of Braddock's Field, in 1755. The first settlement was made in 1795 and it was incorporated in 1867. Population, 1900, 15,654; in 1910, 19,357.

**BRADFORD** (bräd'fērd), a city in McKean County, Pennsylvania, sixty-three miles southeast of Dunkirk, N. Y., on the Erie, the Pennsylvania, and other railroads. It is located in a productive oil field, and is surrounded by a rich agricultural district. The city has large petroleum works, railroad machine shops, planing mills, glass works, brickyards, and nitroglycerin and torpedo works. There are street railways, electric lights, waterworks, a public park, and several fine schools. It has a fine public library and many schools and churches. The first settlement was made in 1823 and it was incorporated in 1879. Population, 1900, 15,029.

**BRADFORD**, a manufacturing city of Yorkshire, England, about twenty-eight miles southwest of York. It is noted for its manufacture of yarn and woollens; not less than 350 mills are in operation. It is beautified by several fine public parks, and has many charitable and educational institutions. The chief buildings include the town hall, the public library, the commercial exchange, the United Yorkshire Independent College, and the Art Museum. Several Protestant denominations have colleges in or near the city. The transportation facilities include the Bradford Canal, electric railways, and four lines of railroads. Among the manufactures are cotton and woolen goods, clothing, soap, ironware, boilers, and spirituous liquors. It has public waterworks, slaughterhouses, electric and gas lighting, and stone and asphalt paving. The growth of the city in wealth and population has been very rapid the past decade. It was incorporated as a city in 1897. Population, 1907, 290,323.

**BRAHMA** (brä'mä), the first person in the Hindu trinity, which consists of *Brahma*, *Vishnu*, and *Siva*. Brahma is worshiped as the universal power or basis of all existence, by certain castes of India. The three taken separately represent the *creator*, the *preserver*, and the *destroyer*. Brahma, the creator, as a personal god, is represented as a personage of a red color, with four heads and four arms. In one of the hands he holds a portion of the Vedas, in one a lustral vessel, in one a rosary, and in one a sacrificial spoon. As a person he

represents merely the agent of Brahma, the universal power, and is the god of the fates and master of life and death. His worship is common among the Brahmans.

**BRAHMANISM** (brä'man-iz'm), the religious and social system developed and expounded by the Brahmans, a religious caste among the Hindus. The ancient religious writings called the *Vedas*, the basis of the system, are held sacred and inspired. It is thought that the oldest of the writings were composed and uttered from 2400 to 2000 B. C. Max Müller, the German antiquarian, translated the Rig-Veda and regarded the whole as dating from about the 15th century B. C. However, its origin dates from no particular century, but seems to have been added to at many different periods as the priestly caste increased in number and power. In time the system became complex, and at least three other great castes originated.

The four early castes were the Brahmans, Kshatriyas, Vaisyas, and Sudras. The first are the philosophers, scholars, statesmen, and administrators of the Aryan people of India. To them the Sanskrit language and literature owes its origin. The second class consists of the warriors, the third class is constituted of the merchants, and the fourth class comprises the laborers. The Brahmans now represent about one-tenth part of those who hold the Vedas sacred. They are the most intellectual of all the classes and possess admirable ability for mathematical reasoning and metaphysical speculation. It is probable that the castes previously represented different races. The great diversity of modern industry and various intermarriages have given rise to innumerable distinctions. There are at least several hundred castes among the Brahmans alone, and quite a large number belong distinctively to each of the other three principal divisions. Many of the castes cannot partake of food prepared by others and are not allowed to intermarry.

From the 5th to the 1st century B. C. Brahmanism implied the worship of the one god, *Brahma*, with the three personages, or trinity, *Brahma*, *Vishnu*, and *Siva*. The idea of a one god and the belief in the first person, Brahma, were too abstract to endure for a long period of time. This led to a general worship of Vishnu, the preserver, and Siva, the destroyer, and the worshipers of these two deities now constitute the two great religious sects of India. The higher classes choose which of the two they prefer and hold the worship only as a means to reach the one first cause, or Brahma. The worship of Vishnu is conducted under



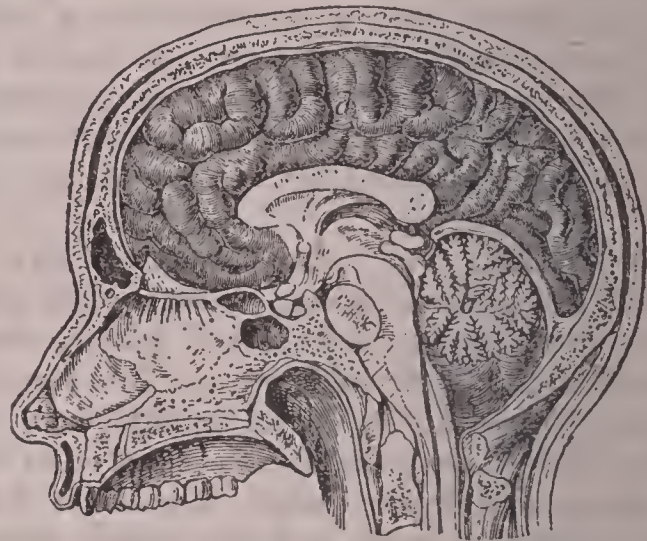
the forms known as Krishna and Rama, and that of Siva under the form called Lingam, with the power of Sukti—the power and energy of the divine nature in action. Hindu reformers are falling back to the teaching of the Vedas, that is, Brahma, with the triad Brahma, Vishnu, and Siva, being regarded the one god.

**BRAHMAPUTRA** (brä'mä-pōo-trä), meaning "son of Brahma," one of the great rivers of India. It rises in the plateau of Tibet and has a length of 1,800 miles. In the upper part of its course, where it is known as the Sanpo, it flows southeast along the northern slope of the Himalayas, and as it turns southward through the mountains it assumes the name of Dihong. In Assam it receives the inflow from a number of tributaries and is generally known as the Brahmaputra, a name applied by some writers to its entire course. It joins the Ganges about ninety miles from the Bay of Bengal, where they discharge after forming a common delta. The stream overflows in the rainy season and when the mountain snow melts, usually in June and July, and floods vast plains, rendering them fertile for the production of great quantities of cereals. More than 800 miles are navigable for commercial traffic, while the several channels of the delta furnish excellent inland connection. The river was first explored by Europeans in 1765.

**BRAIN**, that part of the central nervous system of animals that is found within the skull. It is held to be the seat of intellectual and mental power in man. The shape, when viewed from above, is somewhat like that of an egg. In composition it is soft and yielding, closely filling the cavity of the skull. It is inclosed in a double membrane called the *arachnoid*, which is as delicate as the web of a spider, and which forms a close sack filled with a liquid resembling water. Within this and within the spaces of the brain is a fine tissue. The tissue, called *pia mater*, is penetrated by hollows. The flow of blood to the brain is so copious that about one-fifth of the entire circulation of the body is used. The *dura mater* many blood vessels, which pass through the is a tough membrane which lines the bony cavity of the skull and incloses the entire brain mass, and separates the various parts of the organ by strong partitions.

The brain consists of three main parts called the *cerebrum*, the *cerebellum*, and the *medulla oblongata*. The cerebrum consists of two lateral hemispheres united by a thick, strong band of white tissue, and comprises about seven-eighths of the weight of the entire brain. In the lowest animals the cerebrum is wanting. It

makes its appearance as the scale of animals rises to higher forms. This part of the brain occupies the front and upper part of the skull. The bulk is composed of white nerve fibers. The fibers intimately connect with the fibers of the gray layer of nervous matter, which is found at the surface. The surface is wrinkled and folded, which gives ample surface for the gray matter, in some individuals as much as 675 square inches. The cerebrum is the center of thought and intelligence. The cerebellum is located in the back of the head, below the cerebrum. It is smaller than the cerebrum, but in construction is quite similar, except that it has parallel ridges instead of convolutions. This enables the gray matter of the cerebellum to lie in the white matter within. The cerebellum is



b—CEREBELLUM.

d—CEREBRUM.

the center for the control of the voluntary muscles, particularly those of motion. The various movements of the body, such as grasping, balancing, and walking, arise in the cerebellum, while the nerve-cells of convolution in the cerebrum are the seat of volition, consciousness, and educational intelligence, and of the faculty of language.

The medulla oblongata is the upper enlarged part of the *spinal cord*. It extends from the upper border of the first vertebra to the *pons*, which are connected at each side with the cerebrum above and the cerebellum behind. It is divided by tissue into a right and left portion, and the latter is separated by grooves into four columns. When the cerebrum is injured by disease or otherwise, persons become unable to converse intelligently, both from inability to remember words and a loss of power to articulate them. In an idiot this portion of the brain is not well developed. In persons having an injured or diseased cerebellum there is a tendency to totter and walk with uncertain movements as if intoxicated; all their movements and work are irregular and uncontrollable.



Man possesses a large cerebrum in proportion to the weight of the brain, while in lower animals the cerebellum is larger than the cerebrum. The cerebrum seems to be large in order to provide for an emergency in case of injury. Small parts of the human brain have been lost by accident and in war, and, after recovery from the wounds, men suffered little or no impairment of their mental faculties. This is somewhat analogous to an instance in which a person has lost the use of one eye, the other eye supplying him with the sense of sight. Brain force is developed by activity and grows by exercise.

The average weight of the human brain is about forty-five ounces in females and fifty ounces in males. In some notable instances it attained a weight of seventy-five ounces. The brain of an idiotic boy weighed eight ounces, and a female idiot had a brain weighing ten ounces. The brain of Agassiz weighed 54.4 ounces, that of Byron 63.7; Cuvier, 64.5; and Turgeneff, 74.8. The ability of a man does not depend upon the size of the brain so much as upon its quality, but it is known that men of great ability possess large brains, and that the brains of cultured races are much larger than those of savages. The brain being a delicate organ, it is influenced largely by the condition of the body, requires food adapted to its growth and sustenance, and needs the recuperation which results from healthful rest. It is subject to many diseases, which usually prove either decidedly harmful or fatal. They include *brain fever*, *tumors*, and *inflammation of the brain*.

**BRAINERD** (brān'ērd), county seat of Crow Wing County, Minnesota, about 115 miles southwest of Duluth, on the Northern Pacific and the Minnesota and International railroads. It is surrounded by a rich agricultural country, is a grain and jobbing center, and has modern municipal facilities. The manufactures include flour, machinery, clothing, cigars, and earthenware. It has flouring mills and extensive railroad shops. The school system is well established and carries an excellent course of study. It has electric lights, pavements, waterworks, and a fine courthouse. In 1883 it received its charter as a city. Population, 1905, 8,133.

**BRAINTREE** (brān'trē), a town of Massachusetts, in Norfolk County, ten miles south of Boston, on the New York, New Haven and Hartford Railroad. It is the seat of Thayer Academy and the Thayer Public Library. The manufactures include cotton goods, boots and shoes, hardware, paper, and machinery. Large granite deposits are worked in the vicinity. The first permanent settlement was made on its site

in 1634, and the town was incorporated in 1640. Population, 1905, 6,879; in 1910, 8,066.

**BRAKE**, a device for retarding or arresting motion by means of friction. In railroad cars and machinery it usually consists of a simple or compound lever, connected with a shoe or band, which is forcibly pressed on the periphery of the wheel that is to be stopped or reduced in its speed. The problem of supplying suitable brakes for railroad and street cars has engaged the attention of inventors for several decades. Hand brakes are now used largely for retarding motion in small machines, while air and electric brakes are common on street and railway cars and in large machinery. In an air brake either the compression or vacuum may be used. In the former the air is compressed by a pump attached to the engine and is conveyed to cylinders under the cars by means of pipes, where it acts on the brake-levers. The vacuum method is the reverse; the air is exhausted from the device beneath the car, and the brake-levers are acted on by atmospheric pressure. The electric brake is used largely on electric railways. It is constructed so the car-motor will become a dynamo as soon as it is disconnected from the trolley wire, and as such it generates a force sufficient to act upon the brake-levers.

**BRAKE**, or **Bracken**, a class of ferns found in many parts of America and other continents. It is large and coarse and has a creeping root-stalk, from which naked stalks about fifteen inches high grow up. It grows in rocky regions and on hillsides. The early frosts kill the annual growth, and in the spring new shoots come up from the rootstalk or rhizome, which has a bitter taste and is used to a limited extent as a substitute for hops.

**BRAMBLE** (brām'b'l), the name of a kind of blackberry native to Great Britain. This plant is not cultivated for its fruit, which is of a fair quality, because it spreads rapidly and in this respect resembles an obnoxious weed. The word *bramble* is used in America to describe collectively such plants as the blackberry, raspberry, and blueberry.

**BRANDENBURG** (brān'den-bōōrg), a province and city of Prussia, in the German Empire. The province has an area of 15,383 square miles. It is fertile and farming is conducted with much care. Rye and barley are the chief cereals, and tobacco, fruit, and vegetables are grown. Brown coal is mined extensively, but manufacturing is the leading industry. The chief towns are Königsberg, Potsdam, and Frankfort-on-the-Oder. In 1905 the population was 3,108,554, nearly all of whom



were German Protestants. The present ruling family of Germany, the Hohenzollerns, came into the possession of Brandenburg in the 15th century; in 1711 they ascended to the kingly line of Prussia; and in 1871 became the imperial family of Germany. The city of Brandenburg is on the Havel River, thirty-five miles southwest of Berlin. It has extensive factories producing woolens, leather, silk, pottery, machinery, chemicals, and clothing. It is the seat of excellent schools, churches, and higher institutions of learning. The city is a focus of important railroads, has electric lights and street railways, several parks, and a large trade in merchandise. Population, 1905, 51,239.

**BRANDON** (brăn'dün), a city of Canada, in Manitoba, 132 miles west of Winnipeg. It is pleasantly situated on the Assiniboine River, on an elevated site, and on the Canadian Pacific and the Canadian Northern railways. It has a large trade in grain and live stock. The chief buildings include a courthouse, a convent, and a collegiate institute. The manufactures consist of machinery, flour and oatmeal, ale and porter, earthenware, pumps, and clothing. Near the city is an experimental farm that is con-



ducted by the government. Brandon was founded in 1881 and has had a rapid growth, owing to its car shops and its location in a fertile farming country. Population, 1906, 10,408.

**BRANDY** (brăn'dÿ), a liquid secured by distilling grape wine, manufactured chiefly in France. Both red and white wines are used. The brandy known as *Cognac* manufactured in the department of Charente is considered the best grade, and is transported to America in large quantities. *Catawba* brandy is made in Ohio from the *Catawba* grapes, while high grades of other varieties are made on the Pacific Coast, where the vine attains a prolific growth. Brandy is used in medicines, for stimulants and restoratives, and as a beverage. The

amount of alcohol contained in brandy depends upon the wine from which it is distilled. Some of the higher classes contain a larger per cent. of alcohol and are expensive; as much as twenty dollars per gallon is paid for genuine cognac. The product now made in California is considered equal to the French varieties. The pure quality consists almost entirely of alcohol and water, and is wholly colorless until it is put in kegs, when it takes on the color of wood. *Apple-jack*, a kind of brandy, is made from apple cider, while another variety is made from peach wine.

**BRANDYWINE**, a small stream in Pennsylvania, passing into the State of Delaware, and flowing into the Christiana Creek at the city of Wilmington. The stream became historic on account of the Battle of Brandywine, which was fought on its banks Sept. 11, 1777, between the British and Americans, in which the latter were defeated. The American forces consisted of 13,000 men under General Washington, and the British of 18,000 under Lord Howe.

**BRANTFORD** (brănt'fērd), a city of Ontario, in Brant County, seventy miles east of London, on the Grand Trunk Railway. It is nicely situated on the Grand River, which is navigable within two miles of the town, and from that point it is connected by canal with Lake Erie. It has manufactures of stoneware, machinery, engines, clothing, and flour, and has a brisk trade in farm produce and merchandise. Many of the buildings are of pressed brick and stone, and modern utilities, such as gas and electric lighting, are well patronized. The public buildings include a number of fine schools, and it is the seat of the Ontario Institution for the Education of the Blind and of Wickliffe Hall. A fine monument of Brant, the famous Mohawk chief, stands in Victoria Square. Population, 1901, 16,631.

**BRASS** (brăs), an important alloy of zinc and copper. It is hard, ductile, and malleable, and the color is a bright yellow. Formerly it was made from calamine mixed with copper and charcoal. This process is easier than the fusion of copper and zinc. The proportion of copper and zinc varies, but ordinarily from twenty-eight to thirty-four per cent. of zinc is used. It is harder and yet more easily fusible than copper, and is more sonorous. Brass resists the influence of the atmosphere better than copper, but requires a varnish or lacquer to prevent tarnishing, and is readily turned on a lathe, rolled, and stamped.

Brass was used in very ancient times, and is mentioned in the cuneiform writings of the



Chaldeans and the Assyrians. In the Middle Ages it was made chiefly in the form of sheets, and was used for household utensils and for a number of purposes in churches. The ancient method of making brass was by heating copper with calamine, a native ore of zinc, and charcoal. James Emmerson patented a process for the direct production of brass from copper and zinc in 1781, and this has superseded the older methods. It consists of first melting the copper in a crucible, then adding small quantities of the zinc, and when the two metals are thoroughly mixed, which is brought about by stirring, the molten brass is cast into molds made of sand or iron. Owing to the volatility of the zinc, considerable of this metal is lost during the operation unless much care is exercised.

One part of zinc and two parts of copper, by weight, is a good working basis in making brass. If the proportion of zinc is increased, the compound loses in tenacity, while an increase of copper adds to its strength and tenacity. When the proportion is one part of zinc to ten of copper, the result is a reddish-yellow brass. If a small per cent. of lead is added to the alloy it diminishes its ductility. The addition of tin increases the hardness of brass. *Tombac* and *pinchbeck* contain eighty parts or more of copper to twenty or less of zinc. *Bristol brass*, *similör*, *Mannheim gold*, and *prince's metal* are names used to describe brass made by using different proportions of zinc and copper. In the arts, brass is of importance next to iron and steel. It is used largely in making buttons, pipes of organs, household utensils, and many parts of machinery.

**BRATTLEBORO** (brät't'l-bür-rô), a town in Wyndham County, Vermont, on the Connecticut River, about eighty miles southeast of Rutland. It is located on the Vermont Central and the Boston and Maine railroads. The manufactures include furniture, carriages, organs, and machinery. It is the seat of the Vermont Asylum for the Insane and has fine churches and schools. The famous writer, Rudyard Kipling, made Brattleboro his home for some time. Brattleboro was chartered in 1753 and named from William Brattleboro, one of the original grantees. Population, 1900, 5,297.

**BRAZIL** (brá-zil'), county seat of Clay County, Indiana, about fifteen miles east of Terre Haute, on the Chicago and Eastern Illinois and other railroads. It is located in a rich farming country, and near it are productive coal fields. The manufactures include pig iron, terra cotta, boilers, machinery, and pottery. It has a good jobbing trade, a public library, waterworks, and a courthouse and other public

buildings. The region was settled in 1856 and it was incorporated in 1873. Population, 1900, 7,786.

**BRAZIL, United States of**, the largest country of South America, occupying the eastern and central part of that grand division. It extends from north latitude 5° to south latitude 34°, and from west longitude 35° to 74°. Its extreme length from north to south is 2,665 miles, extreme breadth, 2,688 miles. In extent of territory it is one of the largest political subdivisions, exceeds in area the Commonwealth of Australia, and is somewhat smaller than the United States exclusive of Alaska and the insular possessions. It is bounded on the north and east by Colombia, Venezuela, Guiana, and the Atlantic; while its southern and western boundaries are formed by the Atlantic, Uruguay, Argentina, Paraguay, Bolivia, Peru, and Ecuador. It lies entirely east of the great Andean system, and touches every South American country except Chile. Area, 3,218,991 square miles.

**SURFACE.** The surface consists of two great sections, the lowlands known as the Amazon basin and the elevated plateaus of the central and eastern parts. The lowlands comprise the basins of the Amazon and other great rivers, extending from the Tocantins to the Guiana Plateau, which rises gradually toward the north and forms the larger part of the northern boundary, culminating in the Tumuc-Humac Mountains, between Brazil and Guiana, and the Parima Mountains, which lie on the boundary line of Venezuela. The elevated plateaus of the central and western parts are made up largely of the Highlands of Brazil, which have an elevation of from 2,000 to 10,000 feet above the sea, culminating in Mount Itatiaia, west of Rio de Janeiro. These highlands are made up of many ranges, one of which separates the basin of the Paraná from that of the Paraguay, and trends northward between the Tocantins and the São Francisco. The highest of these ranges trends parallel to the coast, which is known as the Serra do Mar south of Rio de Janeiro, and as Serra do Espinhaco north of that city. Brazil has a coast line of about 4,000 miles. The coast south of Cape Saint Roque is more or less broken and furnishes good harbors, while north of that point it is comparatively low with an extensive coast plain. The surface contains more fertile land than is found in any other country, most of which is in the basin of the Paraná and the Amazon. Marshes and swamps characterize different sections of the country, especially the valley of the Paraguay and of the regions in the lower valley of the Amazon.



**DRAINAGE.** The Amazon and the Tocantins drain more than two-thirds of Brazil. About one-fourth of the drainage is by the Paraná, the Paraguay, and the Rio de la Plata, and the remainder is carried by the São Francisco and smaller streams. The Amazon, which is formed by the union of streams that rise in the Andean Mountains, has a general easterly course toward the Atlantic, and receives a large number of important tributaries. These include, besides the Tocantins, which joins it in one branch of the delta, the Purus, Javari, Juruá, Madeira, Tapajos, and Xingu from the south, and the Iça, Yapurá, and Negro from the north. This river system has a length of about 19,000 miles, and the navigable distance is placed at 13,000 miles. Near the delta the basin is narrow, not more than about 150 miles wide, but it expands inland and occupies all of the northeastern part of Brazil. The São Francisco and a number of smaller streams drain the eastern section, and the southern part is drained by the Paraguay, Paraná, Iguassu, and Uruguay rivers. These rivers are of more than passing importance in the commerce of the country, chiefly for the reason that they furnish the only means of transportation in the vast interior.

**CLIMATE.** The tropic of Capricorn passes on a line drawn a short distance south of Rio de Janeiro, hence Brazil lies almost entirely within the tropics. Rainfall is abundant in all parts of the country, ranging from seventy to one hundred inches annually. It is distributed quite uniformly in all sections, but is greatest in the valley of the Amazon. Two seasons, the wet and the dry, alternate each other, the greatest amount of precipitation extending between January and June. The seasons are influenced by the movement of the trade winds, which follow the sun from north to south, and depend somewhat upon the character and elevation of the surface. Near the mouth of the Amazon, particularly toward the south, and in some parts of the plateau region, the rainfall is limited, especially between the Paraná and the São Francisco. The climate is quite even throughout the year. The maximum temperature is  $95^{\circ}$ , and in most places does not fall below  $70^{\circ}$ , except in the higher altitudes, where it ranges from  $30^{\circ}$  to  $90^{\circ}$ .

**MINERALS.** All the important minerals are found in Brazil, and it is probably the richest country in this respect. The gold deposits are chiefly in Bahia and Minas Geraes, and these two states have the largest interests in mining this mineral and in the output of diamonds. Iron ore is found in many sections of the Brazilian Highlands and in the mountains of the Guiana Plateau, but little progress has been

made in mining this ore on account of a scarcity of cheap fuel and labor. Santa Catherina and Rio Grande do Sul have extensive deposits of bituminous coal and a good grade of lignite is found in many sections, but mining has not been developed to any considerable extent. Other deposits include silver, copper, zinc, rock salt, and kaolin. Many mineral springs and deposits of gas and petroleum abound.

**MANUFACTURING.** Brazil has not taken a foremost position among the nations in the output of its manufacturing enterprises, chiefly for the reason that it is not densely populated and consequently lacks both in labor and capital. However, the vast natural resources and a steady growth in agriculture are rapidly directing attention to this enterprise. The textile industry is the most important, and includes the spinning and weaving of cotton and wool. The cotton and woolen mills are located chiefly in the states of Minas Geraes, Rio de Janeiro, and São Paulo. Next in importance is sugar refining, which is developed to the greatest extent in the states of Bahia and Pernambuco. Shipbuilding is an important enterprise at Rio de Janeiro and a number of other seaports. Cigar making and the manufacture of rum and other spirituous liquors are important industries. Leather is made in large quantities. Other manufactures include matches, soap, clothing, machinery, and straw hats.

**AGRICULTURE.** The valley of the Amazon is the most fertile region and contains the largest forests in the world, but many parts of it are covered with dense tropical vegetation. This accounts largely for the section not being developed for farming. However, it is important for its timber, which yields vast quantities of dyewood, rubber, nuts, and lumber.

Farming is developed most extensively in the southeastern part, in the states of São Paulo, Bahia, Minas Geraes, and Rio de Janeiro. In this section are large coffee plantations, and in the production of coffee Brazil takes first rank. Sugar cane is cultivated profitably in these states and in Pernambuco, and cotton is grown in all of the Atlantic states. Tobacco is grown largely, especially in Bahia, and rice and maize are cultivated extensively in São Paulo and Minas Geraes. The smaller cereals are not cultivated extensively in this section, but experiments made in the higher altitudes have demonstrated that they may be grown profitably. Other products include potatoes, beans, yams, vegetables, and Paraguay tea. All the domestic animals reared in North America thrive, but attention is given chiefly to the rearing of cattle and breeding of horses.



**FLORA AND FAUNA.** The flora is tropical and may be classified according to three zones, that of the southeastern plateau, that of the lower Amazon basin, and that of the west central section. The plants in the southeastern part, near the tropic of Capricorn, are numerous and luxuriant, but somewhat farther northwest the rainfall diminishes and the region is diversified by open country and small forests. In the lower Amazon basin the vegetation is most luxuriant, and includes a large variety of grasses, vines, and forest trees. Here thrive the mangoes, mangroves, palms, silk-cotton tree, rosewood, cinnamon, Brazil nut tree, and the *seringa* or rubber tree. The eucalyptus, which has been introduced from Australia, thrives in this section. Vegetation in the southwestern part is smaller and the number of plants are fewer, owing to a somewhat scant rainfall, but the prairies are covered with nutritious grasses and contain scattered groves of trees.

Many animals abound in the forests and on the plains. The larger animals include the puma, ocelot, jaguar, and tapir. Monkeys are very abundant in the selvas, and deer abound in the southwestern region. Ant-eaters, armadillos, sloths, opossums, and peccaries are plentiful. The boa, jararaca, and rattlesnake are among the reptiles. The Atlantic coast and the larger streams are rich in fish, and the varieties exceed those of any other country. Birds of plumage and song abound in all sections, but they are especially numerous in the forests.

**TRANSPORTATION.** The railroads are regulated by law and about two-thirds are owned by the government. They include lines that aggregate 15,000 miles and many lines have been projected. Nearly all of the railroads are near the Atlantic coast, in the southeastern part, and the vast interior is entirely destitute of railways. However, shipping is facilitated by navigation on its extensive systems of rivers, a number of which have been improved by constructing canals and removing obstructions. The government has encouraged shipbuilding by appropriations, hence an excellent merchant marine has been built up, but the vessels take care of domestic commerce rather than foreign trade, which is carried largely by the vessels of other countries. Telegraph and telephone lines connect the larger cities, but these facilities are practically unknown in the remote interior.

The exports greatly exceed the imports, and the total foreign trade annually has a value of \$390,500,000. Great Britain has the largest share of the trade. Next are Germany, France, and the United States, in the order named. Coffee is the most important article of commerce and

constitutes about sixty per cent. of the total exports. About two-thirds of it is exported to the United States and the balance to Europe. Sugar ranks next to coffee in value as an article of export. Other exports include rubber, cotton, tobacco, hides, lumber, drugs, dyewoods, and minerals. The imports consist chiefly of machinery, cotton and woolen fabrics, flour, breadstuffs, wine, corn, and chemicals.

**EDUCATION.** Public education is regarded with deep concern by the people, but is still in a very primitive state, and about seventy-five per cent. are unable to read and write. The school system includes three classes: the primary, secondary, and superior. Higher education is controlled by the state and general governments, while the other institutions of learning are under local control and supervision. The higher schools include colleges and universities devoted to medicine and law, and to the industrial, naval, and military arts. Several normal schools are maintained for the training of teachers in the fundamental elements of their profession. Some of the states have compulsory attendance laws, but they are not enforced, while in others attendance is voluntary. The language of the country and that taught in the schools is the Portuguese.

**GOVERNMENT.** Brazil is a republic and for the purpose of government is divided into twenty states and a federal district. The constitution vests the chief executive authority in a president, who is elected for a term of four years by popular vote. He is assisted by a cabinet of six ministers, who preside over the departments of war; finance; industry, railroads and public works; navy; interior and justice; and foreign affairs. The legislative power is in a congress composed of a senate and a chamber of deputies. Each state has three senators, making a total of sixty members, who are elected by direct vote for nine years, one-third being elected every three years. Representation in the chamber of deputies is based upon the population of the several states, and the members are chosen by popular vote for four years. The system of courts culminates in the national supreme court, which is the highest judicial authority. Each state maintains its own executive, legislative, and judicial authority, and for the purpose of local government is divided into *municipalities* and *districts*.

**INHABITANTS.** The population of Brazil is greater than that of any country in America except the United States, but the average density is only 4.5 persons to the square mile. About one-half of the people are whites, one-



third half-breeds, and the balance Negroes and Indians. Immigration has been encouraged by the government, which sold the land at prices ranging from \$1.00 to \$2.00 per acre, payment to be made in about seven years. The largest number of immigrants come from Germany and Italy, and it is due to this influx of Europeans that Brazil is gaining in national strength. About ninety per cent. of the people are Roman Catholics, but the church and state are entirely separated and all faiths are tolerated. Rio de Janeiro, the capital, is the most important financial and commercial center. Other cities of importance are Bahia, São Paulo, Santos, Pernambuco, Pará, Campos, Belem, Maranhão, Ceará, and Pelotas. The total population of Brazil in 1900 was 17,371,069.

**HISTORY.** Brazil was discovered in 1500 by Vicente Yañez and Pinzón, who landed at Cape Saint Augustine and explored the coast north to the Orinoco River. Two Portuguese expeditions were sent to explore the coast and plant colonies as early as 1501 and 1503. However, the settlement of Brazil was not decided upon until 1530, when grants were given to individuals who received power to establish colonies and develop trade. Many of the early attempts failed on account of contact with the Indian natives, who were decidedly unfriendly to the settlements of the whites. A colony was established on the Bay of Rio de Janeiro in 1567. The royal family of Portugal, the house of Braganza, was expelled from Portugal by the French in 1808 and took refuge in Brazil, under whose guidance the country enjoyed marked prosperity in commerce and internal improvements. The eldest son of the king declared Brazil independent of Portugal and was crowned emperor as Dom Pedro I. in 1822.

The discovery of gold and diamonds early in the 18th century led to a number of settlements and these minerals soon became a source of profit. This proved an effective incentive to immigration from Europe, especially from Portugal and Spain, and the government began to develop greater stability. Not long after the adoption of a constitution in 1824, serious international complications arose, but Portugal, although losing its largest and most productive colonial possession, formerly recognized the independence of Brazil. Later opposition arose to the reign of Dom Pedro I., and he voluntarily abdicated in 1831 in favor of his eldest son and returned to Portugal. The government was administered by regencies for the next nine years, when a popular agitation led to the declaration of the young prince's majority, then fifteen years of age, and his corona-

tion as Dom Pedro II. He reigned successfully for forty-eight years, when a revolution broke out and he was dethroned on Nov. 15, 1889. The country then became a republic without bloodshed, and the government was entirely reconstructed and reorganized.

**BRAZIL NUT**, or **Cream-Nut**, the seed of the *Bertholletia excelsa*, a beautiful tree native to the northern part of South America. The tree grows to a height of 120 feet and is valuable both for its seeds and the wood it yields, which is known as brazil wood. The seeds



BRAZIL NUT.

grow within a woody pericarp, or seed vessel, and vary in number from fifteen to twenty. They are popularly called nuts and are sold on the market by the popular name of *Nigger-toes*. The nuts are triangular in form, and within the hard shell is a white kernel, which is very agreeable to the taste. It yields a large per cent. of oil, which is used for burning in lamps by the natives. Large quantities of Brazil nuts are exported from Pará and French Guiana to the markets of Europe and America.

**BRAZIL WOOD**, a kind of wood derived from several trees native to the tropical regions of the Western Hemisphere, and exported largely from Brazil and the West Indies. A number of grades are known in commerce, such as *Lima wood*; *Pernambuco*, *Santa Martha*, *Sapan*, and *All Saints*, the names indicating products of different value. Brazil wood is yellow when newly cut, but when exposed to air it becomes red, and as a dyestuff is exported after being ground down to the size of sawdust. It is a heavy, hard wood, and is used in cabinet making. The coloring matter is obtained by weathering the ground wood, then

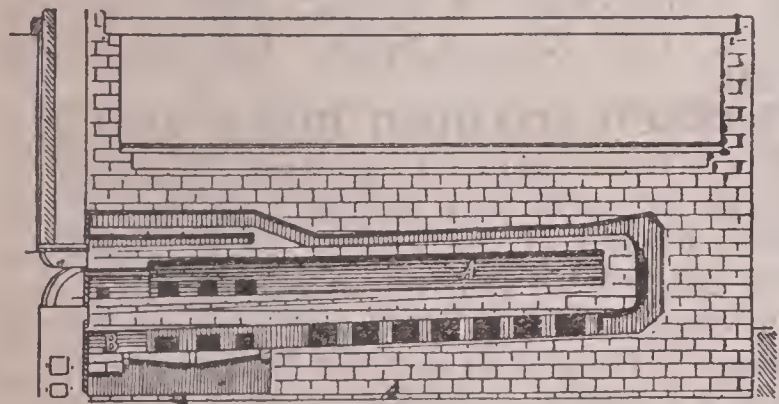


boiling it in water or alcohol, when it yields its coloring matter known as *brasilin*. It is used in making red ink and in calico printing.

**BRAZOS** (brä'zôs), the largest river located wholly in Texas. It rises in the northwestern part, has a southeasterly direction, and flows into the Gulf of Mexico. It is 940 miles in length, of which over 200 miles are navigable in the rainy season, from February till May.

**BRAZZA** (brät'sâ), an island in the Adriatic Sea, belonging to Austria-Hungary. It has an area of 150 square miles and is diversified by mountains and valleys. The soil is generally fertile and produces grain and fruit. Marble quarries are worked profitably. For the purpose of government it is annexed to Dalmatia. San Pietro, the chief town, has 3,500 inhabitants. The island has a population of 24,465.

**BREAD**, an article of food made of the flour or meal of grain, especially wheat and rye. The flour is mixed with water or milk and salt so as to form a consistent paste known as *dough*, and it is then baked in an oven. Bread is either *leavened* or *unleavened*, depending upon the ingredients used. Leavened bread is made by mixing the dough with yeast



OVEN FOR BAKING.

A, receptacle for loaves; B, fire-box.

or baking powder to produce fermentation and rising, or lightness, and the mixture is kneaded twice, once at the time of mixing and a second time after the first rising, and it is then made into the form of biscuits or loaves, which are given a brief time to rise before baking. Unleavened bread is heavy and compact, since it is made by using only flour and water, but it has the advantage of keeping longer, therefore is used more generally by those who cannot secure leavened bread regularly. However, leavened bread is used generally.

A light and porous unleavened bread is made by using an acid and a carbonate of ammonia, or a carbonate of soda. The carbonate is driven off by the heat in the process of baking. This is known generally as *aërated bread* and is used extensively in London and other cities of England. *Whole-wheat bread* is made by using

unsifted ground wheat. It is the true *Graham bread* is more nutritious than white bread, as it contains about fourteen per cent. of nitrogenous matter, while white bread contains only about seven per cent. An excellent bread is made of rye, and this kind is a popular food in many countries of Europe, while in others rice, corn meal, potatoes, and beans are utilized in the production of bread. It may be said that the temperature of a country is an important factor in determining the kind of bread eaten. Barley, rye, and oats are used most extensively in the colder regions, wheat and maize in the temperate portions, and rice and millet in the hotter countries. The principal adulterations of bread are made by the addition of a cheaper flour, such as adding that of rice and beans to the flour of wheat. They are harmless, but add weight and diminish the cost of production.

Grinding grain and baking bread, both leavened and unleavened, have come down to us from remote antiquity. The ancient Egyptians and Assyrians were skilled in these arts. It is thought that the Greeks and Jews learned how to make leavened bread from the Egyptians, and after the rise of Rome this knowledge was carried to the nations of Central and Western Europe. The yeast now used is constituted mainly of the minute cells of a fungous plant and multiplies by budding. It was used in making beer before it became known as a valuable requisite in making bread. When brought in contact with water and flour, it develops alcohol and carbon dioxide, and the former passes off in the process of baking, while the latter is retained in the dough. Bread becomes light and porous from the amount of gas which acts to distend it, and when the dough is sticky and does not allow the gas to escape the bread becomes heavy. Since 1858 machinery has been used extensively in bread making, and in the course of time caused it to develop into one of the most important enterprises. Most of the bread now consumed in large cities is made in bakeries, and is delivered direct to the customers, while the people in the country bake their own supply, which consists largely of leavened bread and light biscuits.

**BREADFRUIT**, the large fruit of the breadfruit tree. It attains a globular form, about the size of a child's head, and is used largely for food. It is baked, stewed, roasted, or fried in palm oil. The eatable part lies between the hard outer skin and the core. When baked, it is white and about the same consistency as wheat bread. The tree is cultivated in the West Indies and the South Sea



Islands. It attains a height of forty feet. The wood is valuable for building and the bark yields material for cloth.



BREADFRUIT.

**BREADNUT**, the fruit of a tree closely allied to the breadfruit, native of Jamaica. It has evergreen leaves and yields a gummy milk. The fruit is a one-seeded drupe, which is edible, and forms an agreeable article of food after being boiled or roasted. It has the taste of hazelnuts and is eaten as bread. The wood of the tree is used in veneering.

**BREAKWATER** (brāk'wā-tēr), a wall, mole, pier, or some similar structure placed at the entrance of a harbor with a view of deadening the force of the waves which roll in from the ocean. Breakwaters are variously constructed of floating bridges, made of wood, brick, stone, and iron, or suspended from chains, and of solid walls or mounds built up from the bottom of the water, with stone inclosing large blocks of concrete. Among the notable breakwaters in the Great Lakes is the one at Chicago, protecting the harbor of the city against the waves of Lake Michigan. It is built on a solid stone basis and incased with wooden beams. Another solid structure is at Buffalo, on Lake Erie, another at Cleveland, and a third in Delaware Bay. Among the most noteworthy in Europe are those at Cherbourg, France, and Plymouth, England. The one at Cherbourg was proposed by M. de Cessart to the French government, and is the largest and most expensive ever constructed. It was completed by Napoleon III. at a cost of nearly \$3,000,000. The ancient Romans constructed several breakwaters at Italian ports, and other

similar structures were made very early in history. In some places they serve for fortifications and residences. In most cases they are constructed from one to five miles from the shore, this depending upon the depth of the water and the conditions surrounding the city or harbor to be protected.

**BRÉCHE-DE-ROLAND** (brāsh'de-rō-lān'), a pass in the Pyrenees, between Spain and France, located a short distance west of Mont Perdu. It was so named from Roland, who, according to a legend, opened the rock with his sword Durandal so the army of Charlemagne could pass through. The defile is about 200 feet wide and is bordered by rocks that rise almost perpendicularly on both sides.

**BREDA** (brā-dä'), a city of Holland, in the province of North Brabant, at the confluence of the Aa and Mark rivers. It has railroad facilities and an important trade. Among the manufactures are cigars, clothing, carpets, and machinery. Formerly it was strongly fortified, but the fortifications were dismantled several centuries ago. In 1566 it was the meeting place of the Dutch nobles, who drew up the "Compromise of Breda," which was presented to the King of Spain. Population, 1906, 27,644.

**BREECH-LOADING GUNS** (brēch'-lōd'-īng), a term applied to firearms in which the charge is introduced at the rear end of the barrel instead of the muzzle. The mechanism is so constructed that the breech can be opened and closed for the purpose of receiving the charge. This gives a decided advantage in small arms for cleaning and rapid firing. While the use of this class of guns dates back to the 16th century, the general introduction of them is quite recent. The efficiency of these firearms for military use was demonstrated in 1864 and 1866 in the Prussian campaigns against Denmark and Austria, and they contributed largely to the victories of the German army in 1870-71. The Prussian gun (Zündnadelgewehr) has been superseded by the Mauser, a needle gun with metallic cartridges on much the same principle. There are now many kinds of breech-loading guns, both for the purpose of hunting and for military use. Germany and most of the nations use the Mauser; England, the Lee-Netford; Austria and Brazil the Mannlicher; and the United States, the Krag-Jörgensen.

**BREEDING**, the art of continuing or improving breeds of domestic animals by continuous care in feeding and pairing. All animals and plants are susceptible to modification under systematic cultivation. This fact has been



turned to advantage by combining in individual specimens a number of good qualities found in several different kinds of original stock. The principles taken advantage of are those of heredity, variability, selection, and crossing. The germs of all that is desired must be found in the specimen to be improved, and the process must be by slow development during long periods of time, else an essential loss will occur in some line at the expense of the higher qualities desired. Breeding for the improvement of all kinds of domestic animals has shown excellent results since the beginning of the last century, although considerable attention was paid to horse breeding from remote periods. The production of increased yields in quantity and fineness of wool in sheep, and beef and milk in cattle, is especially marked, while breeding in swine has largely increased the annual returns to farmers. One important principle to be observed is that the best results are produced between animals comparably similar, changing the breed gradually to the higher quality.

**BREMEN** (brēm'en), an important free city in Germany, on the Weser River, about fifty miles from its mouth. The free district has an area of ninety-nine square miles, and, besides the city, includes Bremerhaven, a port on the estuary of the Weser. The port has wet and dry docks, an excellent harbor, and a hospitiun for emigrants; population, 23,991. Bremen is one of the most important and historic cities of Europe. It was made a bishopric in the year 788 by Charlemagne, and was for some time a member of the Hanseatic league of cities. The government is by a senate and a council, under a constitution which is republican in form. Bremen is the principal seat of the German export and import trade, and the most important port for emigrants. Its foreign commerce extends to all the countries of the world, including a large trade with the United States. The imports aggregate about \$95,500,000 worth of commodities, while its exports are correspondingly large. The manufactures include sugar, tobacco products, ironware, machinery, pottery, fabrics, chemicals, cordage, steamboats, and engines. Among the chief buildings are a Gothic council house, the town hall, the merchants' house, the exchange buildings, and a cathedral founded in 1050. The school system is open to free admission and the attendance is compulsory. The public schools carry courses which range from the kindergarten to the high school, and the instruction is closely articulated with that given in the gymnasiums and trade schools. It has a large public library, many well kept promenades, two extensive parks, and

modern harbor and wharf improvements. The city is a focus of many railroads and canals. Telephone and telegraph lines connect it extensively, and it is finely paved and beautified by statuary, electric lighting, and equestrian fountains. Intercommunication is by a system of electric railways, with branches to Bremen-haven and many inland points. Population, 1905, 214,861.

**BRENHAM** (brēn'am), county seat of Washington County, Texas, in the south central part of the State, on the Houston and Texas Central and the Gulf, Colorado and Santa Fé railroads. It is surrounded by a fertile grain and cotton country, and is an important business and shipping center. The chief buildings include the courthouse, the public library, the Blim Memorial College, and the Evangelical College. Among the manufactures are carriages, ironware, machinery, and furniture. It was first settled in 1844, and was incorporated in 1866. Population, 1900, 5,968.

**BRESCIA** (brā'shē-à), a city in northern Italy, capital of a province of the same name, about 150 miles from Turin, with which it is connected by railroads. The manufactures include silk and linen textiles, machinery, pottery, and firearms. The surrounding country produces considerable quantities of raw silk, fruits, and cereals. Brescia is noted for its fine churches and cathedral, and contains several botanical gardens, hospitals, museum of antiquities, a theater, and an extensive public library. It is mentioned in history as early as 15 B. C., when it became a Roman colony. Charlemagne captured it in 774, and it was long a possession of Germany. In 1859 it was ceded to Sardinia and the following year was united with Italy. Population, 1906, 70,614.

**BRESLAU** (brēs'lou), a city in Germany, capital of Prussian Silesia, at the junction of the Ohlau and the Oder rivers. It is one of the largest cities in the German Empire, containing a growing population and varied industries. A number of handsome bridges across the Oder connect the two parts of the city. It is joined to the marts of trade by several canals and railroads, and has an extensive urban and inter-urban system of electric railways. The municipal facilities include a public library, waterworks, stone and asphalt paving, and systems of gas and electric lighting.

Breslau is the seat of a university founded by Leopold I. in 1702, which is attended by 1,750 students. The institution has a library of 350,000 volumes, and carries courses of study in all the higher branches, which are taken advantage of by students from remote countries. It has



a large number of magnificent churches, among them the Protestant church dedicated to Saint Elizabeth, with a steeple 364 feet high and a splendid organ. While the city contains a number of old parts, it has been largely affected by modern trade, and has responded liberally to the demands of modern culture and architecture. It has manufactures of woolen, silk, linen, and cotton goods, jewelry, machinery, lace, earthenware, soap, firearms, and various other staple products. Its commerce in flax, timber, hemp, metals, corn, and coal is very extensive. While the city is German in language and government, it is of Polish origin and was long occupied by Poles and Bohemians. It afterwards passed to Austria, and was conquered by Frederick II. of Prussia in 1741. It has been frequently besieged and was the scene of many fierce battles. At present it ranks as one of the most important cities of Europe from the standpoint of manufacture and commerce, as well as for educational advancement. Population, 1905, 470,904.

**BREST** (brĕst), a seaport city of France, in the department of Finistère, 385 miles west of Paris. It occupies a fine site on the Bay of Brest, at the mouth of the Penfeld River, and is connected by railways with the leading cities of the country. Its harbor is one of the best in France and it is an important marine station. The manufactures include clothing, wine, soap, and machinery. Its commerce consists mainly in machinery, brandy, wine, cereals, fish, and colonial goods. A cable line connects it with America, near Duxbury, Mass. It is beautified by paved streets, modern municipal facilities, promenades along the coast, and several ancient castles. It has been the scene of many severe struggles. Owing to its location near the English Channel and its nearness to the Bay of Biscay, it was made a naval arsenal by Louis XIV. and was rendered almost impregnable. In 1694 the English and Dutch were repulsed at this fortification, and in 1794 Howe blockaded it and won a great victory over the French fleet off the coast. Population, 1906, 85,294.

**BREVIARY** (brĕ'vĭ-ă-rĭ), the book which contains the ordinary and daily services of the Roman Catholic Church. The contents of the Breviary include all of the service except those for funerals, baptisms, and other special occasions, which are in the Ritual or Pontifical, and those used in the celebration of the Eucharist, which are in the Missal. The clergy and religious are obliged to recite the service for the canonical hours every day. It is divided into two parts, one containing the morning and the other the evening service.

**BREWING** (bru'ing), the art of making malt liquor. The term is applied to the extracting of wort or any saccharine substance from grain. In making beer, three raw materials are used, that is, hops, barley, and water. The first process is known as *maling*, which consists of causing the grain to germinate so the starch is changed into sugar. It consists of *steeping* the barley three or four days, during which time it absorbs some of the water and begins to swell and soften. It is then spread to a depth of about one foot in the malthouse, where it germinates and throws out sprouts. After about ten or twelve days it is taken to the dry kiln, where it is heated to a temperature of 90° to 150°, depending upon the kind of liquor desired, pale beer requiring the minimum and brown beer the maximum temperature. When the malted grain is fully dried and crisp, it is in a condition for brewing.

The next step is to pass the malted grain between two rollers so as to bruise or crush it, when it is known as *grist*. In this form it is put in the malt tub and mixed with water heated to 170°. It is constantly stirred with mechanical mixers and in this stage is known as *mash*. It requires three or four hours to complete the process, after which the liquid, now known as *wort*, is drained off and run into vats containing the yeast, in which fermentation (q. v.) takes place.

In the United States the brewing business is one of the chief sources of revenue, paying as an internal tax \$35,500,000 to the general government. Its sale is also taxed by many of the states and cities. Over 60,000 men are employed directly as laborers in brewing, and many thousands are engaged in the wholesale and retail trade. There has been a contention for many years regarding the liquor question. In some states it has become the principal political issue between the parties. With the adoption of improvements in manufacture, as the use of sterilized water, filtered air, and artificial refrigeration, beer is made free from bacteria and injurious organisms, and is greatly less perishable. Pasteur made several discoveries in scientific brewing. He was among the first to announce why beer, like the lip that quaffs it, is subject to disease. See **Beer**; **Bacteriology**.

**BRIBERY** (brĭb'ĕr-ĭ), a reward or valuable consideration given or accepted by any one with a view of unlawfully influencing judgment or conduct in a public office or some other capacity. This definition is the one usually applied at present, and includes alike the giver and the receiver, both being considered equally guilty on conviction. The charge of bribery is sometimes



alleged against candidates for office, voters, and members of legislative bodies. Legislation with suitable penalties has been directed against it. It is a crime even if the party accepting the bribe does not pursue the course agreed upon. Officers of the general government may be removed from office on conviction of bribery.

**BRICK**, a molded and burned block of clay, forming a species of artificial stone. The name is also applied to the unfinished product when in a molded plastic state, or when it has been dried and repressed, before being burned. Brick were made at remote periods of antiquity by the Egyptians, Babylonians, Assyrians, and other people of ancient history. They mixed sand and straw with the clay and baked the brick in the sun. When made in this way they are known as *adobe* brick. In cold countries freezing would soon dissolve these brick, but they are valuable in warm and dry climates, and some of them have been preserved for more than three thousand years. Many contain written characters, especially those of Babylon, to indicate the name of the reigning king, and are of priceless value in conveying historic facts to the present age. Brickmaking was introduced in Western Europe by the Romans in the year 44 A. D., and in England by the Anglo-Saxons under King Alfred, in 886. In the time of Henry VIII. and Queen Elizabeth the manufacture became vastly important, the product entering largely into the construction of forts and public edifices. Kiln-baked brick are found in the larger ruins of ancient Babylon, where they were used to face or bind together walls of sun-dressed brick in a manner quite similar to the plan of constructing buildings with hard and soft brick at the present time. However, it appears that the kiln was not used much before the time of the higher Babylonian civilization. The people of Holland have long ranked as skilled manufacturers of brick. In the early history of New York they brought large quantities of their product to America, many of which may still be found in the older part of New York City.

Various clays are used in brickmaking. They consist chiefly of silicates, the simplest, and are known as *fire clays*, of which *fire brick* are made. Clays that contain iron burn red, while those containing no iron appear white, although the brick commonly manufactured vary greatly in color. Fire brick are made from clay that contains little material which burns easily. The size of brick varies on account of the different clays used and the amount of heat applied in burning; those subjected to intense heat shrink somewhat. The usual size employed in build-

ing is about eight inches long, four inches wide, and two and one-half inches thick, while sidewalk brick are sometimes made eight inches square and two and one-half inches thick.

In making brick it is best to dig the clay in autumn and expose it to the influence of the rain and frost in order to break it up easily. It should be worked over a number of times and the brick may be molded and burned the following spring. On a small scale brick are made by hand, but for larger productions large machinery is used. The clay is mixed with sand and thoroughly worked in a pug mill, after which the material is put into molds and placed in a drying shed or in the sun. They are taken to the kiln to be burned when dry, which usually takes place in from eight to ten days. The kilns have flues or cavities for the insertion of fuel, and spaces for the passage of the fire and hot air to penetrate the brick stacked in regular order within. The burning is done by gas, wood, or coal, and varies from a few days to two weeks according to the method employed.

In recent years many improvements have been made in the manufacture of brick, particularly in 1893, when the dry-press system came into use. By means of this system the clays are subjected to a pressure of about six hundred tons, in the dust form, and molded ready to put into the kiln. The number of brick burned in a single kiln varies from a few thousand to a million. The dry-press machine has been brought to a high point of perfection and by it from 7,000 to 20,000 brick may be prepared for the kiln in a single day. The pressed brick are the most expensive and are used mostly in the construction of the medium-sized business buildings and in residences. Those used in sidewalks, chimneys, and outside walls are burned harder than those that enter into the inside walls, because of the greater wear when exposed to the weather. Machine-made brick are more durable and heavier than those made by hand because of the greater pressure applied in manufacture.

Pavements are constructed to a large extent of *paving* brick, which are made of a clay that contains a considerable amount of lime. The lime fuses in burning and causes the finished product to become very hard. In the market they are frequently called *vitriified* brick. The larger use of steel frames in constructing the tall buildings of modern times has caused brick to be employed extensively for filling the interior walls, though in some instances they have been replaced by cement. In many buildings, especially in the larger fireproof structures, *hollow* tiles are used for the inside walls.



**BRICKLAYING**, the art of building with brick. The principal implements of a bricklayer are a *trowel*, for spreading mortar; a *hammer*, for dividing and driving brick; a *plumb line*, for carrying the wall up perpendicularly; a *compass*, for maintaining longitudinal levels; a *rod* five or ten feet long, for taking measurements; and a *hod*, for carrying brick or mortar to the workmen. In small buildings brick and mortar are borne on the shoulders of laborers, but in large ones elevators are used. The mortar is made of lime and sand. The foundation of a brick building is an essential part, as buildings crack by settling unequally, if the basis is defective or the foundation is not based on a solid bottom. Bricklaying has been greatly lessened in larger cities by the newer process of constructing large buildings with steel framework and the use of stone.

**BRIDEWELL** (brīd'wĕl), a well in London, between Fleet and Thames streets, from which the name was given to a palace, parish, reforma-

of that country. The first Roman bridge was built across the Tiber under Ancus Martius. Permanent bridges are now constructed in all civilized countries, though in some countries they are few and imperfect. In India few were erected before the British occupancy of the country.

Bridge building became very common in Europe with the extension of the military influence of Charlemagne, and he also established ferries for the safe and permanent crossing of streams. Societies were organized in France and Germany in 1720 to promote the construction of bridges in all parts of those countries. It is thought that the first stone bridge in England was built in 1087 near Stratford, and the second in London in 1186, which was not finished until 1209. Many of the early bridges were erected by companies as business investments and tolls were charged for crossing them. Others were erected by the general government and paid for by tolling. The largest bridges of the world



EADS'S BRIDGE, SAINT LOUIS, MO.

tory, hospital, and industrial school. It is now quite generally applied to a police station or a house of correction.

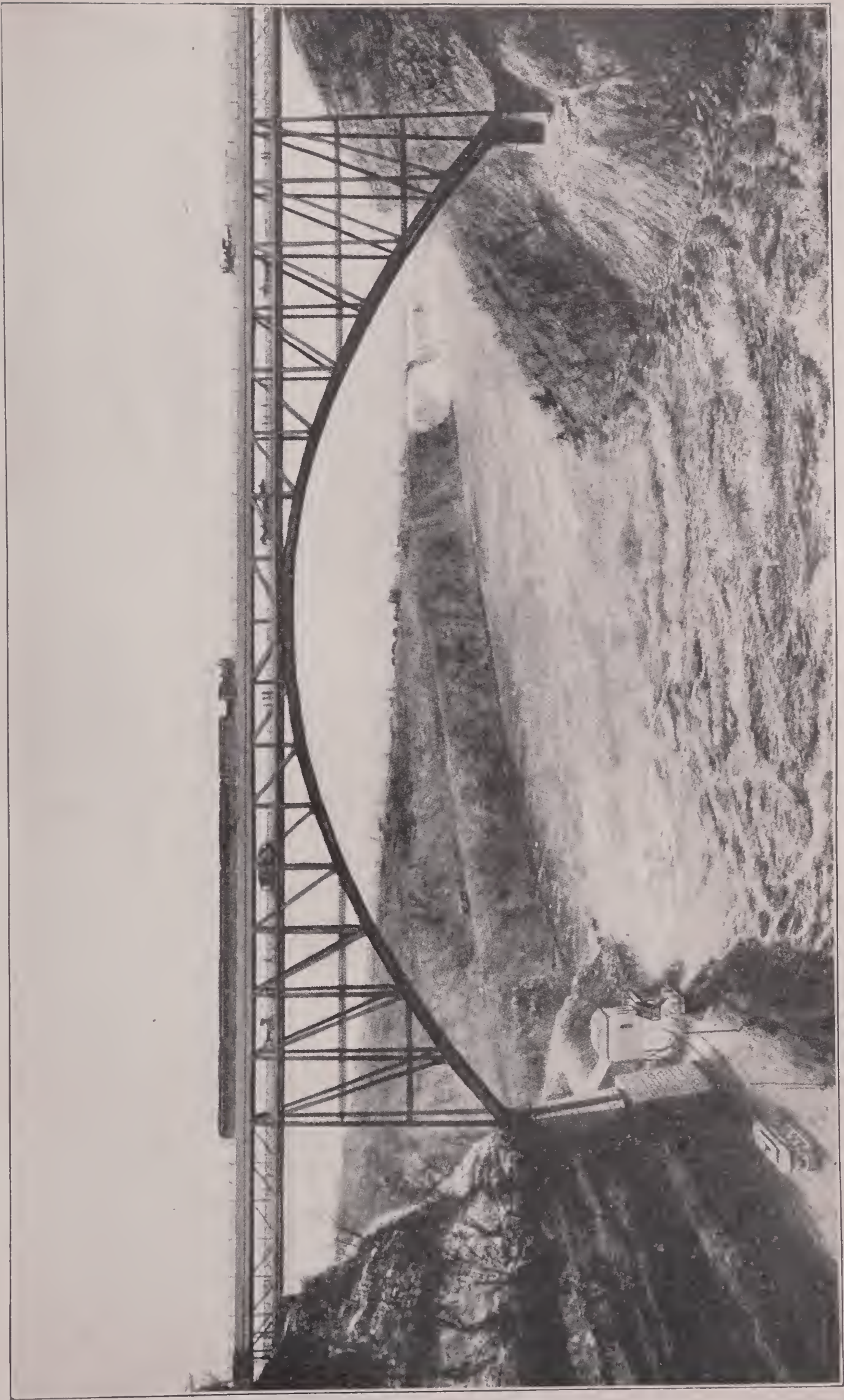
**BRIDGE**, a structure for carrying a highway over a stream, river, valley, or other impediment to its course. Bridges are constructed of stone, brick, wood, and iron, and seem to have existed from a period of considerable antiquity. The Chinese built them for many ages, perhaps the earliest among the ancients. The first bridges or passages made over streams or ravines were no doubt of trees. Bridges for military purposes were devised long before permanent structures for the convenience of the inhabitants were erected. These bridges were often of boats made to float on the water, with connections for the safe passage of armies. Some bridges were constructed by Cyrus about 536 B. C.; Darius, about 490; and Xerxes, about 480. The Romans seem to have been the first to use stone or brick. They carried the art of bridge building to Greece, after their conquest

were not built until after steam machinery was invented, which caused a demand for immense iron structures for the passage of railroad trains across streams and cañons.

The construction of bridges varies greatly with the time they are to be used and the purpose they are to serve. *Stone* bridges usually consist of an arch or series of arches. The length of the arch is called a *span*, the perpendicular supports are the *piers*, and the portion that receives the thrust or lateral pressure of the arch is called the *abutment*. The height of the pier depends entirely upon the land adjacent to the stream and the depth of the basin, usually from fifty to one hundred feet high, and the length of the span also varies greatly. The *girder and truss* bridges, especially those using the tubular girder, have largely superseded the arch. Other forms are the *steel arch* and the *cantilever* (q. v.) bridges.

The small bridges of one span have no piers and are supported entirely by the abutments.





GRAND TRUNK DOUBLE-TRACK STEEL ARCH BRIDGE OVER NIAGARA RIVER.





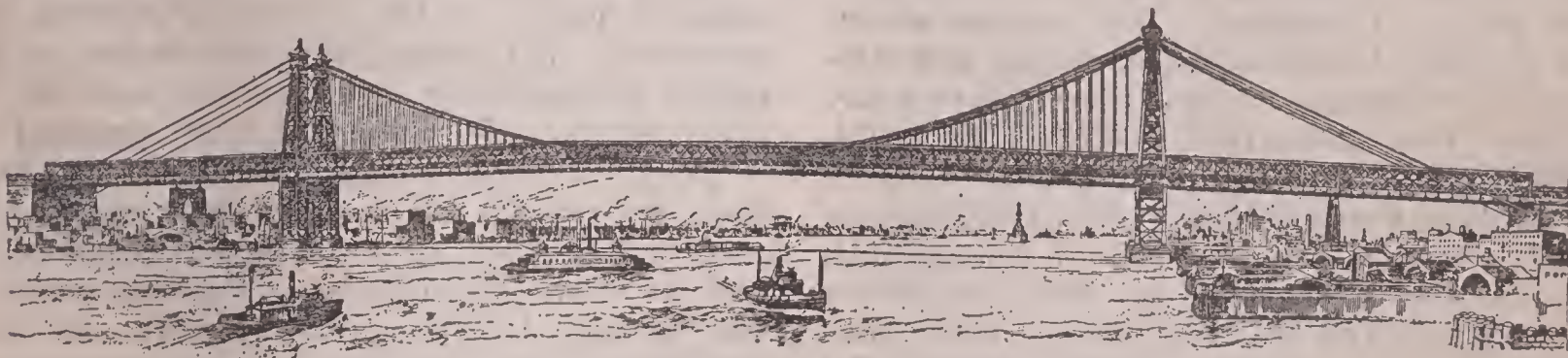


It often adds strength to have the abutments solidified so a single span will answer the purpose, thus avoiding the necessity of a pier in the strong current. In some cases two or more piers may be distributed so as to occupy positions which are not in the main channel. *Arched* bridges proceed from the sides of the space which they span and are keyed by a *keystone*, sometimes a number of arches constituting the groundwork of a single bridge. *Suspension* bridges span the entire stream, the weight resting entirely upon the piers at the two ends. A number of different methods of construction are employed, but usually the roadway is suspended by chains or wire ropes anchored securely to the masonry or iron at the ends of the bridge. *Swinging* bridges are common in large cities where traffic is carried by boats on canals, or across rivers navigable by large vessels. These bridges are so constructed that they may be turned or swung on a center so as to provide an opening for the passage of vessels, and, when closed, furnish safe passage for

called the Brooklyn Bridge. It was commenced under the direction of J. Roebling, in 1870, and completed in about thirteen years. It is 135 feet high, 5,989 feet long, and cost nearly \$15,000,000. About two miles north of the Brooklyn Bridge is the East River or Williamsburg Bridge, on which work was commenced in 1898. It connects Brooklyn with Manhattan Island, is 118 feet wide, and its longest suspension span is 1,600 feet. Its entire length is 7,200 feet. Midway between the two is the newer East River Bridge, on which work was commenced in 1907.

The Cantilever Bridge over the Niagara is built almost entirely of steel. Its total weight is 3,000 tons, length 810 feet, and cost about \$900,000. A similar cantilever bridge spans the Saint John River, in New Brunswick, which has a length of 813 feet. The Poughkeepsie Bridge, across the Hudson River, was built in 1889 and has a length of 6,767 feet. It has five spans, but only three are cantilever spans.

The bridge over the Firth of the Forth, near Edinburgh, Scotland, is 7,295 feet long. It has



WILLIAMSBURG BRIDGE, NEW YORK CITY.

street cars, railway trains, and pedestrians. Many such bridges cross the Chicago Drainage Canal, some having as high as eight railroad tracks, weighing over 7,000,000 pounds, capable of supporting about 9,000,000 pounds, and costing nearly a million dollars. Bridges that may be opened and closed are collectively termed *drawbridges*. They include a class known as *lift bridges*, the ends of which are anchored to framework towers so the span may be raised by means of winding drums.

Below is given a list of the notable bridges of the world:

The new London Bridge is constructed of granite, designed by John L. Rennie. It was commenced in 1824 and completed in about seven years, costing \$7,290,000.

The Bridge of the Holy Trinity at Florence, Italy, was built in 1569. It is almost entirely of white marble, 322 feet long, and stands unrivaled as a work of art.

The first large suspension bridge in the world was built across the East River in New York,

two spans of 1,710 feet each. It is about 370 feet high, contains 51,000 tons of steel, has twenty-five acres of surface to paint, and cost about \$15,000,000. It was commenced in 1883 and completed in seven years.

The Victoria Bridge across the Saint Lawrence River at Montreal, Canada, is tubular and nearly two miles long. It was completed in 1860 at a cost of \$6,300,000.

The Eads's Bridge across the Mississippi River from Saint Louis, Mo., to East Saint Louis, Ill., was designed by James Eads, begun in 1869, and completed in five years. It is regarded one of the most wonderful engineering products in America. The cost of the bridge and an immense tunnel under the city of Saint Louis was over \$10,000,000.

The bridge across the Ohio River at Louisville, Ky., is one of the largest iron bridges in America. It has twenty-seven spans, and is 5,310 feet long.

The Omaha Bridge, across the Missouri River, has eleven spans of 250 feet each, and a



total length of 2,800 feet. It is the longest swinging bridge ever constructed, having a swinging span of 520 feet.

The largest bridge ever built was the Tay Bridge near Dundee, Scotland. It was completed in 1877, and destroyed by a gale in 1879. This bridge had eighty-five spans, was 10,612 feet long, and cost \$10,750,000.

**BRIDGEPORT** (brīj'pōrt), a seaport in Connecticut, county seat of Fairfield County, at the mouth of the Pequonnoc River, fifty-eight miles northeast of New York. It is on the New York, New Haven and Hartford Railroad, has a good harbor on Long Island Sound, and carries an extensive navigation and railroad trade. The large sewing machine factories of Wheeler, Wilson & Co. and Elias Howe made the city famous. Besides sewing machines, it manufactures clothing, saddlery, carriages, cigars, machinery, and cartridges. Among the chief buildings are the public library, the county courthouse, the post office, and the customhouse. It is noted for its fine schools and numerous institutions of learning, which include the Barnum Memorial Institute. The city has extensive systems of waterworks, sewerage, and electric street railways. It was chartered as a city in 1836. Population, 1900, 70,996; 1910, 102,054.

**BRIDGETON** (brīj'tūn), county seat of Cumberland County, New Jersey, on Cohansey Creek, thirty-eight miles south of Philadelphia. It is conveniently located on the West Jersey and Seashore and the New Jersey Central railroads, and is a thriving business center. Its manufactories produce clothing, nails, glass, carriages, and woolen goods, and include rolling mills and tanneries. There are numerous beautiful churches and educational institutions, including the West Jersey Academy, South Jersey Institute, and Ivy Hall Seminary. The city has rapid transit, pavements, waterworks, and several libraries. It was settled before the Revolution and was incorporated in 1864. Population, 1905, 13,624.

**BRIDGETOWN**, a city of the West Indies, capital of the island of Barbados. It is located on the western coast, along Carlisle Bay, and is the terminus of a railroad. The chief buildings include a hospital, the town hall, and the government building. It has several fine churches, including the Church of Saint Mary and the Church of Saint Michael, and in Trafalgar Square is a statue of Lord Nelson. It is fortified, having a well-equipped garrison. Bridgetown was originally called Indian Bridge. It was partly destroyed by fire in 1845 and has been visited by several hurricanes. Population, 1906, 31,500.

**BRIDGEWATER** (brīj'wā-tēr), a town of Massachusetts, in Plymouth County, twenty-six miles south of Boston, on the New York, New Haven and Hartford Railroad. It has modern municipal facilities, including waterworks and electric lights. Among the chief industries are brickyards, a shoe factory, and machine shops. It is the seat of a State normal school, a State workhouse, and has several fine school buildings. The first settlement was made on its site in 1645, when it was known as Nuncketest, and in 1656 it was incorporated as Bridgewater. Population, 1905, 6,754.

**BRIDGEWATER**, a town of Nova Scotia, in Lunenburg County, twelve miles west of Lunenburg. It is located at the head of the La Have Estuary, and has the main offices of the Nova Scotia Central Railway. Its buildings include several schools and churches, and it has a good trade in merchandise. In 1899 it was partly destroyed by a fire. Population, 1906, 5,462.

**BRIGANDAGE** (brīg'and-āj), the name applied to the system of robbery organized by gangs of highwaymen, who make their home in secluded places in the forests or among the mountains. Brigandage was at its height in the period of barbarism, when might was recognized as the only right, and those engaged in it practiced robbery upon wayfarers or held them for ransom. It is older than human history, dating back to times before civilization had its rise. The history of Greece accounts that heroes distinguished themselves by suppressing it, and Hercules rid the country of robbers who infested the caverns. In Germany the so-called robber barons practiced brigandage, and we have examples of it in British history in Robin Hood and Dick Turpin. In France the name *brigands* was first applied to the mercenaries who occupied Paris in 1358, when King John was imprisoned.

Brigandage is still practiced in semicivilized countries, or where the government does not exercise a vigorous policy in protecting the life and property of its citizens or those who may sojourn in the country. Regions not densely populated, even in highly civilized countries, are sometimes infested with brigands. We have examples of brigandage as late as 1901, when Ellen Stone was kidnapped in Macedonia and held for a ransom. She and her companion, Madame Tsilka, were detained about five months, until Feb. 6, 1902, when they were released at Strumitza, Turkey, on payment of a ransom of \$72,000. Several other noted cases of brigandage took place recently in Morocco and other countries bordering on the Mediterranean. Jesse James (q. v.) and other brigands



committed train and bank robberies in the western section of the United States. These crimes were committed usually in small towns or in regions not densely populated, and to escape arrest the robbers destroyed telegraph connection.

**BRIGHTON** (brī'tūn), a seaport on the English Channel, in Sussex County, England, fifty miles south of London. It was made the summer residence of George IV., then prince of Wales, in 1782, and has since been popular as a fashionable resort in the summer season, when about 30,000 visitors are here constantly. It is located on elevated cliffs and has many mineral springs. A promenade and drive over three miles long stretches between the city and the coast, one of the finest in Europe. It has beautiful edifices, fine gardens, and several colleges and institutions devoted to learning. The aquarium contains a fine collection of marine life. Although Brighton has some trade and manufactures, it is noted particularly as a center of art and education and as a seaside resort. Population, 1907, 129,023.

**BRIGHT'S DISEASE**, a granular disease of the kidneys, so named because Robert Bright (1789-1858), an English physician, first made a diagnostic description of it. Its early symptoms consist of the secretion of urine containing a large amount of albumen and less specific gravity than natural, attended by pain in the loins, frequent urination, indigestion, and finally dropsy. It is a fatal disease, remedies having only a palliative effect. It is sometimes induced and always greatly aggravated by the use of alcoholic drinks. The most skillful treatment should be obtained on the appearance of the first symptoms.

**BRIMSTONE.** See **Sulphur.**

**BRINDISI** (brēn'dē-zē), a seaport city of Italy, in the province of Lecce, forty-five miles northeast of Taranto. It is situated on a bay of the Adriatic Sea, on a small promontory, and has railroad conveniences and a considerable trade in produce and merchandise. The chief buildings include an ancient castle, a cathedral, and several schools and monasteries. The harbor was dredged by the government in 1860, and it is now entered by the largest sea-going vessels. Anciently it was important as a commercial center, but it declined until the opening of the Suez Canal, when it began to gain in foreign trade. Vergil died at Brindisi in 19 B. C., and at the time of the Crusades it was important as their chief port for embarking to the Holy Land. Population, 1906, 26,347.

**BRISBANE** (brīz'bān), the capital of Queensland, Australia, on the Brisbane River,

about twenty-five miles from its mouth. It occupies a fine site, has an extensive harbor, and is the terminus of several railways and electric railroad lines. The river divides the city into two parts, known as North and South Brisbane, which are connected by the Victoria iron bridge. Among the chief buildings are the post office, two cathedrals, a university, and the State capitol, which was erected at a cost of about one million dollars. Brisbane has four parks and many large stone business buildings. It has waterworks, sewerage, stone and asphalt paving, and gas and electric lighting. The city was founded in 1825 as a penal colony by Sir Thomas Brisbane. When Queensland was set off as a separate colony in 1859, it became the capital, and has since made rapid progress in commerce and wealth. Population, 1906, 132,468.

**BRISTLES** (brīs's'ls), the coarse hairs of the hog and some other animals. They are glossy and stiff, and are largest on the back, especially in the wild boar. Bristles are used for various purposes in manufacturing, in making brushes and saddlery, and to some extent by shoemakers. The best grade is obtained from swine grown in cold countries, where the bristles are longer and stiffer. Large quantities are secured from slaughterhouses in the United States and Canada, where they are a by-product. The best grades are imported from Russia and Germany.

**BRISTOL** (brīs'tūl), a borough of Connecticut, in Hartford County, twenty miles southwest of Hartford, on the New York, New Haven and Hartford Railroad. It has a public library, a fine high school, and well-paved streets. The manufactures consist largely of machinery, clocks, ironware, and woolen and cotton goods. Among the municipal facilities are electric street railways, waterworks, and a system of sewerage. It was incorporated as a borough in 1893. Population, 1910, 9,527.

**BRISTOL**, a borough of Pennsylvania, in Bucks County, twenty-two miles northeast of Philadelphia, opposite Burlington, N. J. It is on the Delaware River and on the Pennsylvania Railroad. Fine mineral springs abound in the vicinity. The manufactures include leather, yarn, woolen and cotton goods, machinery, iron tools, and farm implements. It was settled as early as 1681, when it was called Buckingham, but was incorporated as Bristol in 1720. Population, 1900, 7,104; in 1910, 9,256.

**BRISTOL**, a port city of Rhode Island, county seat of Bristol County, fifteen miles southeast of Providence, on the New York, New Haven and Hartford Railroad. It is situated on Narragansett Bay, which affords anchorage for



large vessels, and has a lively trade in merchandise and manufactures. The harbor is safe and commodious, and it is the seat of shipbuilding yards. The manufactures include cotton, rubber, and woolen goods. A library and several schools and churches are among the public buildings. It is supposed that the Northmen built dwellings in the vicinity in 1000. The first settlement was made on its site in 1675, and it was incorporated in 1746. Population, 1910, 8,565.

**BRISTOL**, a city of Tennessee, in Sullivan County, 128 miles northeast of Knoxville, on the Norfolk and Western and the Southern railroads. It has a growing trade in merchandise and farm produce. Among the manufactures are flour, cigars, cotton goods, ironware, and machinery. Besides having several fine public schools, it contains Kings College, Southwest Virginia Institute, and Sullins College. It has a public library, waterworks, and electric street railways. Opposite the State line, in Virginia, is the town of Bristol, with a population of 4,579. Bristol, in Tennessee, in 1900, had a population of 5,271; in 1910, 7,148.

**BRISTOL**, an important city between Gloucestershire and Somersetshire, England, but forming a county in itself. The city is prominent partly because of its mercantile business and partly on account of its early history. It was made a county by itself in 1373 by Edward III. Henry VIII. made it the seat of a bishopric in 1542. It is the seat of many notable buildings, among them a cathedral founded in 1142 and Saint Mary Redcliff Church, founded in 1293. The newer buildings include the public library, the University College, the Queen Elizabeth Hospital, an observatory, and the Clifton College. Large coal mines are operated in the vicinity. The city has chemical works, sugar refineries, soap works, glass works, potteries, tanneries, ship yards, and machine factories. It carries an important jobbing business and a large export and import trade. It is built on both sides of the Avon River, which is crossed by the famous Bristol suspension bridge, 705 feet long and 245 feet above high-water mark. Extensive docks are maintained on the Avon and at Avonmouth and Portishead. The *Great Western*, one of the first steamers to cross the Atlantic, was built in Bristol in 1838. The noted philanthropist Colston founded a number of charities in the city, and a holiday is set apart to his honor. It has gas and electric lighting, stone and asphalt pavements, waterworks, a system of sewerage, and many hospitals and charitable institutions. Bristol was known as *Bricgstow* to the Saxons. Population, 1907, 367,979.

**BRISTOL CHANNEL**, the largest inlet of Great Britain, extending from the Atlantic Ocean, between the southern peninsula of England and the southern shores of Wales, and forming the estuary of the Severn. It is about eighty-five miles long, from five to forty-five miles wide, and has a coast of about 225 miles. It is remarkable for its high tides, or bores, which roll up the channel at a height of from six to forty feet. Among the rivers that flow into it are the Severn, Avon, Wye, Axe, and Torridge. Lundy Island is near the entrance.

**BRITISH AMERICA**, the possessions of Great Britain in North America, located north of the United States, and including the Dominion of Canada and Newfoundland. Its area is 3,677,500 square miles and population 5,987,698. See **Canada** and **Newfoundland**.

**BRITISH ASSOCIATION for the Advancement of Science**, an important society of Great Britain, whose object is to bring together eminent men to promote discovery and to diffuse the results of scientific research. This association was organized in 1831 under the leadership of David Brewster, and its first meeting was held on Sept. 26 of that year at York. The second meeting was held at Oxford in 1832, and since then the meetings have been regular each year, usually the latter part of August. Two meetings were held in Canada, one at Montreal in 1884 and the other at Toronto in 1897. The membership of the society is about 5,500. It is supported by fees and annual dues. The income is larger than needed for actual support, and the surplus is used to promote investigations and scientific researches. The general meeting is presided over by the president, who delivers an annual address, after which meetings are held by the ten sections, each having its own committee and presiding officer.

**BRITISH CENTRAL AFRICA**, or **Nyasaland**, a colonial possession of Great Britain in the east central part of Africa. It is bounded by Lake Nyassa, Portuguese East Africa, German East Africa, and the Congo Free State. Southeast of it is Rhodesia, of which it is an extension. The area is 41,800 square miles. The surface is an elevated plateau, and the drainage is chiefly by the Shire River. It has an abundant rainfall, but the climate is not as healthful as that of the country lying toward the south. Coffee, ivory, tobacco, and rubber are exported, and the chief imports are machinery and clothing. Blantyre, the largest town, has a population of 7,500, including about one hundred Europeans. The protectorate was organized in 1891, and since then mining and



farming have been introduced. Zomba, in the Shire region, is the seat of government. Population, 1907, 928,451.

**BRITISH COLUMBIA**, the most westerly Province of the Dominion of Canada, located between north latitudes  $49^{\circ}$  and  $60^{\circ}$ . It is bounded on the north by Yukon and Mackenzie, east by Alberta, south by the United States, and west by Alaska and the Pacific Ocean. From north to south it has a length of 740 miles; breadth from east to west, 620 miles; and area, 312,630 square miles. The coast line, including indentations, is about 12,000 miles.

**DESCRIPTION.** The surface is mountainous, except in the northeastern part, which lies in the



1, Victoria; 2, Vancouver; 3, Prince Rupert; 4, Fort Fraser; 5, Kootenay Lake. Dotted lines show chief railroads.

basin of the Mackenzie River. The mountains are outer fringes of the Cordilleras of North America, and the chains extend from southeast toward the northwest. Ranges of the Cascade Mountains, which attain elevations ranging between 7,000 and 8,000 feet, trend through the western part, and between them and the coast is the comparatively low Coast Range. In the southeastern part, extending almost parallel to the principal chain of the Rocky Mountains on

the line of Alberta, are the Gold Range and Selkirk Range. These mountains are the highest of those in the southern part, and their loftiest peaks, including Victoria, Leroy, and Dawson, have a height of from 9,000 to 11,600 feet. However, the highest summits are near the boundary of Alaska, where peaks of the Rocky Mountains rise to elevations which approximate 16,000 feet. These include Mount Columbia, 14,000 feet; Robson Peak, 13,700 feet; and Mount Fairweather, 15,340 feet. Kicking Horse Pass, where the Canadian Pacific Railroad crosses the continental watershed, is 5,300 feet, and north Kootenay Pass is 6,550 feet above the sea, while the mountains in the vicinity rise about 10,000 feet and are covered with snow the entire year.

The Columbia drains the southeastern portion and crosses into the United States, discharging into the Pacific. Through the south central part flows the Fraser, which rises near the line of Alberta, has a course toward the northwest, and then turns and flows almost due south to a point near the southern boundary, when it turns toward the west and discharges into the Strait of Georgia. In the northern part are the Taku, Stikine, Nass, and Skeena, which flow into the Pacific, the Liard, a tributary of the Mackenzie, and the Peace, which joins the Athabasca in Alberta. A number of lakes are distributed through the central part, all of them quite long and narrow. They include lakes Kootenay, Okanagan, Upper and Lower Arrow, Tacla, Babine, and Stuart. The sea coast is serrated and characterized by rugged cliffs and fiordlike estuaries. Near the mainland are a large number of islands, but all are small, except Vancouver and the Queen Charlotte Islands.

**CLIMATE AND SOIL.** The climate is warmer than that of any other province in Canada, on account of the warm winds from the Pacific, and differs greatly from that of the cold region of the Atlantic coast. These winds modify the temperature noticeably in most of the province, but much of their moisture is given up when they come in contact with the higher altitudes of the Coast Range; hence the climate is less uniform in the eastern part and the rainfall is less copious. At Victoria, on Vancouver Island, the average temperature for January is  $37^{\circ}$  and for July  $60^{\circ}$ , and flowers bloom in the garden the entire year. The climate at Vancouver is practically the same, but in the interior the temperature varies from  $40^{\circ}$  below zero in winter to  $100^{\circ}$  above in midsummer. Rainfall is most abundant along the coast, ranging from 40 inches at Victoria to about 100 inches in the northern part, and diminishing toward the east-



ern part, where some localities do not have sufficient to farm without irrigation. The rains and snows are heaviest on the western slopes, and the passes of the Gold Range and Selkirks have glaciers and snowfall to the depth of thirty feet. The Chinook winds make the Peace River valley pleasant and agriculture profitable in that section.

**FLORA AND FAUNA.** The forest resources possess much value, and the trees are of a northern type. Dense forests are particularly abundant on the western slopes of the coast ranges, and a heavy growth of timber covers the eastern slopes, but the high plateau of the interior is almost treeless. The white cedar is found in large quantities widely distributed, but the yellow cedar is confined to the northern region. Forests of spruce and hemlock abound. Other trees of commercial value are the oak, cherry, fir, yellow pine, yew, white maple, cottonwood, and arbor vitae. Fish are abundant in all the streams and off the coast, particularly the salmon, which is caught in large quantities at the mouth of the Fraser and other rivers. The wild animals include the moose, caribou, deer, bighorn, bear, puma, and wild cat.

**MINERALS.** Many valuable minerals are found in British Columbia. Gold was discovered in 1851 in the gravel along the rivers, from which it was obtained in paying quantities, but placer mining is not carried on to a great extent at present. The Kootenay district has been the chief source of gold, but mining has been developed in the mountains farther north. A fine grade of bituminous coal is obtained on Vancouver Island and in the Rocky Mountains. Copper is mined in the southeastern portion. Other minerals include silver, lead, and platinum.

**INDUSTRIES.** Agriculture is growing steadily, both in the production of cereals and in rearing live stock. Many of the valleys are remarkable for their fertility, such as that of the lower Fraser, where farming has reached a high degree of development. The cereals grown include wheat, oats, barley, rye, and millet. Fruit is cultivated successfully, including interests in most of the varieties common to the temperate latitudes. Irrigation has been introduced in the arid regions of the interior, but most of the farming is done where the rainfall is abundant, including some sections of the Peace River valley.

The salmon fishing and canning industry is an important enterprise. Many canneries are located on the coast and along the rivers, especially on the Nass, Skeena, and Fraser. The canneries of the Fraser River produce about

one-half of the salmon packed in British Columbia, and those of the Skeena are second in importance. Fur sealing is an important enterprise. Other fisheries which are prolific as a source of wealth include those of the cod, herring, halibut, and sturgeon.

While mining and the fisheries have ranked as the two leading industries, there has been much development in lumbering. The Douglas fir, or Oregon pine, yields vast quantities of choice building material. Many specimens of this tree have a diameter ranging from ten to eighteen feet and a height of three hundred feet. It is exceeded in size by the cedars, whose diameters reach twenty feet in some individual specimens. However, both furnish a valuable grade of lumber. Other varieties used in lumbering include the cypress, hemlock, yew, and yellow pine. Vast quantities of timber are exported to Europe, Africa, and South America.

Many of the rivers are navigable and furnish important transportation facilities to carry trade with interior points. Some of the lakes, though not connected with the ocean by navigable streams, are used in transporting locally by steamboat. The Canadian Pacific Railway has a transcontinental line through the southern portion with the terminus at Vancouver, whence traffic is carried by steamer to Victoria, which has railroad facilities by lines on Vancouver Island. The line of the Grand Trunk Railway passes through the central part, with the terminus at Prince Rupert, near the mouth of the Skeena River. Vancouver, Victoria, New Westminster, Prince Rupert, and Ladysmith are among the ports.

**GOVERNMENT.** The executive branch of government is vested in a lieutenant governor, appointed by the Governor General of the Dominion, and he is assisted by an executive council of five members. The legislative authority is vested in a single chamber of thirty-three members elected by the people. A system of public schools is supported by taxation, and includes common, graded, and high schools, all of which are free and undenominational. Many private schools and colleges are maintained, including denominational colleges at New Westminster and Vancouver. The people are very largely Protestants, including Anglicans, Presbyterians, Methodists, Baptists, and Lutherans. In 1901 the Catholics numbered 34,227 and the Buddhists, mostly Japanese, numbered 10,027.

**INHABITANTS.** The population is made up largely of Canadians and Europeans, including English, Irish, and German. The Indian population is about 25,000, and the Chinese and Japanese together number 20,000. Victoria, the



capital, is located on Vancouver Island. Other important cities include Vancouver, Nanaimo, Nelson, Rossland, Ladysmith, and New Westminster. The population of the province, in 1901, was 178,657.

**HISTORY.** Captain Cook explored a part of the coast of British Columbia in 1787, and a settlement was made by the English ten years later at Nootka. However, the settlement was broken up by the Spanish, who claimed the coast as far north as latitude 61°, where the territory of Russia was supposed to end. In 1846 the question of possession was settled by diplomacy, when the United States relinquished its claim and the territory now in British Columbia became a possession of the British crown. The claims of the United States were based on the Louisiana Purchase and explorations made by Lewis and Clarke, out of which grew the campaign cry of "54-40 or fight," at the time Polk was elected President of the United States. Vancouver Island was organized as a crown colony as early as 1849, but little progress was made in developing the country until the discovery of gold in 1858, when settlers began to pour into British Columbia, and it was made a crown colony the same year. The two colonies were united in 1866 as a political entity under the name of British Columbia. In 1873 a dispute in regard to the boundary was submitted to the Emperor of Germany, who awarded San Juan Island to the United States. The colony entered the Dominion in 1871, under an agreement that the federal government should provide railway connection with the Atlantic coast, and this was accomplished in 1887, when the Canadian Pacific Railway was opened for traffic.

**BRITISH EAST AFRICA**, a large territory within the British sphere of influence, located between Abyssinia and German East Africa, and extending from the Indian Ocean to the Congo Free State. The boundaries are not well defined, since there has been no definite agreement in regard to the boundary between it and Abyssinia. It includes the islands of Pemba and Zanzibar, and has an area of about 1,000,000 square miles. For the purpose of government, it is divided into the three protectorates known as Uganda, British East Africa, and Zanzibar. The former two are administered by British commissioners located at Entebbe and Mombasa, and the last mentioned is under a native sultan, who is advised by a British agent.

The region is rich in minerals, especially iron and copper. Fruit, palms, and spices are abundant on the coastal plain. The interior is not

rich in vegetation, especially in the arid highlands, where large tracts have a scanty growth of small grasses. Forests of evergreen trees abound in many parts, and in the jungles are vast growths of bamboo. The large mammals of Africa are numerous, including the hippopotamus, elephant, rhinoceros, giraffe, and antelope; the reptiles include the python, cobra, and crocodile; and the birds are especially numerous, among them being the pelican, flamingo, weaver bird, and sunbird.

A railroad extends from Mombasa, on the Atlantic, to Lake Victoria Nyanza, a distance of 584 miles, and will be connected with the Cape-to-Cairo line. Rubber, ivory, hide, grain, copra, and live stock are exported. The inhabitants are chiefly Arabs and Negroes. Most of the trade is in the hands of the Arabs at Zanzibar and near the coast, and the farming and pastoral regions of the interior are occupied by the Bantu and Nilotic Negro races. Population, 5,150,000.

**BRITISH GUIANA.** See **Guiana**.

**BRITISH HONDURAS** (hōn-dōō'rās), or **Belize**, a colony in Central America, belonging to the crown of Great Britain. It is situated east of Guatemala and southeast of Mexico, and has an extensive coast line on the Caribbean Sea. Its area is 7,562 square miles. The coast is quite low and swampy and the western part is diversified by hills and valleys. Among the chief products are fruit, mahogany, logwood, coffee, sugar, rubber, and live stock. This colony is still unprofitable, since the revenues seldom equal the expenditures, and it is necessary for the home government to grant aid. At present the indebtedness is placed at 170,000. Belize, population 9,113, is the capital and chief commercial city.

The inhabitants consist principally of Negroes and Indians, including only about 400 whites. A large number of elementary and three secondary schools are maintained. The language is a mixture of native tongues with English and Spanish. Numerous attempts have been made to throw off British rule, but English sovereignty has been recognized since 1783. Since 1884 it has been a separate colony. Population, 1906, 41,007.

**BRITISH ISLES**, an archipelago of Europe, located off the western coast of that continent. It is bounded on the north and west by the Atlantic Ocean, east by the North Sea, and south by the English Channel and the Strait of Dover. Great Britain and Ireland are the chief islands, besides which are included the Shetland Islands, the Hebrides, the Orkneys, and the Channel Islands.



**BRITISH MUSEUM** (mū-zē'um), the largest national institution of Great Britain, located on Great Russel Street, London. It was founded in 1753, when Sir Hans Sloane donated his library collection of about 50,000 books and manuscripts on condition that \$100,000 be paid to his heirs, which was much less than half the cost. The Montague House was purchased and opened as a seat for the library in 1759. A new building was erected in 1823, and the present large structure was completed in 1857, but extensive additions were made in 1882 and since. The main structure is 375 feet long. About 200,000 persons use the reading rooms each year, and it is visited by about 700,000 persons annually. The printed books include a total of about 2,000,000 volumes, being exceeded in number only by the Bibliothèque Nationale of France. In addition to this collection of books, it contains many pamphlets and manuscripts.

The museum is open and free to the public. It is lighted with electric lights and has every convenience of modern invention. Priceless rarities of every age and every country are on the shelves, constituting one of the most valuable collections in the world. There are a number of departments, each of which is located in a suitable part of the buildings, and the whole is under the direction of forty-eight trustees, of whom the chief officers are the Archbishop of Canterbury, the Lord Chancellor, and the Speaker of the House of Commons. The most important departments include those of Printed Books, Maps, Manuscripts, British and Mediaeval Antiquities, Egyptian and Assyrian Antiquities, Greek and Roman Antiquities, Coins and Medals, and Prints and Drawings. The collections represent every noted personage and all industries, sciences, arts, and discoveries of ancient and modern research. It has been fittingly said that the museum is a "perpetual monument of the munificence, judgment, and liberal taste of its royal founder, a splendid ornament to the throne and a perpetual benefit to learning."

**BRITISH NEW GUINEA.** See **New Guinea.**

**BRITTANY** (brīt'ta-nŷ), or **Bretagne**, an ancient province in western France, consisting of a large triangular peninsula that projects into the Atlantic. The region now includes the five departments of Morbihan, Finistère, Ille-et-Vilaine, Côtes-du-Nord, and Loire-Inférieure. It has an area of 13,644 square miles. The people, called Bretons, are descendants of the Bretons who were expelled from England in the 5th century. They retained their ancient language, known as the Armorign, which is similar to the Welsh, and is still used in the

rural districts. The people engage largely in fishing and agriculture, and are noted as brave seamen. This region of France has not been interested extensively in manufacturing and commerce, but these industries are beginning to assume considerable importance. Many remains of the ancient Druids have been preserved in Brittany. The folklore and songs of the Bretons are among the richest, many entering as modifying factors into the writings in other languages. The district has been subject to many military contentions, but the people have shown marked loyalty to the French government, especially to the house of Bourbon. A majority of the people speak French and belong to the Roman Catholic Church. Population, 1906, 3,258,314.

**BROCADE** (brō-kād'), a silk fabric, woven so the raised threads of the warp or woof produces figures of flowers, foliage, or other objects. The term is not applied to figures embroidered on silk textiles, but is restricted to those made in the loom. Originally the threads were made entirely of gold or silver, or of the two mixed, and cloth of this kind was used in making the most costly dresses.

**BROCKEN** (brök'ken), or **Blocksberg**, a mountain of Germany, in the province of Saxony, 20 miles southwest of Halberstadt. It has an elevation of 3,745 feet above the sea and is the highest summit of the Hartz Mountains. From its top the observer has a fine view of the surrounding country. It is famous in folklore, owing to the fact that the atmospheric conditions cause shadows of the spectators to be projected on the fog, which are best seen at sunrise. See **Walpurgis Night.**

**BROCKTON** (brök'tŭn), a city of Plymouth County, Massachusetts, about twenty miles south of Boston, called Bridgewater prior to 1874. It is noted for its great wealth and the manufacture of boots and shoes, in which it takes very high rank. The general manufactures include shoe tools, machinery, paper, and wooden boxes. It carries a large jobbing trade in merchandise. Gas and electric lights, waterworks, stone and asphalt pavements, and electric street railways are among the improvements. The city library has 45,500 volumes. It was first settled in 1700 and received its charter as a city in 1881. Population, 1905, 47,782; in 1910, 56,878.

**BROCKVILLE** (brök'vil), a city in Ontario, county seat of Leeds County, on the Saint Lawrence River, about forty miles from Kingston. It is conveniently located on the Grand Trunk Railway, surrounded by a rich agricul-



tural country, and engages extensively in the manufacture of flour, hardware, farming implements, engines, and large machinery. The chief buildings include the courthouse, the public library, the high school, and the town hall. It has a system of sewerage, waterworks, and electric railways. Brockville was named from Sir Isaac Brock. Population, 1901, 15,901.

**BROKEN WIND**, or **Heaves**, an incurable disease in horses, due to a rupture of the air cells in the lungs. It is accompanied by an enlargement of the lungs and heart. The symptoms are most noticeable when the horse is exercised, which causes the blood to be imperfectly purified, causing the nostrils to dilate and the breathing to become labored. The inspiration in breathing is rapid, but expiration is difficult and requires about double the usual time. In advanced stages of the disease two efforts are necessary in exhaling, one rapidly succeeding the other.

**BROKER** (brō'kēr), an agent who engages in the business of negotiating contracts relative to trade or commerce in consideration of a definite per cent. of the profits; or of a fixed salary. Brokers differ from other classes of agents in that they do not have the custody of the property they offer for sale. The compensation they receive is called *brokerage*, or *commission*. *Insurance brokers* are agents for underwriters, who insure owners of vessels and transporters of commodities against losses. *Stock brokers* deal in shares of stock companies and monetary investments, *ship brokers* transact business for owners of vessels, and *bill brokers* buy and sell bills of exchange for others.

**BROMINE** (brō'mīn), one of the nonmetallic chemical elements. It was discovered by Antoine Jerome Balard (1802-76), a French chemist, while he was extracting common salt from sea water. This element is not found in the isolated state, but occurs in minute quantities in sea water, in the ashes of marine plants, in combination with alkalis, and in the water of some mineral springs. It has a dark reddish color when in the liquid form, freezes at 19.4°, and boils at 145.4°. It is poisonous, has a suffocating odor, and combines readily with metals. The most important use of bromine is for the manufacture of bromide of potassium, which is used in photography and medicine, and it has value as a disinfectant and for bleaching. It is made extensively from the salt water of mineral springs at Stassfurt, Germany, Syracuse, N. Y., the Kanawha region in West Virginia, and other sections of the United States.

**BRONCHI** (brōn'kī), the divisions of the trachea or windpipe, which conveys the air into the lungs. The trachea divides in the chest, forming two bronchi, one of which enters the right and the other the left lung, where they divide and subdivide to form minute tubes. The walls of these tubes are composed of fibro-muscular tissue strengthened by plates of cartilage, and at the extremity is a cluster of air cells.

**BRONCHITIS** (brōn-kī'tīs), an inflammation of the bronchial tubes leading from the trachea to the lungs, and affecting the mucous membrane. There are several forms of the disease, designated as *acute*, *chronic*, *plastic*, *mechanical*, and *syphilitic*. All varieties are preceded by a cold in the chest, but later complications may set in and render the disease dangerous. The early symptoms include pain in the chest, shortness of breath, and the expectoration of mucus. Sometimes the disease takes on an acute form or merges into pneumonia.

**BRONCHO** (brōn'kō), a nearly unbroken native horse, usually an Indian pony or one bred from Indian stock, also called *mustang*. The term is used commonly in the western part of the United States, where it is applied to small, active horses. It is said to be from a Spanish word which signifies that they can never be broken.

**BRONZE** (brōnz), a fine-grained alloy of copper and tin, in variable proportions. It is harder and more fusible than copper, and is used chiefly in making church bells, cannon, statues, utensils, and various useful appliances. The ancients used it largely for weapons and utensils, and it has been found among the antiquities of China, Egypt, Assyria, Europe, and Mexico. In making the common bronze the proportions are about nine parts copper to one of tin; in instruments, twelve to one; in machinery, eight to one; in musical bells, six to one, and in large bells, three to one. The metals are melted separately, and they are afterward united in a molten state and cast in molds. In some kinds of bronze, zinc, silver, and lead are added, while aluminum and copper also make a bronze alloy. The bronze formed of aluminum and copper is strong, ductile, and malleable. The proportion is one of the former to nine of the latter.

**BRONZE AGE**, the term used to denote the stage of culture of a people at the time of using bronze for implements and weapons. The classification includes the three ages in this order: the *stone age*, the *bronze age*, and the *iron age*. It was adopted and developed



by Danish scholars, including Nilsson, Thompson, and Forchhammer. The classification does not apply equally to all nations, nor to different nations in the same period. The stone age existed in some countries while others were passing through the bronze and iron ages. In the stone age the weapons or implements consisted of stone and bone, metal being yet unknown. In the bronze age the method of alloying copper and tin had been discovered, but iron was yet undiscovered. Later iron took the place of bronze. These views have been adopted by geologists, though some think the age of copper intervened between that of stone and bronze. In Denmark, during the age of bronze, the oak was the dominant tree; the Scotch fir having flourished in the stone age, but became extinct in the bronze age, while the beech was and remains the prevailing tree of the iron age. Among the tools of the bronze age of different countries are found saws, hammers, awls, sickles, knives, daggers, swords, axes, spears, arrows, anvils, gouges, and shields. The composition of bronze varies with different periods and the size and form of the implements were changed frequently. The composition of bronze consisted mostly of ten parts of tin to ninety of copper. In some cases other metals were added.

**BROOK FARM**, a community established at West Roxbury, Mass., by George Ripley (q. v.) in 1841. The organizer associated with himself a number of men and women prominent in American History, and announced that the object was to substitute a system of brotherly coöperation for one of selfish competition. No distinction was made in regard to sex, but all were required to work a definite time each day for the common good, the proceeds to be shared equally by the members. All ate at the same table, had a share in the property, and had access to its social and literary advantages. The community was maintained by teaching children for a compensation, and by selling its products on the market. After several years a number of the leading members became discouraged and the community sustained financial loss. In 1846 some of the best buildings were destroyed by fire, and the enterprise was finally abandoned the following year. Among the members of this socialistic venture were Charles A. Dana, George W. Curtis, W. B. Channing, Nathaniel Hawthorne, Bronson Alcott, Margaret Fuller, and Theodore Parker. Hawthorne made use of many of his experiences at Brook Farm in writing his work of fiction entitled "Blithedale Romance."

**BROOKFIELD**, a city in Linn county, Mis-

souri, on Yellow Creek, twenty-four miles east of Chillicothe. It is on the Chicago, Burlington and Quincy Railroad, and is surrounded by a region rich in coal deposits. The chief buildings include the public high school, the library, and extensive railroad shops. It has manufactures of brick, flour, and machinery. Electric lights, waterworks, and sewerage are among the improvements. It was incorporated in 1865. Population, 1900, 5,484; in 1910, 5,749

**BROOKLINE** (brōok'lin), a town in Norfolk County, Massachusetts, four miles west of Boston, on the Charles River. It is on the Boston and Albany and other railroads, and is connected with Boston by a system of electric railways. Brookline is a suburban residence portion of Boston, and was originally a part of that city, but was incorporated separately in 1705. The chief buildings include a public library with 46,500 volumes, the Riding Academy, and many villas and country seats. It has manufactories of clothing, machinery, and electrical supplies. With it are included the villages of Longwood, Reservoir Station, and Cottage Farm. Population, 1910, 27,792.

**BROOKLYN** (brōok'lin), the "City of Churches," formerly one of the largest and most important cities in the United States, but united with the city of Greater New York in 1898 by a legislative bill passed May 11, 1896. This portion of New York City is located on the west end of Long Island, and is connected with the other portion of the great city over the East River by the Brooklyn Suspension Bridge, the Williamsburg Bridge, and the new East River Bridge. Intercommunication is further facilitated by the extension of the Subway under the East River and by many lines of ferries. It is noted as a financial center, has many valuable structures, is improved by all modern conveniences, and is beautified by parks and other public improvements. The first settlement on its site was made by the Dutch in 1636, and it was incorporated as a city in 1834. At the time of its union with New York the city contained a population of 995,276. It is now divided into twenty-one aldermanic districts and represented by that number of aldermen in the common council. Population, 1905, 1,358,891; in 1910, 1,634,351. See **New York**.

**BROOM** (brōom), a plant of the bean family, native to many parts of Europe. It has yellow flowers and grows in heaths and sandy soil. Several species have been described, some of which are shrubs. The common broom is planted for its fiber and a yellow dye obtained from its flower. The *white broom* is cultivated in England as an ornamental shrub. It bears



white flowers and attains a height of twelve to fifteen feet.

**BROOM CORN** (kôrn), a name applied to two plants with jointed stems belonging to the order of grasses. The panicles of a species belonging to the *sorghum vulgare* are made into brooms for sweeping and clothes brushes. The seeds are valuable as food for cattle and poultry. It grows to a height of twelve to fifteen feet, and is cultivated very much like corn. There are numerous species, all of which are produced chiefly in America, where the annual production is valued at several million dollars. See **Sorghum**.

**BROTHERHOOD OF ANDREW AND PHILIP**, a society organized in 1888 by Rufus W. Miller, a pastor of the Reformed Church at Reading, Pa. Its purpose is to foster good will and Christian fellowship and to spread the Christian faith by enjoining its members to bring people within hearing of the gospel. To this organization belong many members of evangelical denominations. In 1908 it had 920 chapters and a membership of 32,000, and was promoted by organizations in the United States, Canada, Australia, and Asia.

**BROTHERHOOD OF SAINT ANDREW**, an organization of the Protestant Episcopal Church. It was founded in Chicago in 1883, at Saint James Parish. The object is to spread the kingdom of Christ among young men. Two departments are maintained, the *junior* and the *brotherhood*, and the local chapter is the unit of organization. In 1908 the junior department had 8,000 members and the brotherhood proper had 15,000. Pittsburg, Pa., is the headquarters. Organization work is promoted in all the continents.

**BROWN**, in painting, a dark color formed by a mixture of red and black, and then modified by a small addition of yellow. It belongs to the colors known as russets and olives, in which a black or a dark pigment modifies the hue. Umber, bister, and brown madder are among the brown pigments.

**BROWNSVILLE**, a city and port of entry in Texas, county seat of Cameron County, on the Rio Grande, opposite Matamoros, Mexico. It is on the Rio Grande Railroad, is surrounded by a stock-raising district, and has a large railroad and navigation commerce. Besides having good schools, it is the seat of Saint Joseph's College and Convent, a Roman Catholic institution. Among the chief buildings are the post office, county courthouse, customhouse, and town hall. It has manufactures of cigars, clothing, earthenware, and machinery. Electric lights and waterworks are among the public

utilites. It was settled in 1848 and incorporated in 1853. In November, 1863, it was captured by the Federals under General Banks. Population, 1900, 6,305; in 1910, 10,517.

**BROWN UNIVERSITY**, one of the oldest educational institutions in the United States, founded in 1764 at Warren, R. I., and moved to Providence four years later. It has sixteen buildings, eighty instructors, and about 1,000 students. Its productive fund is about \$1,800,000, with an annual income of \$250,000. The library has 112,500 volumes. Degrees in sciences, arts, and engineering are conferred. It is under the direction of the Baptist denomination, but the instruction is nonsectarian. The college known as the Woman's College of Brown University was established in 1891. Nicholas Brown, in whose honor the university was named, was its principal benefactor.

**BRUGES** (brū'jĕz), an ancient city of Belgium, capital of West Flanders, about fifty-six miles northwest of Brussels and eight miles from the sea. It is known in history from the 3d century and was the center of the world's commerce in the 12th century, when it had a population of more than 200,000, and carried on an extensive trade with all the leading countries known at that time. It is inclosed within walls, has been the seat of great military contentions, and was an important factor in the history of the Middle Ages. It is now a railroad and canal center, commerce reaching it by the largest sea vessels through three canals which connect it with the sea. However, it has lost much of its importance, alike from the standpoint of commerce, manufactures, and population. There are numerous modern improvements, including fine schools, rapid transit, and several libraries. It has a remarkable tower 354 feet high, containing a set of excellent chimes. Other important structures include the palace of justice, the Hôtel de Ville, and the Church of Nôtre Dame. The last mentioned is in the early Gothic style of architecture and contains the tombs of Mary of Burgundy and Charles the Bold. In the art galleries are many paintings and sculptures, including productions by Jakob van Oost, Hans Memling, and Cornelius van Dyck. It was the residence of the printer Caxton. Besides commercial interests, the city has manufactures of textile goods, laces, ornamental work, and machinery. The shipbuilding yards and breweries are extensive. Bruges belonged to the Netherlands from 1814 until 1830, and in the latter year was annexed to Belgium. Population, 1906, 53,486.

**BRÜNN** (brün), a city of Austria, capital of



Moravia, ninety miles north of Vienna. It is beautifully located at the confluence of the Zwittawa and Schwarzawa rivers, at the foot of Mount Spielberg, and is connected with Vienna and other cities by important railroad lines. The principal building is the Cathedral of Saint Peter and Saint Paul, built in the 15th century, and it has several other noted churches in the Gothic style. The manufactures embrace woolen goods, leather, chemicals, and machinery. A system of waterworks is owned and operated by the city. Many of the streets are substantially paved with stone and asphaltum. It is the seat of several schools and business colleges. The trade is chiefly in grain, live stock, cereals, and merchandise. Brünn was founded in the 9th century and became a free imperial city in 1278. Population, 1907, 112,346.

**BRUNSWICK** (brūnz'wīk), county seat of Glynn County, Georgia, on Saint Simon's Sound, twelve miles from the Atlantic Ocean, on the Southern and other railroads. It has a safe harbor and enjoys a growing navigation and railroad commerce. Among the chief buildings are the city hall, the post office, the county courthouse, and the Oglethorpe Hotel. The manufactures include furniture, canned oysters, ironware, flour, cigars, and machinery. The city has street railways, electric lights, and pavements. It is popular as a summer and winter resort. The first settlement was made by James Oglethorpe in 1735. Population, 1900, 9,081.

**BRUNSWICK**, a town of Cumberland County, Maine, on the Androscoggin River, and on the Maine Central Railroad. It has several fine schools and is the seat of Bowdoin College. The manufactured products include cotton goods, machinery, paper, flour, and leather. It has a public library, waterworks, street pavements, and a considerable trade. The first settlement was made in 1628, when it was known as Pejepscot, and it was incorporated in 1717 as Brunswick. Population, 1900, 6,806.

**BRUNSWICK**, an important city of Germany, capital of the duchy of Brunswick, on the Oker River, thirty-two miles southeast of Hanover. The principal buildings are the Church of Saint Magnus, built in 1031; Catharine's Church, 1172; the Cathedral of Saint Blaise, 1173; a Gothic council house; and the Gewandhaus. It is the seat of many fine schools, two museums, a public library, and a gymnasium. The manufactures include fabrics, machinery, clothing, sugar, and earthenware. Rapid transit, gas and electric lights, telephones, several parks, and waterworks are among the improvements. It was founded by Bruno, Duke of Saxony, in the 9th century and was enlarged

by Henry the Lion. For many years it was an important member of the Hanseatic League of cities. A large majority of the inhabitants are Lutherans. Population, 1905, 136,397.

**BRUNSWICK, Duchy of**, a state in Germany, surrounded by the Prussian provinces of Saxony, Hanover, and Westphalia. It has an area of 1,418 square miles. It belongs mainly to the basin of the Weser River, but the southeastern part includes ranges of the Harz Mountains, which rise to an altitude of 3,000 feet. The inhabitants consist largely of Saxons. They are almost entirely Protestants, and engage in agriculture, mining, and commerce. The mines yield copper, lead, iron, and coal, while the agricultural products consist of cereals, vegetables, and fruits. Large interests are vested in rearing live stock, in dairying, and in growing sugar beets. The manufactured articles include beet sugar, tobacco, paper, soap, fabrics, wine, and leather. It is penetrated by many electric and steam railroads, the latter of which belong largely to the state system of Prussia. Its government is a constitutional monarchy, the duchy having two members in the national Bundesrath and three deputies in the Reichstag. In the time of Charlemagne the region was a part of Saxony, but it became independent in 1235. It was annexed to the kingdom of Westphalia by the Treaty of Tilsit, but again became independent in 1813. In 1866 it sided with Prussia, joined the German Confederation in the same year, and since 1871 it has been a part of the German Empire. Brunswick, on the Oker, is the capital and largest city. Population, 1905, 485,958.

**BRUSA** (brōō'sā), or **Broussa**, a city of Asiatic Turkey, capital of a vilayet of the same name, about twenty miles from Mudania, its port on the Sea of Marmora. It is surrounded by a fertile plain, and in its vicinity are thermal springs noted for their medicinal properties. It has extensive manufactures of carpets and silk goods, which are exported to the commercial centers of Europe and Asia. It is a market for produce and merchandise and the seat of numerous mosques. Several sultans and Turkish nobles were buried in tombs in its vicinity. Brusa was founded by Prusias II., King of Bithynia, and anciently was known as Prusa. It was captured by Orkhan, son of Othman, the second Sultan of Turkey, in 1327, and made the capital of the Turkish empire, but later Amurath I. removed the capital to Adrianapolis. In 1402 it was captured and plundered by the Tartars. The inhabitants consist mostly of Turks. Population, 1907, 76,303.

**BRUSH TURKEY**, a large bird native to



Australia, noted for the peculiar manner in which its eggs are hatched. The nests are built by several pairs of birds uniting in doing the work. They are made of grass and other vegetable matter. The eggs are laid into the same



BRUSH TURKEY.

mass by several females, and remain there until hatched by the heat of its decay. When the young come out of the eggs, they make their own way out of the nest and support themselves. The brush turkey is about the size of a common turkey, and like it has wattles on its neck and head. About twelve species belong to this family of birds, which are sometimes called *mound birds*. They are hunted for their flesh, and when pursued fly into the branches of trees or escape by running through tangled brush.

**BRUSSELS** (brüs'selz), the capital of Belgium, in the province of Brabant, on the Senne River. It is one of the most beautiful cities of Europe. Rapid transit, gas and electric lights, waterworks, and pavements are maintained. There are railroad connections with many of the principal cities of the continent, and it is the center of an important and growing commerce. The older part is located on the site of former fortifications and has crooked and ancient streets, while the newer portion has many substantial structures and contains the newer residences and public buildings. The king's palace, the palace of justice, the palace of chambers, the palace of fine arts, and the public library and museum rank among the finest structures of the kind in Europe.

The city has many fine public boulevards, botanical gardens, and public parks, a number of which are adorned by monuments and statuary of prominent men. Its educational institutions include schools for all grades of instruction, and terminate in the University of Brussels. It has about 1,050 students. With it are connected an observatory, a conservatory of music, and a fine library. This library has over 400,000 vol-

umes and 31,500 manuscripts. The city contains a large number of learned societies which maintain departments of Flemish art, and scientific and philosophic courses. Among the ancient buildings is the Cathedral of Saint Gudule, a fine structure in the Gothic style. The Hôtel de Ville, built in 1450, is in the Gothic style and has a spire 364 feet high, surmounted by a gilt statue of Saint Michael, the city's patron saint. There are several historic monuments, including the equestrian statue of Godfrey of Bouillon. The Grand Place and the Place of Martyrs are among its many noted squares.

The industries of the city consist, besides commerce, of manufacturing and jobbing. The production of lace, cotton and woolen goods, and machinery are important. It has large distilleries, foundries, sugar refineries, and breweries. Its lace production has long been important and its manufacture of Brussels carpets has given it and its suburbs renown. The language spoken is French, German, and Dutch. The appearance of the city is modern, although it dates back to the Middle Ages. In 1044 a wall was built around it by Baldric of Lauvain, in 1380 it was strongly fortified, and in the 15th century it was ravaged by the plague and twice damaged by fire. The French bombarded it in 1695 and conquered it in 1794. Under French occupation it became the chief city of the department of Dyle. In 1815, after the defeat of Napoleon, it was made the capital of the Netherlands. After the revolt of 1830, Belgium was separated from Holland. Population, 1906, including a number of suburbs, 623,041.

**BRYN MAWR COLLEGE** (brīn mār), an educational institution at Bryn Mawr, Pa., about five miles west of Philadelphia, on the main line of the Pennsylvania Railroad. It was founded for the education of women by Joseph W. Taylor, a member of the Society of Friends, and opened in 1885. The grounds include a plot of fifty-two acres, laid out in lawns, and beautifully fitted with tennis courts, hockey grounds, and an athletic field. The college buildings are of gray stone in the Jacobean-Gothic style of architecture. In the library building, completed in 1907, are 55,000 bound volumes and 8,000 pamphlets. Full graduate and undergraduate instruction is offered in Greek, Latin, English, German, and other modern languages, and in Sanskrit, history, political science, philosophy, mathematics, physics, geology, chemistry, and biology. Eight competitive matriculation scholarships are awarded annually. It has a fund aggregating about \$1,250,000. Undergraduate students are admitted by examination. The faculty consists of fifty-five professors and in-



structors, who are carefully selected for the particular work assigned to them, and the students in attendance number about 450.

**BRYOPHYTES** (brī'ō-fīts), one of the four divisions of the plant kingdom, including the members which do not produce flowers. It is divided into two divisions, one including the mosses and the other the liverworts. The former have a vertical axis and a leafy body, while the latter have a horizontal axis and a thalloid body. These plants do not have true roots, and propagate largely by spores and a class of cells known as *elaters*. See **Mosses**.

**BUBASTIS** (bū-bās'tis), or **Bubastus**, an ancient Egyptian city, situated in the delta of the Nile, now ruined and called Tel Bast. It was so named from the goddess Pasht, whose festivals were the most important celebrated by the Egyptians. The ruins excavated show that the city had magnificent temples, solid fortifications, and extensive baths. It was the seat of a great commerce and the center of much wealth.

**BUBONIC PLAGUE**. See **Plague**.

**BUCCANEERS** (bŭk-kā-nēr'z'), a celebrated association of pirates who plundered the West Indies and the Spanish colonies of South America from the 16th to the end of the 17th century. They consisted mostly of French and English. Their occupation was largely that of seafaring people, and they united by common enmity against the arrogant pretensions of the Spaniards. They were first fortified on the Tortugas Islands, off the southern coast of Florida, but later divided, when the French established themselves in San Domingo and the English occupied Jamaica. The chief leaders of the French were Montbar, known as the exterminator, and the Welshman, Henry Morgan. They adopted a code of laws for their government and organized in bands to plunder the Spanish vessels as they returned from Europe to supply the colonies with provisions and manufactured articles. In 1670 they made attacks upon Panama, where they defeated the Spanish troops and secured considerable booty. They took possession of Vera Cruz in 1683, carrying off booty valued at \$2,500,000 and 1,200 slaves. Later Morgan became deputy governor of Jamaica, and for many years was a terror to navigation and the early settlements. In 1697 Cartagena was taken and prizes valued at \$8,000,000 were secured by the buccaneers. At the beginning of the 18th century they were lost sight of as common pirates and subsequently were exterminated or conquered.

**BUCEPHALUS** (bū-sĕf'ā-lŭs), the horse purchased for Alexander the Great in Thessaly, and which was his favorite steed in all his cam-

paigns. It is said to have cost sixteen talents, about \$20,000. It died in India from the effects of wounds received in a battle about 326 B. C., and the great commander built the city of Bucephala in its honor.

**BUCHAREST** (bŭō-kā-rĕst'), capital of Rumania and of the principality of Wallachia, on the Dimbovitza River, a tributary of the Danube. The chief buildings include the town hall, the royal palace, the university, and the palace of justice. Germans and Hungarians control the larger commercial interests. The city ranks as one of the largest centers of the Balkan peninsula. It has extensive manufactures, railroad facilities, a public school system, and a number of splendid edifices, although it does not hold a high place in learning and culture. Its principal growth and improvements date since the war between Russia and Turkey in 1878. Within recent years electric lights, telephones, and rapid transit have been introduced. Bucharest was founded in the 13th century by Radul the Black, of Transylvania, after the conquest of Wallachia. In 1595 it was captured by the Turks under Linan Pasha, and became prominent in European history in the early part of the 18th century. It was occupied by the Russians in 1828, taken by the Austrians in 1857, and made the capital of Rumania by the union of Wallachia and Moldavia in 1861. Population, 1907, 276,178.

**BUCKBOARD** (bŭk'bŏrd), a light vehicle with four wheels, so named because of its bucking or bouncing. It has a floor or platform of elastic boards, attached to the crossbar in front, fastened to the axle with a bolt, and connected with the hind axle by small bolts or rivets. This vehicle may have one or two seats, though a one-seated buckboard is the most common. It is a good conveyance for rough and rocky ground, and came into use when the Adirondack region was first visited as a resort.

**BUCKEYE** (bŭk'ī), the American horse chestnut. It is found widely distributed in the Mississippi valley, where it attains a large size. The tree has small flowers, strongly scented bark, and bears considerable quantities of large nuts in a prickly inclosure. Owing to its general prevalence in Ohio, that State is called the Buckeye State, and the inhabitants are known as Buckeyes. See **Horse-chestnut**.

**BUCKINGHAM PALACE**, a palace in London, England, one of the residences of the royal sovereign. It is located opposite Saint James's Park, and was built in the reign of George IV.

**BUCKTAILS**, a name familiar in the politics of the State of New York, which originated



from the fact that the members of the Tammany Society wore bucks' tails as badges. It came into use about the time of the War of 1812, when the Democratic party was divided into two factions, one headed by James Madison and the other by De Witt Clinton, who were rival candidates for President. When Clinton was elected Governor of New York, in 1816, those who opposed him were known as Buck-tails and his supporters were called Clintonians. The Bucktails gained control of the Democratic State organization under the leadership of Martin Van Buren, and the State administration was styled "Albany Regency."

**BUCKTHORN** (bŭk'thōrn), the name of a class of shrubs and trees common to Europe and America. The common buckthorn has serrated leaves and produces a berrylike drupe, containing seedlike nutlets. The berries are used as a cathartic, and the bark is employed in medicine and for making a yellow dye. The wood yields a light charcoal used in making gunpowder. Many species of this class of plants have been described. The *alder buckthorn* is common in Southern Europe, and grows to a height of from six to ten feet.

**BUCKWHEAT**, a plant native to Eastern

Europe and Central Asia. It was first brought to Western Europe by the Crusaders and is now extensively cultivated in many countries. Buckwheat is grown quite extensively in the United States and Europe, owing to its ability to yield abundantly without much attention, even on stony soil. The seed weighs about forty-eight pounds per bushel, and forty bushels per acre is a fair crop. It

flowers profusely, is a favorite plant for the honey bee, and is cultivated largely to feed bees. In Europe the seed is ground into flour and used for gruel, breakfast cakes, and bread. In Canada and the United States it is used extensively for cakes, which are considered a great delicacy for breakfast. The annual production in the United States aggregates 14,750,000 bushels, New York and Pennsylvania producing about two-thirds of the total yield. Canada is peculiarly fitted for the cultivation of buckwheat. Ontario, where the production is largest, has an annual output of about 2,750,000 bushels.

**BUCYRUS** (bŭ-sī'rŭs), county seat of Crawford County, Ohio, on the Sandusky River, about sixty-five miles north of Columbus. It is on the Pennsylvania and other railroads, and is surrounded by a fertile farming country. The chief buildings include the county courthouse, the high school, and the city hall. It has manufactures of brick, wagons, and machinery. In its vicinity are a number of valuable mineral springs. Many of the streets are paved with vitrified brick. It was first settled in 1818 and incorporated in 1829. Population, 1900, 6,560.

**BUD**, the germ of the future leaves, branches, or flowers of plants. When large enough to have its parts distinguishable, it is seen that the bud is formed of undeveloped leaves. Large buds that are to remain over winter are covered by protecting scales, within which the life of the plant is stored, much the same as the embryo in seeds. The plumule of the embryo is a bud that makes the main stem, which is carried on year after year by a bud called the *terminal bud*. The buds that are to form the branches appear on the side of the stem, at the axils of the leaves, and are called *axillary buds*. The leaf buds contain the rudiments of the leaves and are classed as *leaf buds* and *flower buds*, the flower being a modified leaf bud. Some of the lower animals propagate themselves by buds.

**BUDAPEST** (bŭ'dā-pĕst), one of the capitals of Austria-Hungary, the second largest city in the empire, located on both sides of the Danube River. It is the imperial capital of the kingdom of Hungary, and at one of the capitals of the dual empire it is of minor importance, since only the two delegations meet alternately here and at Vienna. Its name was derived from Buda and Pesth, formerly two cities, but since 1873 united as one municipality. The two parts of the city are united by many bridges across the Danube. It is the seat of an imperial residence, has excellent transportation facilities by the Danube River and a large number of important railroad lines, and is the cen-



BUCKWHEAT.

a b, flowers; c, seed.

flowers profusely, is a favorite plant for the



ter of a vast commercial trade. It ranks as one of the important cities of Europe, being a center of wealth, industry, and intelligence.

The electric street railway system is one of the finest in the world, which has, instead of trolley wires, conduits between the tracks from which the power is gathered off metal strips, and lines are operated on all principal streets. Andrassy Strasse, one of the thoroughfares, has an underground road. It is one of the most beautiful streets in the world, containing stone pavements and having tall and well constructed buildings on both sides. The new house of parliament is an excellent structure, and, besides it, there are the Jewish Synagogue, the Leopold Basilica, a magnificent royal palace, excellent public schools, and other buildings devoted to higher education, including colleges and universities. The library contains 480,000 volumes and 65,000 manuscripts. There are well improved boulevards, public baths, and healthful mineral springs. The botanical gardens and public parks are among the most beautiful, while its promenades and stone quays along the river are delightful. The University of Budapest has 250 lecturers and professors and is attended by over 5,000 students.

The chief manufactures consist of gold, silver, copper, and iron wares, leather, silk, and woolen goods, tobacco, beverages, and machinery. It is one of the largest milling centers of the world, and in this respect has long ranked second to Minneapolis, Minn. Its sulphur springs have attracted health seekers and excursion parties from all parts of Europe, thus rendering the city a gathering place for many visitors to its baths, as well as to its libraries and institutions of learning. The language spoken is largely German, but the city has a considerable Bohemian and Hungarian population. Buda for many years contained the larger population, but was surpassed by Pesth in 1799, since which time the latter has greatly outgrown Buda in every respect. At that time the two cities contained a total population of a little over 50,000. Buda was known to the Romans as Aquincum. It was made the capital of Hungary by Matthias Cörvinus in 1444. Pesth was founded by the Germans in the 13th century. It became the capital of Hungary after the *Ausgleich* of 1867. Since 1873 they have been united as one municipality. Population, 1905, 798,692.

**BUDDHISM** (bōōd'diz'm), the system of faith introduced or reformed by Buddha. It was effective in counteracting the caste system of the Brahmans and other Aryan invaders of India, and therefore fitted to become the religion

of the Turanians. It existed in India as the principal religion for more than a thousand years, but has been almost entirely supplanted by Brahmanism. At present it is the religion of Ceylon, China, Japan, Tibet, and Burmah, and is the great Turanian faith of the modern as of the ancient world. It has existed for more than 2,500 years and numbers as its followers from one-tenth to one-eighth of the entire human race. One of its most prominent doctrines is that *Nirvâna*, a state of absolute release from existence, is the highest good. It is held that pain is inseparable from existence, thus it can cease only through *Nirvâna*; and, to attain to this state, our desires and passions must be suppressed and the most extreme self-renunciation practiced, while personality must be entirely subordinated.

The principles of Buddhism are stated in the so-called *Four Great Truths*, namely: 1. That misery always accompanies existence; 2. That all modes of existence result from passions or desires; 3. That there is no escape from existence except by destruction of desire; 4. That this may be accomplished by following the four-fold way to *Nirvâna*. The four stages, called *the passes*, begin with the awakening of the heart, called the first; in the second stage one loses all impure desires and revengeful feelings; in the third, one becomes free from all evil desires, from ignorance, from doubt, from heresy, and from unkindness and vexation; the fourth stage is that of Buddha, or the perfect state. Among the laws of the faith are those that require fundamental virtues to be practiced by all men alike, including patience, courage, purity, charity, contemplation, and knowledge. The five fundamental precepts of the moral code are these: Do not kill; do not steal; do not commit adultery; do not lie; do not give way to drunkenness. The greatest virtue is benevolence.

*Nirvâna* is not reached until all the conditions necessary have been complied with. If these conditions have not been met with at death, an individual does not attain rest until he is fitted for *Nirvâna*. In that case he is born again as a person, a plant, a spirit, an animal, an insect, or as some other animated organism, from which state his soul transmigrates again and again until *Nirvâna* is eventually reached. In outward form Buddhism resembles some of the Christian churches in at least a few respects. The priests wear dresses and caps, construct monasteries, hold to celibacy, use bells, practice incense, use the rosary of beads, have lighted candles at the altar, have intonations in the service, believe in a purga-



tory, offer prayer for departed spirits, and pray in an unknown tongue. However, there is no similarity between the two faiths. The original teachings of the founder have been perverted and distorted by a number of disciples in various ages, and now lack many virtues formerly common to the faith.

**BUDDING**, a form of grafting in which a leaf bud is used instead of a young shoot. It is preferred for plants that throw out much gum when wounded, as the cherry, peach, plum, and apricot, and also for roses and flowering shrubs. It is done by cutting a bud from one plant and inserting it in some species closely allied. The bud is inserted into an incision, shaped like the capital T, in the stock of the allied tree, and then tied round by a ligature of matting. See **Grafting**.

**BUENA VISTA** (bū'nā vīs'tà), a small town in northeastern Mexico, in the state of Coahuila, noted for a celebrated battle between the American forces under General Taylor and the Mexicans under General Santa Anna. It was fought on Feb. 22 and 23, 1847, and the Mexicans were totally defeated, owing to poor generalship. The American army numbered 4,767 and the Mexican 17,000. The American loss was 648, while the Mexicans lost nearly 2,000.

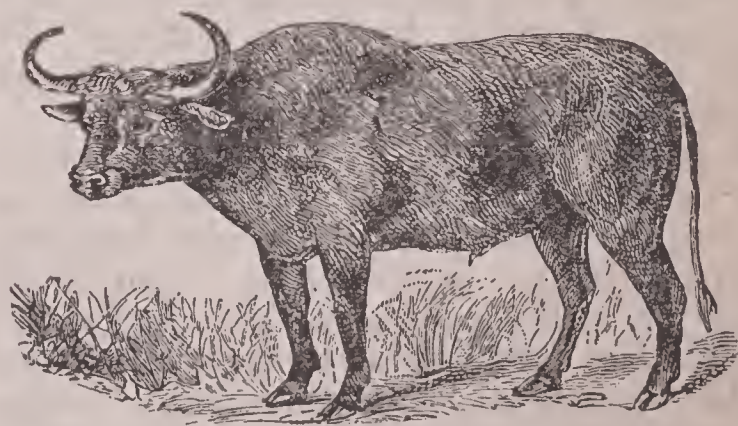
**BUENOS AYRES** (bō'nūs ā'rīz), an important city of South America, capital of Argentina, on the La Plata River, 160 miles from the ocean. The city is built on a modern plan with regular streets crossing each other at right angles. It is one of the most important trade centers south of the equator, and enjoys a large oceanic commerce. It is connected with the interior cities of South America by numerous railroads. The river is thirty-six miles wide at the city, and quite shallow, but has been improved for all classes of navigation by a vast system of harbor works. In 1887 alone the sum of \$20,000,000 was appropriated for harbor improvements, which has been expended to fit its wharves and dry docks for the largest vessels.

The city contains a general school system for free attendance, several colleges, and a central university with higher courses of study. The university is one of the best in South America and is attended by about 1,250 students. It is the seat of a fine cathedral, the Chapel of Santa Felicitas, a military college, the public mint, and government offices. The congress hall stands in a fine plot of sixteen acres and was erected in 1887 at a cost of \$8,000,000. About 200 periodicals are published in the city, principally in the Spanish, but a number in the French, German, English, and Italian languages.

It has several normal schools, a number of medical colleges, and a public library of 50,000 volumes. The city has 150 miles of electric street railway lines and extensive telephone systems, and is connected by cable communication with Europe and the United States. There are substantial stone and asphalt pavements, waterworks, several parks, and gas and electric lights.

The exports and imports are enormous, amounting annually to about \$285,500,000. They consist largely of live stock, tallow, hides, cereals, fruits, tobacco, and minerals. The manufactures are expanding rapidly, being stimulated both by local and European capital. Among the chief products are carpets, furniture, cigars, clothing, textiles, boots and shoes, machinery, musical instruments, and other articles of commerce. The city was founded in 1535 by Don Pedro de Mendoza. It was twice destroyed by the natives, but has grown steadily since 1580. In 1851 it seceded from Argentina and organized as a separate state, remaining independent until 1859, when it rejoined the Republic and became its capital. Population, 1906, 1,029,653.

**BUFFALO** (bŭf'fā-lō), an oxlike animal with long horns, found native in Asia and Southern Africa. The Asiatic buffalo is still found in a wild state in the jungles of India. From it the domestic kind now largely bred in Eurasia descended. It has short hair, is brown



CAPE BUFFALO.

on the back with a black head, and attains a height of seven feet. It is a better beast of burden than the ox, and the female yields a greater quantity of milk than the common domestic cow. In the wild state it is vicious, but when thoroughly domesticated it becomes gentle and docile. A species of this animal found in the Philippines is known as the *carabao*. The *Cape Buffalo*, found in South Africa, is larger than the Asiatic. It is famous for its vast horns, which start from a great bony mass at the head and often measure six or seven feet



from point to point. The hide of the buffalo is useful for boots and shoes, while the meat is regarded a wholesome article of food. In India these animals are trained for exhibition and used for dairying. The buffalo is fond of marshy places and seems to enjoy standing in the water during the warm days with only its head projecting. See **Bison**.

**BUFFALO**, the second city of New York, county seat of Erie County, at the eastern end of Lake Erie and at the head of the Niagara River. It is 20 miles above Niagara Falls and 410 miles by rail northwest of New York City. Fifteen great trunk lines of railway center at Buffalo, including the most important railroads of the eastern part of the United States and Canada, and it has additional transportation facilities by the Erie Canal, the Great Lakes, and urban and interurban electric railways. Among the chief railways are the New York Central, the Wabash, the Erie, the Grand Trunk, the Pennsylvania, the Lackawanna, and the Lake Shore and Michigan Southern. The site of the city gradually rises from the harbor to a height of 50 to 60 feet, and presents a view most beautiful from a distance on the lake. It is protected by an immense breakwater nearly a mile long, and its harbors are among the best on the Niagara and Lake Erie.

**DESCRIPTION.** The area of the city is 42 square miles, and the streets are broad and generally cross each other at right angles. Most of the pavements are constructed of asphalt, this class of paving having a length of 235 miles, and the total number of miles paved aggregate about 400. Main Street, which extends northerly from the lake front, is the principal business thoroughfare. At the center of the business district, which is near Lafayette Square, Niagara Street starts from Main Street, and is the main highway to Tonawanda and Niagara Falls. Lafayette Square, where a number of streets meet, is surrounded by large and substantial business buildings and contains the beautiful Soldiers' and Sailors' Monument. Delaware Avenue and North Street are the principal avenues of the fashionable residential district, and here and in many other places are fine homes surrounded by lawns and ornamental shrubs and trees.

Buffalo has numerous parks and other points of interest for those who seek the open air. At the place where the waters of Lake Erie form the Niagara, south of Fort Porter, is the Front, a tract of 45 acres, and near the State Insane Hospital grounds is Delaware Park, whose area is 365 acres. Humboldt Park consists of 56 acres, and in the south are the

three parks known as South Park, Stony Point, and Cazenovia Park. Forest Lawn Cemetery, a tract of 230 acres, is one of the numerous burial grounds of great beauty. Besides the Soldiers' and Sailors' Monument in Lafayette Square, are those of President Fillmore and Red Jacket in Forest Lawn Cemetery, and the fine monument dedicated in 1907 to President McKinley, who died in the city.

Buffalo is noted for its fine public school system, which includes kindergartens, grade and high schools, and a training school for teachers. It is the seat of a State normal school, the German Martin Luther Seminary, the University of Buffalo, the Saint Joseph's College, the Academy of the Sacred Heart, and many other institutions, including numerous denominational and parochial schools. The charitable and philanthropic institutions include a State insane asylum, an orphan asylum, the Home for the Friendless, the Church Home for Aged Women, Saint Mary's Asylum for Widows and Foundlings, and Ingleside Home for Erring Women. It has more than 175 churches, and these represent all the leading denominations. The municipality has two libraries, aggregating about 235,000 volumes, and in addition are maintained a number of libraries in the schools and colleges. The educational associations are well represented, including the Society of Natural Sciences, Young Men's Christian Association, Lutheran Young Men's Association, and numerous scientific and historical societies.

The United States government building is a substantial structure of gray stone, erected at a cost of about \$2,000,000. Other large buildings include the Chamber of Commerce, the city hall, the public library, the Fidelity Trust Company's building, the Ellicott Square building, the Grosvenor Library, and the Roman Catholic and Protestant Episcopal cathedrals. The Iroquois, Lafayette, Lenox, and Statler are among its larger hotels.

**INDUSTRIES.** Buffalo is preëminently a manufacturing and commercial city. This is due largely to the fact that its transportation facilities are very advantageous. A belt-line railroad encircles the city and furnishes facilities for intercommunication among the large number of trunk and branch lines, and enables transfers of freight with boats on the Erie Canal and steamships in its well-improved harbors. Though originally built for small tow-boats drawn by horses, the Erie Canal has been materially improved and will eventually furnish facilities for large vessels from the Atlantic by way of the Hudson River. The city has about fifty large grain elevators, including both trans-



fer and floating elevators, and is the largest market for wheat and flour in the Eastern States. The elevator capacity is sufficient for 35,000,000 bushels, equipped to enable handling 5,000,000 bushels of grain per day. It is the largest coal market and lumber port in the world. The storage capacity for coal is enormous, and its coal docks are sufficient to enable handling 30,000 tons a day. In the manufacture of iron and iron products it ranks next to Pittsburg. Among the manufacturing establishments are machine shops, soap works, carriage and wagon factories, shipyards, flouring and grist mills, stove works, distilleries, oil refineries, and breweries. Enterprise in manufacturing is facilitated greatly by electric power obtained from a large plant at Niagara Falls, which is brought through three circuits having a normal capacity of 30,000 horse power. It has a large trade in live stock, manufactures of all kinds, and merchandise, and is a center for both retailing and wholesaling.

**HISTORY.** La Salle was the first European to visit the locality. He landed at its site in 1679, and near the present city built the *Griffin*, the first ship to sail on Lake Erie. The first settlement was made by a trader in 1792, and the Holland Land Company purchased a tract of land and platted it into townships the following year. The work of surveying and platting was done by Joseph Ellicot, and he is regarded the founder of Buffalo. The village founded at that time was situated at the mouth of Buffalo Creek and named New Amsterdam, but it soon came to be called Buffalo. A force of British and Indians under Gen. Riall captured it in 1813 and much of it was destroyed by fire, but it was rebuilt in 1815. Its prosperity began with the completion of the Erie Canal in 1825, when it became the center of a large trade in produce and raw materials. Black Rock was annexed in 1853. It was the home of Millard Fillmore and Grover Cleveland, and the latter was its mayor in 1882. The Pan-American Exposition was held in Buffalo in 1901, at which President McKinley was assassinated. Population, 1905, 376,618; in 1910, 423,715.

**BUFFALO GNAT** (năt), a small insect found in the western section of the valley of the Missouri River and other regions. It attacks human beings and domestic animals, but differs from the mosquito in that it bites in the daytime. Swarms of these insects are most frequent when the sun shines brightly and there is no movement of wind. The bites are poisonous. The larva is aquatic and frequents well-aërated water.

**BUFFALO GRASS**, a short grass common

to the fertile soil of the western plains of North America, ranging from Texas to Alberta and Saskatchewan. It seldom grows higher than six inches, but is very important as pasture for domestic and wild animals, especially in the arid regions, to which it is best adapted. In the summer it covers the ground with a dense growth and turns brown at the first frost, but is eaten at all times of the year. It propagates by runners as well as by its seed. The male and female flowers grow on different plants.

**BUFF LEATHER**, a kind of leather made originally from the skin of the buffalo, but now chiefly from light hides of cattle. It is naturally of a light-yellow color, but is sometimes bleached white or tanned and stained a dull yellow or dark brown. When dressed with oil, it becomes soft and does not easily crack or rot. It is used for making belts, gloves, pouches, and cartridge boxes.

**BUG**, the name used frequently in describing the species of insects belonging to the order *Hemiptera*. The mouth is fitted for piercing and sucking, being in the form of a beak, and most of the species feed on the juices of plants. Some of these insects, such as the louse and bedbug, partake of animal fluid as well as that of plants. The cochineal and lac-dye insects, which belong to the bug family, secrete fluids valuable in commerce. The chinch bug, aphid, squash bug, and green bug are among the pests that destroy plants.

**BUGGY**, the name of a four-wheeled vehicle, either with or without a top or hood. The name is one of the *Americanisms*, and describes a vehicle called a *cart* in England, while cart in the United States is properly a vehicle with two wheels. Buggies are fitted for one horse, and are intended for light driving.

**BUGLE** (bū'g'l), a musical instrument made of brass or copper, used chiefly for signals. The bugle is the signal horn for the infantry, and has a shorter tube than the trumpet, which is used more generally for the cavalry. Bugle and trumpet calls remind the soldier in time of peace of daily routine duty, and in war they serve to direct and guide the marches and movements of troops.

**BUILDING.** See *Architecture*.

**BUILDING AND LOAN ASSOCIATION**, a society organized to promote interest in the accumulation of savings, and to provide facilities to secure the use of money at reasonable rates for those who desire to build homes. Associations of this kind are usually organized as private corporations, and are known by various names, such as coöperative banks, mutual loan associations, building societies, home aid



associations, etc. They may be classed under two general terms, the *mutual* and the *proprietary*. Mutual societies receive deposits from individuals, who become stockholders to the extent of their deposits. Those who wish to invest in land or erect a building borrow the amount needed and give a mortgage on the property, and, when the amount of deposits equals the sum borrowed plus the interest, the stock is surrendered and thus cancels the debt. Proprietary societies pay interest on deposits and loan money for building purposes, secured by mortgage and repayable by monthly installments. When the total installments amount to the loan plus the interest, the indebtedness is canceled. In this class of associations, the profit to the company depends upon the difference in the rate charged those who borrow and that paid to depositors. Building associations were organized in Great Britain and Germany in the 18th century, and in America they date more largely from the last century. All of the states, provinces, and nations in which they are promoted have laws regulating the transaction of business, intended as a safeguard to the people who put their savings into such organizations.

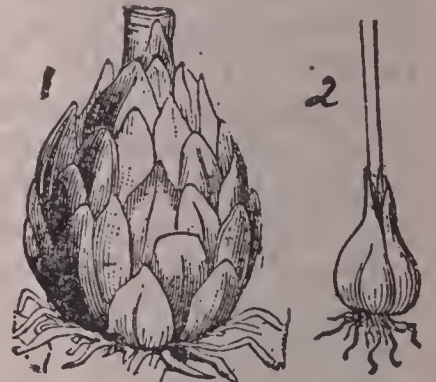
**BUILDING STONE**, any stone suitable for the construction of buildings or fitted for structural engineering. Many varieties of stone present a beautiful appearance in the quarry, but their composition is such that they disintegrate rapidly from the action of air and moisture. The disintegration may affect the appearance by reason of discolorations, or it may soften or dissolve the stone to the extent that the structure becomes unsafe. Stone of a porous nature, such as soft limestone, readily absorbs water, and it is greatly damaged by freezing and thawing. While material of this class may be suitable for the interior walls, it is not advisable to use it for exteriors. Some grades, especially those that contain iron, become discolored from the action of moisture.

The best building stones may be classed as fragmentary, calcareous, and crystalline siliceous rocks. Among the fragmentary rocks used in building are sandstone and slate. Sandstone is composed of grains of sand, either rounded or angular, and held together by a cementing material, such as silica or carbonate of lime. The color depends upon the nature of the cementing material. In gray sandstone the cementing material is carbonate of lime, in white colored stone it is silica, and in brownish or reddish stone it is mixed with oxide of iron. Slate is used largely in roofing and for floors. The calcareous rocks include the limestones and

marbles, and in color vary as much as sandstones and for the same reason. Granite is the most familiar example of crystalline siliceous rock, and is one of the most durable and valuable building materials. It is quarried extensively in Canada, especially near Kingston, Ontario; near Victoria, British Columbia; near Saint George, New Brunswick; and near Shelburne, Nova Scotia. Quarries are worked in the United States at Berry, Vt.; Saint Cloud, Minn.; Concord, N. H.; Westerly, R. I.; Richmond, Va.; and many other localities. Granite ranges from dark red to light gray, and includes many shades of bluish and dark brownish colors.

**BULACÁN** (bōō-lā-kān'), a town of the Philippine Islands, on the Island of Luzon, twenty miles northeast of Manila. It is conveniently located on a small river, and is surrounded by a fertile country, which produces sugar cane, rice, and tobacco. The buildings consist mostly of native huts. It was important as a military point and the scene of several insurrections during both the Spanish and American occupation of the islands. Population, 13,800.

**BULB**, in botany, a broad imbricated bud, either above or beneath the surface of the ground, having roots beneath and the stalk and foliage above. The leaves or scales with which it is clothed are thickened by the deposition of nutritive matter, stored for the future use of the plant. It differs from the tuber, which is the enlargement of a subterranean branch and forms the fruit or seed. Some plants have bulblets, or small aerial bulbs, as in some kinds of onions. Among the chief bulbous plants are the tulip, onion, and common lily.



BULBS.

1, Meadow Lily; 2, Tulip.

**BULGARIA** (bōōl-gā'rī-à), a principality of Europe, in the eastern part of the Balkan Peninsula. It is situated between north latitude 41° 30' and 44° 15' and east longitude 22° 30' and 28° 30'. It is bounded on the east by the Black Sea, south by Turkey, west by Servia, and north by Rumania. Most of its northern boundary is formed by the Danube River. The area of Bulgaria proper is 24,280 square miles, and of Eastern Rumelia 13,800, or a total of 38,080 square miles.

**DESCRIPTION.** Bulgaria is a mountainous



country, traversed by the Balkan Mountains. In the southwest corner of Rumelia are ranges of the Rhodope Mountains, between which are deep valleys isolated from each other except by elevated passes. The Balkans include Vitosha, 7,517 feet, and Musalla, 9,610 feet, which are the highest summits. The ranges of the southern section are less elevated.

Most of the drainage is into the Black Sea, chiefly by the Danube and its tributaries. The confluents of the Danube include the Lom, Vid, Osma, and Ogost. Those flowing into the Black Sea direct include the Devna and Kamtchik. The Maritza and Struma flow southward into the Aegean Sea. Its eastern boundary is indented by the Gulf of Burghas, an inlet from the Black Sea.

The climate is healthful and quite pleasant, though a district subject to malaria extends along the Black Sea. It may be said that Bulgaria has a somewhat colder climate than Eastern Rumelia, since the elevated Balkan Mountains obstruct the passage of breezes from the Mediterranean. In Bulgaria the climate ranges from eight degrees below zero to ninety above, with an average temperature of about 50°. Forests cover the mountains, but the valleys are mostly treeless. Among the wild animals are the deer, bear, boar, and many species of wild fowl.

**INDUSTRIES.** Agriculture is the chief enterprise, and the land is subdivided in small holdings among the peasants, who pay a nominal rent to the government, to which most of the land belongs. About twenty-five per cent. of the land is under cultivation and fifty per cent. is in pasture. Corn and wheat are the chief products, and next of importance are barley, rye, oats, and vegetables. Grapes are grown extensively. The government has control of all the minerals and operates the mines. Coal is the chief mineral product, but other minerals of value abound, including lead, copper, zinc, cobalt, and petroleum.

The Danube is important as an avenue of transportation. A number of its tributaries have been improved and canals have been constructed, which, together with the Black Sea, afford considerable shipping facilities. The railroad lines aggregate about 1,200 miles, most of which are owned and operated by the government, and telegraph and telephone lines connect the business centers with the cities north and south. Bulgaria has nine river ports and seven seaports, which are the seat of most of the trade. The exports are somewhat larger than the imports, and foreign trade is chiefly with Austria-Hungary, Germany, Great Britain, France, and Turkey.

**GOVERNMENT.** Bulgaria is a constitutional monarchy. Chief executive power is vested in the sovereign, and legislative authority is vested in him and the national assembly, or *sobranje*, which consists of deputies elected by universal manhood suffrage. The sovereign is assisted by a ministry responsible both to him and the assembly. For the purpose of local government it is divided into twenty-two *okrugs* and these are subdivided into eighty-five *okolics*. An obligatory school attendance law is enforced quite generally, and the school system includes both grade and high schools. Special and technical schools, gymnasia, and the University at Sofia comprise the facilities for higher educational work. The Greek Catholic Church is recognized by the state, though a considerable number of the inhabitants are Mohammedans and Jews.

**INHABITANTS.** The people of Bulgaria belong to the southern branch of the Slavic stock, and are made up of several more or less closely related branches, of which the Teuto-Slavic, Teutonic, and Finno-Tartaric are the most numerous. Some Greeks and Mussulmans are included, though the percentage is not large. The language is of Slavic origin and consists of the old and new dialects, the former being the richer and more generally spoken. Sofia is the capital of Bulgaria proper and of the principality, while Philippopolis is the capital of Eastern Rumelia. The former is the largest city and chief commercial and intellectual center. Other cities of note include Varna, Burghas, Shumla, and Rustchuk. In 1905 the population of the country was 4,035,623. This number included 497,818 Turks, 83,942 Rumanians, 69,757 Greeks, 94,649 Gypsies, and 36,455 Jews.

**HISTORY.** The history of Bulgaria is intimately connected with the early history of Eastern Europe. Most of the early occupants came from the banks of the Volga and overran the country in the 6th century. They built up a strong central government and for some time ruled Epirus, Thessaly, Albania, and Macedonia, and looked forward to the founding of a great Slavonic empire. However, they were conquered soon after the rise of the Byzantine Empire, and later fell under the dominion of the Turks, which caused them to lose much of their civilization, and their national spirit was broken. A new spirit of nationality rose about the middle of the 18th century, when they established newspapers, developed literature, and founded schools and colleges, but the Turks, jealous of their development, continued to hold them under subjection. The wholesale slaughter of Christians in 1876 by the Turks aroused the



spirit of Christian Europe. Russia soon after occupied the region with an army to defend them against the onslaughts of the Turks, which resulted in the War of 1878 and the final treaty of peace at Berlin.

Bulgaria was now made an independent state, with the condition that the choice of its chief ruler must be concurred in by the powers of Europe and Turkey. Prince Alexander of Battenburg was elected sovereign in 1881 and was authorized to convoke a constitutional convention to be promulgated in 1888. Two years previous to this he was kidnapped and compelled to abdicate on account of Russian hostility to him and to his followers. However, he was in touch with the spirit of the Bulgarians and only abdicated to avoid complications with Russia. In 1887 the vacant throne was filled by the election of Prince Ferdinand of Saxe-Coburg, youngest son of Prince Augustus of Saxe-Coburg. Eastern Rumelia was united to Bulgaria proper in 1885, which resulted in a war with Servia, but the latter power was defeated. In 1908 the *sobranje*, under the guidance of Prince Ferdinand, declared the country independent of Turkey and the latter assumed the title of Czar of Bulgaria. This action caused extended diplomatic complications, but the country maintained its autonomy.

**BULL**, or **Papal Bull**, an edict or decree of the pope, equal to the proclamations of secular sovereigns. The bulls are written in Latin for most countries, and are transmitted to the churches that recognize the pope as their head. The first words of the text usually designate the character of the contents. They are written on parchment, and those issued as a favor have a leaden seal appended by means of a silken cord, but those issued as a matter of justice have the seal attached with a cord of hemp. Edicts issued by secular sovereigns were formerly called bulls. The most important of these was the *Golden Bull* of Charles IV., Emperor of Germany, issued in 1356, which fixed the laws to regulate the number and privileges of electors and to govern the election of emperors.

**BULL**, **John**, a name used as a popular synonym for the English people. It originated in 1712, when Arbuthnot published his satire, "The History of John Bull," to intensify the feeling against the war with France and to ridicule the Duke of Marlborough.

**BULLDOG**, a kind of dog that has been bred as a distinct race for centuries. It is characterized by its thick, short, flat muzzle, a projecting under jaw, thick lips, half-pricked ears, flat forehead, and low but thick and strong

body. It is a good watchdog on account of its activity, courage, and intelligence. The *bull terrier* is smaller than the bulldog, and is a cross between the bulldog and the terrier. Formerly the sport of bull baiting was practiced in England. It consisted of blowing the nose of a bull full of pepper and setting bulldogs upon him, one at a time. The sport consisted chiefly in seeing the dogs tossed.

**BULLDOZE** (bul'dōz), a word derived from the practice of punishing those who, in 1876, were stealing and killing cattle in Louisiana. The punishment was with a bull whip and a dozen lashes were called a dose, hence the word bulldoze. In the same year it was applied in the political campaign, when some of the Negroes were prevented from exercising the elective franchise by *bulldozing*. The term now signifies to overawe, to silence by threat, to terrify.

**BULLET** (bul'let), a projectile discharged from a rifle and other small arms. Bullets are made chiefly of lead, and those intended for smooth bore arms are usually spherical, and those for rifled arms are elongated with the apex rounded or conical. Formerly bullets were cast, but now they are made largely by being stamped in steel dies. Copper-covered bullets poison a wound and are not favored in modern warfare.

**BULLFIGHT** (bul'fit), the national game of the Spanish and Mexicans. It was introduced into Spain by the Moors, and has continued popular ever since. The bullfighting season begins in April and ends in November. Bullfights take place in a kind of arena or circus. In most cases the fighters mount a horse, and, armed with a sword or lance, they worry the bull until he is killed. Often a horse is killed by the infuriated animal, when the fighter mounts another or combats with the animal on foot. In the larger cities where bullfighting is practiced regularly each season, there are three classes of fighters. They consist of the *picadores*, who are on horseback; the *banderilleros*, who are on foot; and the *matadors*, or the killers. When a bull has been killed, he is dragged away and another is brought from the stall into the arena. Nearly all Spanish cities have places to carry on these games, which are attended by thousands of people. In early history the game was popular in Greece, Rome, and other countries, but it was forbidden by the popes and later emperors, and was abolished by Charles IV., but was reinstated by Joseph Bonaparte, brother of Napoleon. At the great games of Madrid, in June, 1833, over a hundred bulls were killed in a single week.



It is still popular in Mexico and Spanish America.

**BULLFINCH** (bul'fīnch), a bird of the finch family. The male has a black tail, throat, bill, and head; the back is bluish-gray and the breast is red. It is nearly seven inches long. The female is less brightly colored. These birds feed on moss and buds of fruit. They are prized for their song and can be taught to sing musical airs. The bullfinch is found in Europe and on the islands adjacent to its coasts. Allied species inhabit Asia and one is found in Alaska.

**BULLFROG** (-frōg), a large aquatic frog widely distributed in Canada and the United States, but most abundant in the warmer regions. The larger species are common to the Southern States, and are found more commonly in marshes and swampy lands. The voice is a deep bass, loud and coarse, from which the name was derived. They feed on worms, insects, and crustaceans, and the larger species eat other frogs and young birds. The hind legs are edible and considered a delicacy.

**BULLION** (bul'yūn), the term used to describe uncoined gold or silver which has been reduced to the standard fineness of the coinage of a country. It is sometimes employed to designate these metals whether they are coined or uncoined, and is likewise applied to old or foreign coin held for recoinage. In England it is quite common to report as bullion the metallic reserve held in banks, but such money is more generally referred to as coin in the United States.

**BULL RUN**, a small stream in northern Virginia, a tributary of the Potomac through the Occoquan River, which was the scene of two great battles of the Civil War. The first was the great battle that took place on July 21, 1861, between McDowell, commanding 28,000 Union soldiers, and Beauregard and Johnson, leading 31,000 Confederates. The battle commenced early in the morning, the advantage remaining with the Federal forces until noon. They had crossed Bull Run and attempted to displace the enemy's left, but the Confederates received reinforcements in the afternoon and led a vigorous attack upon the Union forces, causing them to retreat in confusion and disorder, the panic reaching as far as Washington. The Confederates lost 2,000 men and the Union loss was about 2,800. Jackson rendered valuable services to the Confederate side and was named "Stonewall" ever after. The battle had an encouraging effect upon the South, and clearly demonstrated that the war would be a long struggle instead of a skirmish

of several months, as formerly supposed by the people of the North.

The second battle of Bull Run occurred Aug. 29 and 30, 1862. The Confederate forces were commanded by Jackson, who was awaiting reinforcements at Bristoe Station, and the Union army, consisting of 40,000 men, was commanded by General Pope. McDowell was dispatched to intercept Lee's conjunction with Jackson, but was recalled to join Pope. Jackson then moved to Manassas Junction and took a strong position near Gainesville behind an old railroad grading. The Union attack was led by General Sigel at daylight on August 29. The battle raged furiously in the forenoon, Pope expecting McDowell and Porter to join with reinforcements. However, the afternoon arrived, but Porter never came. The fighting ceased at night and was resumed the next day, but Pope's troops were so wearied that he was compelled to retire. Porter was afterward court-martialed for his conduct during the battle and dismissed from service. The losses, though never accurately determined, were heavy, about 9,500 for the Confederates and 14,500 on the side of the Federals. Lee took the aggressive immediately after the battle and invaded Maryland.

**BULL TROUT**, the name applied to certain species of fish belonging to the salmon family. They are fine game fish and are frequently mistaken for the salmon, from which they differ in having a body somewhat thicker than that of the salmon. The bull trout of England is found in large numbers in the mouths of rivers and approaches the salmon in size and habits. In some sections of the Rocky Mountains, where a fine species is abundant, it is considered a fine game fish, but is more popularly called the *Dolly Varden Trout*.

**BULRUSH** (bul'rūsh), the popular name of an aquatic plant. It is rushlike or reedlike, with a cylindrical stem growing from two to ten feet in height. In many species the sheath bears a small awl-shaped leaf, and the culm is tipped with an erect and pointed leaf. The roots are,



BULRUSH.



creeping and have astringent and diuretic properties useful in medicine. In some species the flowers are compound, with small spikes on their sides. The stems and leaves are the most useful parts of the plant, since their toughness renders them of service in thatching and for making chair bottoms and mats. The bulrushes are common to the rivers and ponds of many sections of America and Eurasia. Large tracts of Southern Asia are noted for a prolific growth of these plants, where they are used quite extensively by the natives for thatching cottages.

**BUMBLEBEE** (bŭm'b'l-bē), or **Humblebee**, a large bee found in nearly all parts of the world, except New Zealand and Australia. It has a hairy body and the tibiae of the hind legs terminate in two spines. The community ranges from fifty to two hundred. A large number of species have been described, most of which select as a nest some hole in the sod, frequently a deserted mouse nest, or an opening between rocks or in a log. About half of a colony are workers and the remainder are males and females. Rude cells are built by the workers, in which the honey is deposited and at the end of the season all except a few females die. In the spring the fertilized female gathers a mass of pollen and honey and deposits her eggs, and the scant store of honey is laid up by the workers as they mature, while the mother bee confines herself to the task of increasing the numbers of the colony. The females are longer than the males and workers, and they live together in the same colony without attacking each other. These bees are not valuable except that they fertilize plants, and some species of clover depend for their fertilization exclusively upon these insects. This fact has caused the bumblebee to be introduced in Australia.

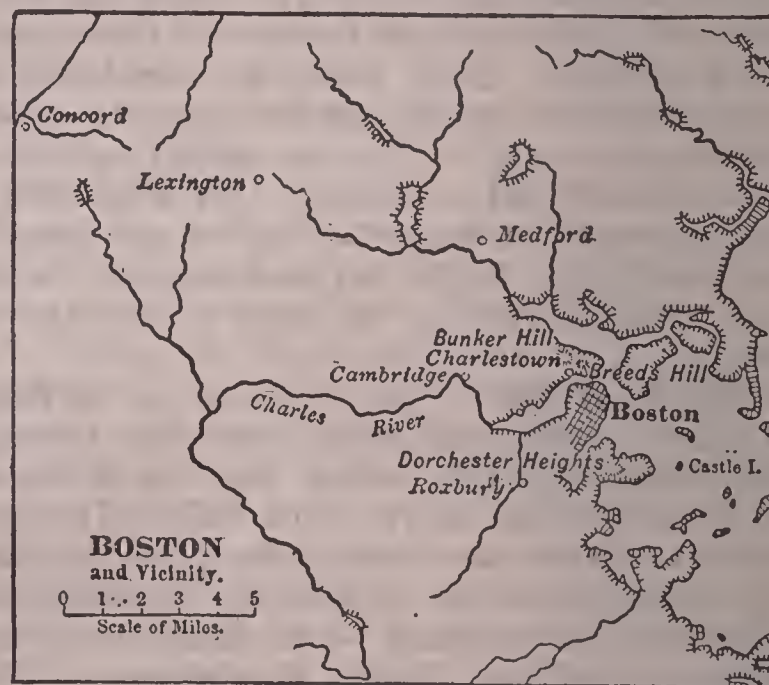
**BUNDESRAT** (böön'dēs-rät), the federal council of the German empire which represents the individual states, the nation being represented by the Reichstag. It is mainly a confirming body, but has power to reject measures passed by the Reichstag. The imperial chancellor is presiding officer and the members from each state vote as a unit.

**BUNGALOW** (bŭn-gā-lō'), the name of a kind of house built in the interior of India. It is of light construction, one-storied, and usually of sun-baked brick. The roof is thatched or tiled, and extends some distance over the walls so as to prevent them from becoming excessively wet during a rain. Bungalows are constructed for officer's quarters and by many Europeans, who furnish them elegantly. In some parts of India, where the country is not

well settled, structures of this kind are erected and maintained by the government for the benefit of travelers, who are charged a small fee per day when they occupy them.

**BUNION** (bŭn'yŭn), an inflammation and enlargement of the membraneous sack situated over the metatarsal joint of the great toe. It is caused by pressure, hence may be attributed to a tight or badly fitting boot or shoe. The attack begins with a small spot and gradually enlarges, and may be overcome by rest and poulticing. It is advisable to wear a shoe that will protect the bunion against pressure.

**BUNKER HILL**, a small elevation in Charlestown, now connected with Boston, Mass., the site of the famous Battle of Bunker Hill. The battle occurred on June 17, 1775, between the British, commanded by Generals Clinton, Howe, Burgoyne, and Gage; and the American army, by Generals Ward and Putnam, Colonel Prescott, and Major Brooks. The British army occupied Boston with 10,000 men and intended to occupy Bunker Hill and fortify themselves on the neighboring heights. The American army consisted of 15,000 men stationed at Cambridge.



MAP SHOWING BUNKER HILL AND THE VICINITY OF BOSTON.

Hearing of the intention of the British, the Americans hastened to fortify Breed's Hill, near Bunker Hill, and were attacked by the enemy from their ships and batteries in Charlestown harbor. They advanced upon the Americans from Morton's Point, who withheld their fire until the British were close upon them, when they made a vigorous defense and repulsed the British with great loss. A second unsuccessful attack was made, and soon after followed the burning of Charlestown. The British led a third attack and were resisted by the



Americans with stones and the butts of their rifles, on account of their ammunition being exhausted, but the latter finally withdrew from the scene of battle with small loss. The Americans lost 308 wounded, 30 prisoners, and 116 killed, among them General Warren. The British loss was 1,054. The Battle of Bunker Hill, although unfavorable to the Americans, was really a victory in that it taught the lesson that the patriots were fired with a great cause and that the British could be defeated. They were greatly encouraged in spirit and a general respect for their soldierly ability was inspired.

The Bunker Hill monument is located in the center of Breed's Hill. The corner stone was laid June 17, 1825, by General Lafayette in the presence of an enormous and enthusiastic crowd, among them many survivors of the battle fought fifty years before, who had gathered from far and near. After singing "Old Hundred," Daniel Webster delivered his famous address. The monument was completed June 17, 1843, when Webster delivered another address before a large audience, among them President Tyler and a number of his cabinet members. This monument is of beautiful granite, 221 feet in height. The chamber at the top is reached by a spiral stairway.

**BUNKER HILL MONUMENT.** See **Boston; Bunker Hill.**

**BUNTING** (bŭn'ting), the name of several birds native to Asia and Europe. It resembles the finches, but differs from them mainly in having a bony knob on the palate, which is an enlargement of the dentary edges of the bill. The *snow bunting* is common to the colder regions, and the *common* or *corn bunting* is seen in England and continental Europe in the fields, where it gathers food. About twelve species have been described, and to these may be added a large number of birds very closely allied in habits and structure. They gather in flocks on the approach of winter and move toward the warmer regions, and in the spring go far north to breed. The *cowbird*, or *cow blackbird*, is a familiar bird of North America of this class. See **Cowbird.**

**BUOYS** (bwói), the floating bodies that are fastened or anchored at a point near the location of reefs, shoals, or other dangerous objects in or near harbors as a safeguard in guiding ships. They are usually painted in bright colors, as red and white, so they may be easily seen. A class known as *whistling buoys* have an apparatus which is acted upon by the movement of the waves, causing compressed air to escape through a whistle. In recent years electric incandescent lights were introduced.

Buoys of this class are connected by wires with the shore, and are securely anchored by means of wire-rope moorings. Formerly large steamers could sail into harbor only in daytime, but with the use of electric buoys they pass safely at night. The lights used are of 100-candle power, and are fastened to cedar buoys anchored with 5,000-pound weights. Charts are made of the harbor, on which are shown the location and the special information to be conveyed by the buoys. These charts are placed in the hands of navigators for their instruction when entering or leaving the harbor. The Germans have invented and extensively use an electric life buoy. It is supplied with a storage battery that casts a light over a mile for six hours. It has proved of much value in the life-saving service.

**BURBOT** (bŭr'böt), a fresh-water fish of the cod family, the only representative of that class of fishes which does not enter salt waters. In appearance it resembles the ling, having an elongated form and a broad head. The skin is covered with imbedded scales and the mouth is large. It has two small barbels on the nose and a larger one on the chin. It inhabits the streams and lakes of North America, from Canada to Mexico, and is sometimes called *eelpout*, *coney fish*, and *fresh-water cod*. Several species closely related are well known in the United States, where they grow to a weight of twelve pounds, but the species of Europe are somewhat smaller.

**BURDEKIN** (bŭr'dĕ-kĭn), a river of Australia, in the northeastern part of Queensland. It rises in the Gilbert Range of the Australian Alps and flows southeast until it is joined by the Belyando River, when it turns abruptly and flows almost due north into Upstart Bay, an inlet from the Pacific Ocean. It is about 350 miles long.

**BURDOCK** (bŭr'dök), a coarse-looking weed with hooked flower heads that adhere to the wool of sheep, the hair of other animals, and to clothing. By these means the ripened seeds are widely distributed. It is regarded troublesome in Canada and the United States, but in some countries is cultivated for food. The roots and young shoots are the edible parts. It yields medicine useful for rheumatism and cutaneous diseases.

**BUREAU** (bŭ'rô), in government, a department of public business requiring a force of clerks, who labor under the direction of a chief. The term is confined to inferior and subordinate departments of England and the United States, such as the pension bureau, but most governments on the continent of Europe apply the term to the higher departments, as the bu-



reau of the minister of foreign affairs. In Russia the administration is carried on through a series of officials, each of which is at the head of a bureau, and from this has arisen the term *bureaucracy*.

**BUREAU OF THE AMERICAN REPUBLICS**, a bureau maintained in the United States with the view of collecting and distributing commercial information concerning the republics of America. It was established under the recommendation of the Pan-American Conference held at Washington in 1889, of which James G. Blaine, then Secretary of State, was the president. It is controlled by the Department of State and the chairmanship of the executive committee is vested in the Secretary of State. The general director of the Bureau of the American Republics has charge of its business and must be a citizen of the United States, but the executive committee is made up of one representative for each country that has membership in the union. The bureau is supported by the several American republics in proportion to their population.

The bureau continues to publish monthly bulletins of general information relative to commerce, resources, and political matters of general interest. A series of useful handbooks are issued as well as directories and bulletins treating of the patent, copyright, land, mining, and tariff interests of the countries concerned. In 1905 the members from the United States took position with those who favored a reduction of tariffs on some articles and reciprocity in trade, which, if successfully carried out, would no doubt increase the trade among the American republics.

**BURGOS** (bŭr'gŏs), a city of Spain, capital of a province of the same name, 130 miles north of Madrid. It is on the Arlanzon River, near the Sierra de Oca, and has railroad and electric railway facilities. The surrounding country produces cereals and fruit, and it is important as a market for wool, merchandise, and machinery. Hat making and weaving are among the chief industries. It has a Gothic cathedral founded in 1221, and contains the tombs of Cid and Don Fernando, who resided at Burgos. It was the capital of the kingdom of Castile until 1087, when Alfonso VI. removed the seat of government to Toledo. Population, 1905, 31,425.

**BURGUNDY** (bŭr'gŭn-dĭ), once an independent kingdom of Europe, but now included chiefly in the French provinces of Yonne, Côtê-d'Or, Ain, and Saône-et-Loire. The ancient Burgundians were a Germanic tribe that settled on the banks of Vistula and Oder, and afterward

spread to the Rhine and Neckar. In the year 407 A. D. they penetrated into Roman Gaul. Their kingdom was divided about 451, after a defeat of their King Gundicar by Attila the Scourge. In 534 they were conquered by the Franks, but a portion of their country became independent in 832. They again became powerful in 930, but in 1038 were annexed to the German Empire. Subsequently a number of changes in the ruling dynasties occurred which passed the title of their domain to various rulers. A portion of the region passed to Austria by the marriage of Mary of Burgundy to Maximilian, and a large part was acquired by Louis XI. as a male fief of France.

The first dynasty of Burgundy included twelve personages, who succeeded each other and ranked among the most powerful princes of their time; most of them were friendly with the kings of France. After the extinction of their line, the ruling influence passed to Philip the Bold, son of the French King John, and from him to his three successors: John the Fearless, Philip the Good, and Charles the Bold. These three sovereigns ranked among the most famous characters in the history of their time. During the reign of the last two mentioned, Burgundy included the Netherlands and several other countries.

The region included within Burgundy is fertile and productive. It is now penetrated by many railroads and contains the cities of Chalon-sur-Saône, Dijon, and Macon. The department of Côtê-d'Or is noted for its large output of Burgundy wines, which are celebrated for their rich flavor and delicate qualities.

**BURIAL** (bĕr'rĭ-al), the disposal of the bodies of the dead. The disposition of the dead and the funeral rites differ greatly. They are influenced more or less by the state of civilization and the moral and religious sentiments of the people. A natural tenderness is felt for the bodies of those who were dear in life, from which fact the mode of burial has been greatly influenced, and the need of removing from sight the body after life has departed has caused the subject to be considered with concern and interest. The pagan Greeks and Romans had elaborate burial ceremonials, and from them came the practice of three-fold sprinkling with earth, which is now practiced extensively when the casket is lowered in the grave or set in the tomb. The three principal methods practiced by mankind are *mummification*, *incineration*, and *interment*.

Many savage people expose the body of their dead to be devoured by animals and birds of prey, a custom still in vogue among the Bush-



men and other natives of Australia, who expose their dead in the limbs of trees. In India many bodies are thrown into the Ganges River, which the Hindus consider sacred as a stream flowing toward immortality. Mummification was the chief method in Egypt, where the bodies were embalmed and kept inviolate in expensive tombs, a custom that originated from the practice of burying in earthen jars, which was practiced to a great extent by the Babylonians. The Greeks and Romans patterned after the Egyptians to some extent in embalming the dead, but inhumation was a more general method, and later cremation came to be practiced. In some countries, especially in Assyria and Babylonia, the dead were buried very generally by placing the bodies on the surface of the ground and covering them with a mound, which was surrounded with stone and covered with decorations.

Interment in ancient times was more largely in tombs, and these were built on the property belonging to the family, but later burial grounds were set apart for the interment of persons

been subject to Russia since 1664. They inhabit the region about Lake Baikal and support themselves by farming and stock raising, but more recently they have taken up mechanic arts and some branches of trade. A number have been converted to the Greek Church, though the larger portion retain a preference for their worship of idols. Their dwellings consist largely of huts, or *yurts*, and these are protected from the colds of winter by coverings of leather and felt. These people number about 250,000.

**BURLESQUE** (*bûr-lĕsk'*), a dramatic or literary composition tending to excite contempt or laughter by extravagant images, or by a contrast between the subject and the manner of treating it. In this form of composition, insignificant things are described in glowing terms, while elevated and important subjects of thought are treated in the most commonplace language. The writings of William Schwenck Gilbert (q. v.) contain good examples of burlesque in which fads and affectations play an important part, and the highest dramatic excel-



EGYPTIAN SCULPTURE, SHOWING FUNERAL PROCESSION.

belonging to a certain society or church, and subsequently community or municipal cemeteries were established. The popular plan at present is to inter the bodies in the ground to a depth of from four to seven feet, but in many places tombs are erected to receive the bodies, which are invariably placed in caskets made of wood or metal. Tombs are usually large enough for a number of persons or even a number of families, and where the ground is low and wet, as in New Orleans, this method of disposal is very popular. Many cemeteries are established and maintained by churches, but the tendency now is toward municipal ownership and control. Cremation, though practiced very extensively among the Greeks and Romans, went out of use with the rise of Christianity, but it is now gaining in favor on the ground that it is a more sanitary method. See **Cemetery**; **Cremation**; **Embalming**.

**BURIATES** (*bōō-re-hĕs'*), a nomadic race of people native to southern Siberia. They are Tartars, a branch of the Kalmucks, and have

lence is attained in the works of Molière. Chaucer's "Rime of Sir Thopas" is a burlesque on the tales of the Middle Ages, and Cervantes' "Don Quixote" is a popular work intended to ridicule the romantic tales of chivalry. *Vaudeville* is of French origin and corresponds to burlesque, but more recently it, like burlesque, has become a mixture of ballet and travesty.

**BURLINGTON** (*bûr'ling-tŭn*), a city in Iowa, county seat of Des Moines County, on the Mississippi River, 135 miles southeast of Des Moines, on the Chicago; Burlington and Quincy and other railroads, and has connection by steamers with ports on the Ohio, the Mississippi, and the Gulf. The chief buildings include the courthouse, the city hall, the opera house, the Federal building, and the central high school. It has a public library of 22,500 volumes, and is the seat of Burlington Institute College. The municipal improvements include systems of gas and electric lighting, central heating, sewerage, and street pavements of brick and asphalt. An extensive system of electric



railways supplies urban and interurban communication. Near the city are rich coal deposits. The manufactures include furniture, packed meat, machinery, implements, flour, cigars, ironware, and soap. It has a large trade in lumber, cereals, and merchandise. It was first settled in 1833 and was chartered as a city in 1838. From 1837 until 1840 it was the capital of Iowa. Owing to its fine location and many parks and gardens it is called "Orchard City." Population, 1905, 25,318.

**BURLINGTON**, a city of New Jersey, in Burlington County, on the Delaware River, eighteen miles northeast of Philadelphia. It is on the Pennsylvania Railroad. It is surrounded by a fertile agricultural and fruit country, and has extensive manufactures of implements, ironware, flour carriages, and shoes. The chief buildings include Burlington College, Saint Mary's Hall, Saint Mary's Church (Episcopal), and a public library. The city has several fine schools and modern municipal facilities. It is the birthplace of James Fenimore Cooper. Quakers settled it in 1677, and it was incorporated in 1733. Population, 1905, 8,038.

**BURLINGTON**, county seat of Chittenden County, Vermont, on Lake Champlain, 35 miles northwest of Montpelier, on the Vermont Central and the Rutland railroads. It occupies a fine site on high ground overlooking the lake. In the center of the city is a large square, near which are the city hall, the county courthouse, the post office, the public library, and the customhouse. It has a large trade by steamboat navigation. The manufactories include cotton and woolen mills, marble and stone works, and flouring mills. The surrounding country is agricultural. Gas and electric lights, street railways, pavements, and waterworks are among the improvements. It is the seat of the State College of Agriculture, the University of Vermont, the Vermont Episcopal Institute, and many fine public schools and churches. Burlington was chartered in 1763, became a town in 1797, and was incorporated as a city in 1865. Population, 1900, 18,640.

**BURMA** (bûr'mà), a country of Southeastern Asia, the largest province of British India. It lies between north latitude 10° and 28°, and east longitude 92° and 101°. The boundary on the north is formed by Tibet; on the east by China, French Indo-China, and Siam; south by the Bay of Bengal; and west by the Bay of Bengal, Bengal, Manipur, and Assam. From north to south it has a length of 1,250 miles, and its breadth in the southern part is only 30 miles, while in the central part it broadens to a width of 550 miles. The area is 168,550 square miles,

exclusive of dependent states, which have an area of about 68,500 square miles.

**DESCRIPTION.** Lower Burma, which extends south from about latitude 22°, is a narrow strip along the coast of the Sea of Bengal and has a level surface, while Upper Burma is diversified by level lands near the gulf and elevated plateaus in the northern part. It is separated from Tibet by ranges of the Himalaya Mountains, which approximate altitudes of 15,000 feet above the sea. The ranges diminish in height toward the south, and at Mandalay, situated near the central part, the altitude is about 6,500 feet. The chief ranges are the Patkoi Mountains in the north and the Garo Hills in the northwest.

Burma lies chiefly in the basin of the Irrawaddy River, which rises in the Himalayas and flows south into the Bay of Bengal by an extensive delta. Near Mandalay it is joined by the Chindwin, its largest tributary. The delta is very extensive, covering an area of 18,000 square miles, and during the rainy season this section overflows. In the eastern part the drainage is chiefly by the Salwin and its tributaries. The Salwin flows south and discharges into the Bay of Bengal near Maulmain.

The climate is various, ranging from the torrid in the southern part to the temperate in the higher altitudes of the north. In most sections the climate is tropical and the rainfall is very heavy. The coast ranges have a precipitation equal to 120 to 165 inches, and in some regions of the northern part the rainfall is irregular, ranging from 30 to 150 inches. The temperature in the lowlands has a mean average of about 85°, and in the interior the summers vary from 80° to 95°, while the winters are about 30° lower. Europeans find the lowlands unhealthy and the monsoons unpleasant. These winds blow from the sea in the summer, causing heavy precipitation, and in the winter they move from the north toward the sea, hence a dry season in winter and excessive moisture in summer.

**FLORA AND FAUNA.** Burma is rich in dense tropical forests, which include the valuable teak, ironwood, palm, betel, and bamboo. The coconut, palmyra, mango, and other varieties abound. Crotons, screw pines, balsams, oranges, pineapples, begonias, and many others are cultivated. Wild animals are abundant, both in the jungles and the mountains. They include the crocodile, tapir, goat, gibbon, buffalo, elephant, and many varieties of birds and monkeys.

**MINERALS.** Though rich in mineral wealth, Burma has not developed mining to any great extent. Ruby, amber, and sapphire are obtained



in the sand of many streams, which is also a source of gold. Some mining is done for copper, iron, silver, lead, and antimony, but the output is not large. Coal and petroleum are abundant and considerable interest has been developed in quarrying white marble. This produce is obtained largely near Mandalay and is favored by the Buddhists in making sculptures and for decorating temples.

**INDUSTRIES.** Farming is the chief industry. The land is owned by the state and is leased to the farmer, who is required to pay a tax based on the extent and fertility of the land worked. Rice is the chief product and may be cultivated in about one-tenth of the country. Indeed, Burma takes first rank in the cultivation of this cereal. Other products embrace cotton, sugar cane, indigo, tea, rye, and vegetables.

The elephant is used extensively as a beast of draft and burden, but more recently the horse and mule have come to occupy an important place in farming. Cattle are grown extensively for dairying purposes, but the flesh is not eaten by the natives, since their religion prohibits meat eating.

Though quite important in the enterprises of manufacturing, no large establishments are maintained. The weaving of silk and cotton is a growing enterprise and is practiced in all of the cities. Earthenware of various kinds, jewelry, clothing, agricultural implements, and furniture are among the leading manufactures. Transportation is facilitated by the Irrawaddy, the Salwin, and a number of other rivers, some of which have been improved by embankments and connected with centers of trade by canals. A railroad line extends from Rangoon to Mandalay and other points of the interior and the northern section. Many highways have been improved and the chief cities have been fortified in modern style. The exports exceed the imports, and foreign trade is largely with China, Great Britain, Germany, and the United States. Rice, cotton, hides, India rubber, and lumber are exported. The chief imports include textiles, raw silk, fish, and metal products.

**INHABITANTS.** The inhabitants consist chiefly of Burmese, who are related to the Chinese. They constitute an important branch of the Mongolian race, and probably descended from people who came from Tibet. In stature they are medium and heavy-set, and have black hair, brown skin, broad skull, and black eyes. The language is monosyllabic, much like the Chinese, and their characters in writing are more or less circular. The civilization is stationary and stereotyped, maintaining its characteristic features from century to century. A large amount

of wealth is lavished on temples, which are of much greater concern to the average Burmans than highways and public utilities. The religion is Buddhism, and their monks, numbering about 20,000, have a marked influence socially and politically. Rangoon, on the Rangoon River, and Mandalay, on the Irrawaddy, are the chief commercial centers. Other cities of importance are Maulmain and Myitkyina. The total population, including that of the dependent states, is 10,650,000.

**GOVERNMENT.** The government of Burma is under the viceroy of India, and is administered locally under a lieutenant governor, who is assisted by a legislative council at Rangoon. For the purpose of local government the country is divided into eight divisions, each of which is presided over by a commissioner, who is the chief executive and judicial officer. The divisions are subdivided into townships and villages, and these are presided over by Burman magistrates. The educational work is conducted largely through monasteries, of which there are many in all parts of the country, but the government is promoting training in public schools and institutions of higher learning.

**HISTORY.** The ancient and modern history of Burma is not important as it affects the history and civilization of the East. It is thought that the Burmans came to the valley of the Irrawaddy more than 2,000 years ago. The region was long divided into two kingdoms, those of Pegu and Ava, which contended against each other for mastery many years. The former seems to have attained its zenith about 1580, when the Peguans became dominant over all Burma, and they held sway until 1752, when a temporary decline began through European influence in the delta of the Irrawaddy. About that time the kingdom of Ava began to rise and overthrew the domain of Pegu. In 1755 the city of Rangoon was founded by Alompra, an energetic Ava chief, who made it the commercial center of Burma, which attained its greatest power as an independent nation in 1822.

The British East India Company gained a strong foothold in the latter part of the 18th century, when it founded factories and opened an important trade in the interest of Great Britain. Difficulties in consequence of disputes about trading privileges and the frontier were numerous in the early part of the 19th century, and in 1824 the British invaded Burma with a large army. This resulted in Assam being relinquished by the Burmese, and a second war in 1852 resulted in the annexation of Pegu as British territory. The British again invaded Burma in 1885 on account of disputes in regard



to commercial concessions, relating chiefly to the transportation of timber, and the following year the remainder of Burma was proclaimed a part of Great Britain. In 1896 a treaty was concluded between France and Great Britain, by which the Mekong was made the boundary between Burma and Laos, a part of French Indo-China.

**BURNING GLASS**, an instrument to concentrate the rays of the sun. It consists of a double convex lens, hence is thick in the center and thin at the edges, and brings the rays of solar heat to a focus at nearly the same point to which it brings the rays of light. This instrument is used to set fire on various substances, such as paper and wood. Burning glasses were made by the ancients, and Aristophanes and several writers declare that Archimedes fired the Roman ships by means of burning mirrors. George Buffon (q. v.), the French naturalist and philosopher, made a large reflector with which he set fire to wood at a distance of 210 feet, proving the possibility of Archimedes having thus burned the Roman fleet.

**BURNLEY** (bŭrn'lĕ), a city of England, in Lancashire, 24 miles north of Manchester. It is located on the Burn River and the Leeds and Liverpool Canal, and has transportation facilities by numerous railway and electric railroad lines. The chief manufactures include textiles, clothing, machinery, and ironware. Slate quarries and iron mines are worked in the vicinities. The municipality owns most of the public utilities, including the gas and waterworks, slaughterhouses, public markets, and the electric lighting plant. It has public baths, a sanatorium, and several hospitals and technical schools. The trade is brisk, especially in cotton and worsted goods, machinery, and merchandise. Burnley is comparatively a modern city, and has regularly platted streets and many fine buildings of stone and cement. It was incorporated as a town in 1861. Population, 1907, 103,947.

**BURNT OFFERING**, the object offered as an atonement for sins and burnt on the altar as a sacrifice. The practice of burning objects of value was in vogue both among pagans and the Jews, the former offering their sacrifices to idols and the Jews to Jehovah. Both animals and vegetable products were burned. When the whole offering was consumed upon the altar, it was known as the whole burnt offering. The peace offerings consisted usually of parts of animals, of which portions were given to the priests for their families. See **Sacrifice**.

**BURRARD INLET**, a narrow inlet of British Columbia, an arm of the Strait of Georgia, a short distance north of the mouth of the

Fraser River. It is nine miles long and on its northern shore is the city of Vancouver. Its shores are covered with forests of firs, cedars, and pines, and it is noted for its fisheries.

**BURRILLVILLE** (bŭr'rĭl-vĭl), a town of Rhode Island, in Providence County, 22 miles northwest of Providence. It is situated on the New York, New Haven and Hartford Railway, and near it is Wallum Lake, a popular summer resort. The manufactures include textiles and machinery. Population, 1910, 7,878.

**BURTON-ON-TRENT**, a town of Staffordshire, England, on the Trent River, twenty miles east of Stafford. It is surrounded by a level country, producing cereals, fruits and live stock. The river is crossed by a stone bridge with twenty-nine arches, and it has transportation facilities by several railroads and the Grand Trunk Canal. Among the public buildings are a public library, a college, and many fine churches and hospitals. The manufactures include ale, clothing, cotton goods, and machinery. The breweries are among the largest in the world. Burton was incorporated in 1878. Population, 1907, 53,425.

**BURY** (bŭr'ĭ), a town in Lancashire, England, eight miles north of Manchester. It is the seat of immense manufactures of woolen goods, fabrics, machinery, ironware, and dyestuffs. A fine stone statue of Sir Robert Peel, who was born near here, adorns the public park. It has many fine churches and school buildings, several hospitals, and good municipal improvements. Freestone quarries and coal mines are worked in the vicinity. It was incorporated in 1876. Population, 1907, 58,918.

**BUSH BUCK**, or **Boshbok**, an antelope of South Africa, so named from its habit of frequenting the thick underbrush. It is easily caught in the open country. The body is from four to five feet long and about three feet high, and the horns are triangular. It is esteemed for its venison. A similar animal known as white-backed bush buck is native to Sierra Leone.

**BUSHEL** (bush'ĕl), a measure of capacity, containing eight gallons or four pecks, used in measuring dry quantities. The bushel contains 2,150.42 cubic inches, and the standard cylinder used is eight inches deep and 18½ inches in diameter, inside measurement. This particular bushel is used in the United States, while the imperial bushel of Great Britain has a capacity of 2,211.192 cubic inches, equal to eighty pounds of distilled water.

**BUSHMEN**, or **Bosjesmans**, a native race of South Africa, who dwell in the region of the Orange River. They are low in the scale of mankind and have made little progress in



the arts of civilization. Their habitations are caves and clefts in the mountains, or holes in the ground covered with roofs of reeds. They support themselves chiefly by hunting and trapping and by gathering berries, roots, insects and reptiles, which they eat about half cooked. The dog is their favorite domestic animal. They have numerous legends and do a rude form of painting, but their language is very simple.

**BUSHRANGERS** (bush'rān-jērz), a gang of escaped convicts who frequented the forests of New South Wales in 1810-80. They robbed banks, plundered villages, and laid tribute on the settlers. Subsequently they infested Van Dieman's Land and frequented the mountainous districts of eastern Victoria. They were exterminated under martial law proclaimed by the governor in 1815, but the last of their gang was not executed until 1880, when three were shot at Melbourne.

**BUSINESS COLLEGE**, an institution in which students of both sexes are trained for commercial employment. These schools have been promoted for many years, or departments doing similar work have been maintained in public schools or normal colleges, but since the middle of the last century they have multiplied greatly. This is due to the fact that stenography, typewriting, and telegraphy have demanded more attention, and through these branches of study all lines of office work have been modified to a great extent. Business colleges do not only teach the three branches mentioned, but in addition provide courses in book-keeping, commercial arithmetic, commercial law, commercial geography, and one or more modern languages, especially German, French, or Spanish. All the larger cities of the United States and Canada have one or more business colleges, and in these countries commercial departments are maintained in a large number of high schools. Writers of text-books have supplied outlines and texts suitable for class work in all the branches taught, and these are quite as numerous as those offered for use in public schools and colleges.

**BUST**, in sculpture, the representation of the chest and the upper part of the body. The earliest bust known is that of Scipio Africanus the Elder. Busts were very common in the literary period of Greece and quite extensive in Rome. By means of them we have good representations of the faces of Plato, Socrates, Demosthenes, and many other Greek characters; and of Caesar, Cicero, Cato, and other eminent Romans. However, they are less common among the latter. King Louis I., of Bavaria, made the most celebrated collection that exists, now at the Wal-

halla, about seven miles east of Regensburg (Ratisbon), Germany. Among the busts are 101 representations of eminent Germans.

**BUSTARD** (būs'tērd), a bird of the Eastern Hemisphere, belonging to the order of runners. The great bustard was once common to the British Isles, and is still found in the southeastern part of Europe and in Tartary. It measures six to seven feet from wing to wing



GREAT BUSTARD.

and weighs thirty pounds. The little bustard is common to Europe. Several species are found in Africa and one is native to Australia, but none is found in America. The bustard family is esteemed for food, but attempts to domesticate these birds have failed.

**BUTCHER BIRD.** See **Shrike**.

**BUTLER**, a borough in Pennsylvania, county seat of Butler County, about twenty-three miles north of Pittsburg, on the Bessemer and Lake Erie, the Pennsylvania, and other railroads. It has a growing trade in minerals and farm produce. Among the chief buildings are the county courthouse, the public library, and several banks and business houses. The city is in the natural gas and oil belt, and engages in the manufacture of machinery and implements. It has extensive flouring, woolen, and planing mills. Gas and electric lights, street railways, pavements, and fine schools and churches are among the conveniences. It was settled in 1798 and became incorporated in 1803. Population, 1900, 10,853.

**BUTTE** (būt), a name frequently applied to mountains whose peaks are more than 8,500 feet above the sea. In this sense the word is used quite frequently in Canada and England, and



to some extent in the United States, but in the last mentioned country it applies more generally to a hill or knoll rising abruptly on a plain or plateau. Many small buttes are located in the Rocky Mountains and on the high plains of North Dakota and eastern Montana. They were formed by the erosion of ancient plateaus, being the more solid portion of earth or clay mixed with rock.

**BUTTE**, a city of Montana, county seat of Silverbow County, sixty-four miles south of Helena, on the Great Northern, the Northern Pacific, the Chicago, Milwaukee and Saint Paul, and other railroads. In its vicinity are productive deposits of gold, silver, and copper. The chief buildings include the county courthouse, the Federal post office, the State School of Mines, the city hall, and the opera house. It has a public library of 35,000 volumes. The manufactures include cigars, clothing, earthenware, and machinery. It has a large local and jobbing trade. The municipal improvements are electric and gas lights, pavements, street railways, sewerage, and waterworks. Butte was settled in 1864 and was first incorporated in 1879. Population, 1900, 30,470; in 1910, 39,165.

**BUTTER** (büt'tēr), the fatty substance of milk or cream solidified by churning. Formerly butter was made wholly of cream that was collected from time to time by skimming the surface of milk, where it accumulates by gravitation. This method is still employed on the smaller farms, but in dairying it has been superseded by the use of the cream *separator* (q. v.). After a sufficient quantity of cream has been gathered, it is placed in a *churn*, or in some other suitable apparatus, and is agitated until butter forms. When the churning has been finished, the butter is taken out and is worked thoroughly to free it from milk, and about two per cent. of salt worked into it. The milk of a well-fed cow contains about four per cent. of butter. In the newer process of making butter by separating the cream from the milk by a separator, the centripetal principle of revolution is applied to the process, and later the cream is agitated in a churn propelled by steam or electric power. In the larger creameries the whole milk is churned. The agitation in churning ruptures the fat globules and causes them to collect in masses.

Much care must be exercised in the packing and storage of butter, as it is very sensitive to its environments and its flavor is easily impaired. When the butter is delivered by the creamery to the customer or is shipped only a short distance, it is usually put up in the form of bricks, but when shipped a long distance it

is packed in tubs or firkins. Farmers either make the butter themselves and sell it to grocers, or they sell the milk or cream to the creamery or cheese factory. The modern refrigerator cars and cold-storage plants permit transporting butter long distances or keeping it many months without danger of injury.

The production of butter is an important industry. Denmark and Holland excel all other countries in the quality of the butter produced, and both are large exporters. The butter industry of Canada and the United States has grown constantly the past decade, owing to the introduction of the creamery system. The annual production in the United States is valued at \$275,500,000. Chicago, New York, and Boston are the leading butter markets, but it is an article of extensive commerce in many localities and in most countries. An artificial butter, called oleomargarine, is made of beef fat, or suet. A general law places a heavy tax upon it, in order to protect the production of dairy butter. However, it is produced extensively and forms an important article of commerce.

**BUTTERCUP**, a name popularly given to several varieties of plants of the ranunculus family. The taller species grow to a height of two or three feet, the smaller varieties form runners, while others grow in water. They flower in May; the flowers have a shining yellow color and are double in several species. They were so named because formerly illy informed people thought the yellow color of butter was due to cattle eating them, which they never do.

**BUTTERFLY**, the common name of a large class of diurnal insects, that is, insects which are active during the daytime. The butterflies and moths constitute the Lepidoptera, or scaly-winged insects. They exhibit much similarity to other kindred insects. Many species are found in all parts of the world, though in some regions they are seen only in the summer season. They are more numerous in the tropical climates than in the colder zones. They are found as far north as Greenland and Spitzbergen, where they extract nectar from the flowers, while in warmer climates they inhabit the shade of moist foliage in the woods and jungles. Most species fly by day, while the hawk moths move about by twilight, and the moths by night.

The life of the butterfly may be divided into three periods or stages. It begins when the *larva* or *caterpillar* is hatched from the egg, when it is wormlike in form. In this stage it lives from three to ten months, depending upon the locality and the season, and during all this time it takes in food with much greediness.



During the second stage, when it is known as the *pupa* or *chrysalis*, it takes in no food whatever. While in this period of development, the pupa of the moth is inclosed in a cocoon of silk, while that of the butterfly is incased in a chrysalis with a hard outer case. Some species remain in this stage only a few weeks, but some do not emerge from it before the following spring. In the third stage the insect is known as the *imago* or *perfect insect*.

The eggs are laid on the leaves of plants, but only the kinds fed on by caterpillars are selected for the purpose, and they are hatched by the heat of the sun. When laid in the summer, they hatch in a few days, but in cold climates the eggs hatch in the spring following their deposit. When hatched in the spring, they



CATERPILLAR, PUPA, AND BUTTERFLY.

live as caterpillars during the greater part of the summer, while those hatched late in the summer remain in the chrysalis or pupa state during the winter and develop into butterflies in the spring.

Butterflies have four wings. They are richly colored on both sides and are separate from each other and held upright when at rest. The wings are covered with beautiful scales or feathers, as perfect as those found in the most beautiful birds, but are so small that several hundred thousand occupy a square inch. The wings possess great power, considering the size of the insect, and many species are able to soar in the air with a steady and continuous motion, while others in the tropical regions are migratory, often moving many miles in large numbers. The

smaller species have a zigzag flight, and stop to rest frequently on leaves of trees and grasses.

Butterflies are admired for their beauty. They are active in delightful weather, and are usually associated with the most beautiful vegetation and natural scenery, but the caterpillar is a very uncouth appearing insect and gives annoyance by its ravages in fields and gardens. Some caterpillars are associated in large colonies, sometimes several hundred, and in this form are very destructive to fruit trees, especially apples and plums. The fully developed butterflies are short lived, serving the purpose of depositing their eggs and then die. There are no less than 50,000 species in the different climates, and about one-eighth of them are found in America north of Mexico. The species include every color, and in size range from very small insects to the largest found in the tropical countries, some measuring nearly foot across the wings. Some are remarkable for the likeness they bear to the leaves, flowers, bark, or vegetable life on which they feed, this often serving as a protection against their enemies.

**BUTTERFLY WEED**, a plant native to North America, found widely distributed in Canada and the United States. It is allied to the so-called milkweeds, and is known in some sections as *pleurisy root*. It has bright orange-colored flower clusters and the root is used as a medicine, chiefly as an expectorant.

**BUTTERINE** (büt'tēr-in). See *Oleomargarine*.

**BUTTERNUT**, or *White Walnut*, a wide-spreading forest tree of America. It ranges from the Atlantic to the Missouri River and beyond, has nearly smooth bark and serrated and pointed leaves, and grows to a height of fifty to seventy-five feet. It flowers in May and bears an oblong-ovate nut that ripens in September. The kernel is much used for eating, while the bark yields a dye, and the wood is useful for cabinet work and for fuel. It is not so valuable as the wood of the black walnut, being lighter in weight and less hardy.

**BUTTERWORT** (büt'tēr-würt), a plant common to the marshy grounds of Europe and Canada. The flowers of most species are purple in color, and have a two-lipped calyx. The leaves are thick and somewhat greasy to the touch, and secrete a glutinous fluid that holds small insects, which are consumed by the plant for food. Some species, as the butterwort of the Alps, bear a yellowish flower. The leaves are used in northern countries, as in Sweden and Norway, to coagulate milk.

**BUTTON**, a small circular disk used chiefly to fasten together parts of a dress and for orna-



mentation. It is made of a large variety of materials, including pearl, bone, horn, wood, ivory, copper, rubber, and brass. A very durable button is made of the blood of animals, which is gathered at slaughterhouses and the liquid portions are evaporated. In style or pattern buttons differ very largely, but they may be classed as *shank buttons*, *hole buttons*, and *covered buttons*. Shank buttons are fastened to the garment by a loop of wire, called the *eye*, and are used extensively in overalls and other garments worn by men. Hole buttons are sewed to the cloth by means of thread, which is passed through the holes drilled in the center. Covered buttons are worn largely on garments of a better grade, and are covered with cloth or silk to conform to the pattern to which they are attached.

The manufacture of buttons is an enterprise of vast importance, though as such it does not date to remote antiquity. An article of this kind was not used by the Greeks and Romans to any great extent, who fastened their loose garments with strings and girdles, or used pins, brooches, or buckles. Hooks and eyes have been in use many centuries, but the extensive use of buttons does not date back farther than the 14th century. Birmingham, England, is the chief center of the manufacture of buttons in Great Britain, and this enterprise is developed quite extensively in Canada. In Germany, the United States, and many other countries buttons are made to some extent by convict labor in the penitentiaries. The pearl button industry is centered largely along the Mississippi River, in which fresh-water mussels are abundant. Extensive factories are operated at Muscatine and Fort Madison, Iowa, and in many places along the Mississippi River between New Orleans, La., and Red Wing, Minn. Buttons of this class are cut with tubular saws from the shells into the sizes of the buttons desired, after which holes are pierced or drilled, and the button is finished by polishing. Waterbury, Conn., is the center of the metal button industry in the United States, and large quantities are made in Philadelphia. Glass, porcelain, and gutta-percha buttons are manufactured to a considerable extent. Other kinds are those made of celluloid and papier-maché. Many civic societies and other organizations, especially the Grand Army of the Republic (q. v.), wear buttons of metal, usually bronze or brass, on the common garments, and of gold or silver for symbols or ornamentations.

**BUTTRESS** (bŭ'trĕs), in architecture, a support on the outside of tall buildings, used extensively in bridges which bear a heavy super-

structure. The Chaldeans built rudimentary buttresses to strengthen the walls supporting heavy vaults or roofs, but the more substantial forms came into use at the time of the Byzantine Empire. In Gothic architecture it is an essential feature, especially the so-called flying buttress, which has an arched form and springs from a heavy pinnacled buttress, serving to support a higher portion of the building by transferring its thrust downward to the exterior buttress. In many styles of buttresses more or less ornamentation has been introduced and some are paneled over the entire surface.

**BUTYRIC ACID** (bŭ-tĭr'ĭk), one of a number of acids obtained from butter, and contained in various other substances, such as perspiration and cod-liver oil. It is formed in milk by the action of caseine upon the sugar, lactic acid being first formed, and this by its decomposition producing hydrogen and butyric and carbonic acids. When obtained from butter, it is a colorless liquid, and is unpleasant to the odor and taste. Butyric acid gives the rank smell to rancid butter.

**BUZZARD** (bŭz'zĕrd), the name of a class of birds of prey belonging to the falcon family. The common buzzard of Europe is large and has a heavy body.

It is skillful in catching birds, mice, and poultry. About ten or twelve species are found in Canada and the United States, of which three deserve especial note; the *turkey buzzard*, the *brown buzzard*,



TURKEY BUZZARD.

and the *rough-legged buzzard*. The turkey buzzard is native to the Southern States, where it is very common and useful as a scavenger and carrion-vulture, and for that reason is commonly protected by law. This bird is allied to the condor of South America, and, like it, has the head and neck bare. It is about the size of a turkey, is dark or black in color, with wide-spreading wings, and is seen in large numbers hovering around the carcass of a dead animal. The brown buzzard is deep brown in color. It nests in trees and ledges of rocks and feeds on worms, insects, birds, and small mammals. The rough-legged buzzard is feath-



ered to the toes. Buzzards are distributed more or less in all the continents.

**BUZZARD'S BAY**, an inlet from the Atlantic Ocean, on the southeast coast of Massachusetts, extending in a northeasterly direction about thirty miles. It is from five to ten miles wide. The principal harbors on the coast are Fairhaven, Wareham, and New Bedford. It is famous for its abundance of fish, game, and fine summer resorts.

**BY-LAW** (bī'lā), an organic law or regulation made by the members of a corporation, society, or some similar body to govern its members and officers in the official proceedings. It is common for school boards, library trustees, town councils, railroad companies, and legislative bodies to agree upon by-laws. These are authorized by law or the constitution of the society and may be abridged, repealed, or amended as the corporation may direct.

**BYZANTINE ART** (bī-zān'tin), the art resulting as the outgrowth of the rise of Constantinople, when the barbarians of Western Europe were pouring into Rome. The city was then called Byzantium, hence the name of this peculiar art and of the mighty Eastern Empire. At Byzantium the artists gathered and nursed the sparks of artistic beauty in the Middle Ages, which kindled the fires of modern art, after the Revival of Learning. This peculiar art dates from the early part of the sixth century, called the Justinian Age. It was retarded by the fall of the Eastern Empire under the sway of the Crusaders in 1204, and finally terminated with its destruction in 1453. Byzantine painting was executed with care and some degree of skill. The illuminations of the scriptural manuscripts were especially fine, and many examples are still to be seen in the larger public libraries of Europe, as fresh and beautiful in appearance as when they were painted. The most remarkable are found in Italy and were made at the school of Sienna. Among them is a picture of the Virgin in the Church of Saint Dominico at Sienna, by Guido, which was executed in 1221, and is a production of exquisite beauty. Interest in the painting of this time is induced by its influence on the later paintings in Italy of Cimabue, Giotto, and even of Raphael.

The sculptures of Byzantium well deserve admiration and respect, especially when compared with the later plastic works of Rome. All the figures are laden with drapery and costume, which largely obscure the nobler and freer features admired by the ancients. It was influenced more or less in this respect by the spread of Christianity. The most beautiful specimens in-

clude the "Forty Saints," now in the museum at Berlin. While relief work and statuary were profuse, the crosses, candlesticks, plates, lamps, cups, altars, and all portions bore decorations and were richly adorned with precious metals, mosaics, or frescoes.

Byzantine architecture influenced largely the construction of public edifices of Western Europe, especially the churches of Germany and those built in the early Norman period. The finest work included in this form, and, in fact, typical of it, is the church of Saint Sophia, still the greatest mosque of Constantinople. It was rebuilt by the order of Justinian and completed



CHURCH OF SAINT SOPHIA.

in 537 A. D. It was the largest and most magnificent of twenty-five temples built in the capital, and many similar structures were erected throughout the empire by its pious emperor. Its style influenced the construction of the churches of Ravenna, the Saint Mark's at Venice, and many of Western Europe; among them is the notable Cathedral of Aix-la-Chapelle, which is purely in the Byzantine style. The style presents endless varieties of the Roman arch; characteristic cupolas, and profuse ornamentation. The fresco paintings, rounded windows, and bold projection mouldings, ornamented with foliage, are conspicuous.

**BYZANTINE EMPIRE**, a powerful country of antiquity, with its seat of government at Byzantium, now called Constantinople. In history it is sometimes spoken of as the Eastern, the Lower, the Greek, and the East Roman Empire. It was founded in 395 A. D., by the two sons of Theodosius the Great, Honorius and



Arcadius, when he divided the Roman Empire. Arcadius was made emperor of Western Europe, but that portion soon passed into the hands of the barbarians. Honorius became ruler of the Byzantine Empire, which existed nearly a thousand years, from the death of Theodosius the Great to the fall of Constantinople in 1453. The origin of the empire dates back to the removal of the capital of the Roman Empire from Rome to Byzantium by Constantine, in 330 A. D., which city was named Constantinople in his honor. The seat of government was changed partly because the barbaric Germanic tribes were pressing hard against Rome, and because of the spread of Christianity in the East, a consequence following the movement of the Roman influence toward the East. In its greatest prosperity the Byzantine Empire included Syria, Pontus, and Asia Minor in Asia; Egypt in Africa; and Macedonia, Crete, Greece, Thrace, and Moesia (now Bulgaria) in Europe. The territory was successively enlarged and diminished by victory and defeat until the fall of Rome in 476, when its territory was merged into other dominions by reason of the conquests attained by the Huns, Goths, and Vandals.

The first period of the empire proper dates from 395 to 716. The period is distinguished by the reign of Theodosius II. (408-450), partly under the regency of his sister, Princess Pulcheria, who carried on successful wars against the Persians in the East and the ravages of Attila and the Huns in Thrace, in the West. He was succeeded at his death in 450 by his sister, Pulcheria, who reigned with extraordinary dignity, and was succeeded by Leo I. He was succeeded by Zeno the Isaurian (474-491), in whose reign a disastrous fire destroyed the famous library of Byzantium. Within his reign also occurred powerful invasions of the Goths and Vandals.

The reign of Justinian I., known as the Age of Justinian, was the most efficient in the history of the empire. It is distinguished by the rise of painting, sculpture, and architecture. In this reign the empire was extended; the great churches were constructed, including Saint Sophia and several hundred others; and the famous "Code of Justinian" was written. He was succeeded by Justinian II., who was unfortunately harrassed by the Persians in the East and the Avars in the West. His reign was followed by Maurice, a weak and lawless ruler, who was overthrown by Heraclius. The latter reigned successfully from 610 to 641. His achievements in war are regarded equal to those of Scipio and Hannibal. Though several posses-

sions were lost, those remaining were closely united and the empire became more distinctly Greek.

From 716 to 1057 followed a period of prosperity. It was marked by successful defenses against the Bulgarians and Saracens. The period witnessed the great internal religious controversy that tended to weaken the empire against foreign foes. The controversy was between the Iconoclasts and the Established Church. The former, who opposed the presence of images in places of public worship, were led principally by Leo III. This long dispute resulted in the separation of the Greek Church from the Roman Catholic Church in the last half of the 9th century; the formal separation occurred at the excommunication of the Greek Church in 1054. In this period the empire possessed various distinguished rulers, among them Empress Irene, who sought to unite the Eastern and Western empires by an endeavor to marry Charlemagne, after blinding her own son, but she failed for want of support in her own nation. In the reign of Constantine VII., in the middle of the 10th century, many Russian and Hungarian princes embraced Christianity and Christianized their people. In the beginning of the 11th century the Bulgarians were conquered, but the Turks began to threaten Italy from the East, while the Normans became aggressive from the West.

From 1057 to 1204 the empire gave evidence of a slow but constant decline, owing to the attacks of the Crusaders and the rise of Turkish power. The Crusaders had a marked effect upon Constantinople as they pressed forward to Asia Minor, and finally came into open conflict with the emperors. Alexis made a treaty with the second Crusaders, by which he was to acquire territory conquered by them, but their plans were not carried out. The Normans in the West became even more powerful in their attacks. However, Constantinople was captured by the Crusaders in 1203, and by them Isaac was restored to the throne, having been previously dethroned by Alexis. The latter and his sons were put to death the next year.

From 1204 to 1261 the Latins occupied the empire, following the second capture of Constantinople by the Crusaders in that year. It was now commonly called the Latin Empire of Rumelia, and Count Baldwin of Flanders became the first emperor. At this time it was divided into various kingdoms and was made tributary to the Venetians and French. Latin occupation was marked by harmful influences, since both art and culture degenerated, and its former greatness was forever lost. In 1261 the



Latin Empire vanished, but many of the smaller principalities still remained.

From 1261 to 1453 the final fall was accomplished by the rapid rise of Turkish power. A dynasty was founded by Michael Palaeologus, the ruler of Nicaea, in 1261, which remained in control until the final fall of the empire, and is known as the dynasty of Palaeologi. He made fruitless efforts to reconcile the Latin churches and to unite the Greeks as one mighty people. He was hard pressed by the Turks, but they became even more powerful in the reign of his son, Andronicus II., who lost Adrianople, in 1361, and afterward Macedonia and Albania. Sultan Amurath was succeeded by Bajazet, a strong Turkish warrior, who captured Philadelphia, in Asia Minor, and laid siege to Constantinople, but the city was saved by the Tartars under Timour, who invaded Western Asia, which caused a retreat of the Turks to defend their countries in the East. Various rulers followed successively until the Turks attacked Constantinople with an army of 400,000 men under Sultan Mohammed, April 6, 1453. The garrison of 8,000 men made a noble defense, but was finally conquered, and Constan-

tine, the last of the Byzantine emperors, was slain in the battle. The cross on the dome of Saint Sophia was replaced by the crescent of the Moslem. Christianity was exterminated, and the surviving inhabitants were sold into slavery.

The Byzantine Empire had not stood in vain. It served as a mighty bulwark against the rising power of the Turks until the spark of Western culture and the spirit of advancement were fanned into a flame that developed the highest learning of modern civilization. It was the means of protecting the treasures of ancient Greece and Rome from destruction by the Western tribes in the long period of the Middle Ages, preserving them safely until the rise of learning, which spread like fire over Western Europe after the fall of the last Constantine.

**BYZANTIUM** (bĭ-zăn'shĭ-ŭm), a city founded in 667 B. C., on the Thracian Bosphorus, by emigrants from Megara, which rose rapidly into commercial importance. Its situation on the shores commanding Asia and Europe made it a powerful factor in early history. In 330 A. D. its name was changed to Constantinople and it was made the metropolis of the Roman Empire. See **Constantinople**.





C

**C**, the second consonant and the third letter of the English alphabet, and of all alphabets derived from the Roman. It has the same position in the alphabet as the Greek *gamma*, from which it was derived through curving the form. In the English it has two distinct sounds; before *e*, *i*, and *y* it is sounded as *s*, and before *a*, *o*, and *u*, as *k*. Before *k*, as in *trick*, it is silent.

In music *C* is used to represent the first note of the diatonic scale of *C* major, corresponding to *do* of the Italian. It is employed as an abbreviation for cent and in expressing the scale of the Centigrade thermometer. In combination with *B*, as *B. C.*, it signifies before Christ.

**CAB**, a vehicle drawn by one horse, having either two or four wheels. In large cities cabs are used commonly for conveying passengers and are under police regulations. The name is also applied to the part of the locomotive in which the engineer and fireman are stationed.

**CABAL** (*kā-bāl'*), a term used to denote a small party united for political or personal ends. Previously it was used to designate a secret body or cabinet organized to further political designs. It was applied especially to the infamous ministry of Charles II. of England in the 17th century, which was constituted of Clifford, Ashley, Buckingham, Arlington, and Lauderdale, the initial letters making the word *cabal*.

**CABATÚAN** (*kā-vā-tōō'án*), a city of the Philippines, on the island of Panay. It is located on the Tigum River and has a growing trade in fruit, tobacco, and merchandise. The buildings consist largely of small huts, but some of the business houses are substantial and are constructed of brick and stone. Population, 16,495.

**CABBAGE** (*kāb'bāj*), the name of a plant which is cultivated extensively for culinary purposes and for feeding cattle. It is native to Europe, and in its wild state attains a height

CABBAGE

of two or three feet. The wild plants have no heads, the heads of our garden and field plants having been obtained by propagation.

It shows a greater tendency to vary its form through cultivation than almost any other plant, and is esteemed very highly among the vegetables. The familiar species that are cultivated extensively include the *Savoy*, the *broccoli*, the *common*



PURPLE CABBAGE.



WHITE CABBAGE.

*cabbage*, and the *cauliflower*. The common cabbage is the most important. It includes the red, or purple, and the white varieties; the delicate Portugal, and the coarser tree or cow cabbage. The stems of the cow cabbage, which reach a height of ten to twelve feet, are used for walking sticks, umbrella handles, and as material for farm buildings. Cabbage is cultivated on a small scale in nearly all the gardens, usually in connection with other vegetables, but in some localities it is grown extensively in large fields. As a food it is boiled, made into *sauerkraut*, or is eaten as a salad. In most climates the seed is sown in a hotbed early in the spring, usually in March, and the plants are set in the ground as soon as the frost is out of the ground. Both early and late species are grown, the former



maturing in July and the latter in autumn. The heads may be kept over winter in a cold, damp cellar, or by putting them in pits head down and covering with straw and earth. In the southern portions of the United States the cabbage industry is a successful enterprise, and large quantities of the product are shipped to the northern markets almost the entire year.

**CABBAGE INSECTS**, the insects that infest the cabbage plants. These pests include a number of insects more or less harmful or destructive. The *cabbage moth* is widely distributed in North America. It is the most destructive in the larva state, when it is known as cabbage worm, or kale worm; and is particularly harmful to the young plants. About a dozen species are common to Canada and the United States, and most of them are very prolific, having two or three broods in a season. The caterpillar of these insects have a green color of about the same shade as the cabbage, and they attack the heads as well as the leaves. A plant louse, known as the *cabbage aphid*, infests the leaves of cabbages and turnips. It is greenish below and brownish above. The *cabbage bug*, a brilliantly colored insect, hibernates in tufts of grass and weeds and attacks the young plants.

**CABBAGE PALM**, the name of several species of palm trees, so named from their large terminal buds, which are eaten like cabbage. The trees in the West Indies belonging to this class are species of the *areca* palm, and the cabbage palm of the United States is the palmetto.

**CABBAGE ROSE**, a species of roses noted for its fragrance, and sometimes called the Provence rose. It is cultivated extensively for the manufacture of rosewater and attar.

**CABINET** (kăb'î-nět), a body of advisers or ministers, usually composed of the heads of executive departments, so named from the cabinet or private apartment in which the monarchs of England consulted their privy councilors. The present Cabinet of England may be said to date from the time of William III., who presided over its meetings, and during his reign the ministry was placed on a Parliamentary basis; that is, all of the members of the Cabinet were made members of one or the other of the houses of Parliament. The Prime Minister, who is appointed by the Chief Executive, selects from the chief officers of the government those he desires to have in his Cabinet. He submits their names to the crown for approval, and he is the presiding officer at the meetings. There is no restriction as to the division of the cabinet officers between the two houses of Parlia-

ment, or even as to their number, except that not less than eleven are to be chosen, including the first lord of the treasury, the lord president of the council, the lord chancellor, the chancellor of the exchequer, the lord privy seal, the first lord of the admiralty, and the five secretaries of state. The meetings are secret and no record of the proceedings is kept, and each member is bound by its decisions or must resign from the ministry. This body must stand or fall together and is the responsible government of the British empire. Though an essential part of the government, it has never been officially established by an act of Parliament.

In the United States the Cabinet is authorized by the Constitution. The President may require the principal officers of the cabinet departments to submit an opinion in writing on any subject relating to the duties of their respective offices. It is customary for the President to call the cabinet officers into sessions and act as the presiding officer, the meetings being designed for the discussion of matters of grave importance to the success of the government. There are nine departments, of which the Secretary of State, of the Treasury, of War, and Postmaster General were established in 1789. The Secretary of the Navy was raised to the dignity of a cabinet officer in 1798, of the Interior in 1849, the Attorney General in 1870, and the Secretary of Agriculture in 1889. The Department of Commerce and Labor was organized in 1903. The President nominates the cabinet officers, subject to the approval of the Senate. It is customary to select for cabinet positions public men who belong to the same political party as the President, though this was not followed by George Washington and several others. The cabinet officers receive a salary of \$8,000 per year.

In 1886 the so-called presidential succession law was passed, which provides for the succession to the office of President in case both the President and Vice President die or are removed from office by conviction after impeachment. The order of the succession begins with the Secretary of State, then Secretary of the Treasury, of War, Attorney General, Postmaster General, Navy, and Interior. The others are not affected by it, because they were not created until some years after the passage of this provision. It may be found convenient to use the word St. Wapniac to recall the order of the succession, as the letters in the word indicate the initials of the departments in regular order.

There is no principal cabinet officer in the United States, but the position as Secretary of State is usually regarded the most important. In most countries the cabinet has similar duties



to those discharged by cabinet officers in the United States, but many are given larger powers, or modified duties are placed upon them. In Switzerland and all the American republics the Cabinet is responsible, not to the Legislature, but to the Chief Executive, while in France the Cabinet is more largely responsible to the legislative branch of the government.

**CABLE** (kā'b'l), a strong rope exceeding two inches in circumference, originally made of hemp, but now made largely of iron or copper wire, and of iron links. It is used for anchoring ships, in building suspension bridges, for moving cable cars, etc. In making a cable of hemp or coir, the yarns are twisted to form a *lissum*. Three lissums twisted in an opposite direction form a *strand*, and three strands twisted in the direction of the yarns in a lissum form a *cable*. Chains are now preferred to hempen cables on board of ships, because of greater durability, compactness for stowage, and superior strength.

**CABLE CARS**, a class of vehicles used to carry passengers. They are propelled by an endless cable wire that makes a continuous circuit over pulleys, through a subterranean channel, by means of a stationary engine located at some point of the line where two loops of the cable meet. They are less expensive to maintain than horse cars, but are more costly than the electric system. The average cost of construction per mile of a cable railroad system is about \$350,000, but there is a considerable variation with differences in the geological strata. Cable car lines are being fast superseded by electric railroads in cities, but they continue to serve a useful purpose in mountain lines, as they constitute the only practical means yet devised to successfully ascend steep elevations. The Stanserhorn Railway in the Alps of Europe makes an ascent of sixty per cent. and attains an altitude of 6,235 feet. The cost per horse power, furnished by electricity and applied to cables, is only \$20 per year. The Catskill, New York, elevated cable railway, built in 1892, is 7,005 feet long and rises 1,605 feet. In this system the cable is supported by pulleys and the machinery is controlled by levers. The cable road at the Jungfrau, in the Alps, is tunneled the entire length and ascends a grade at an angle of 45°. It is the most remarkable yet devised. All the cars in ascending lines are provided with safety brakes for clutching the rails in case of accident.

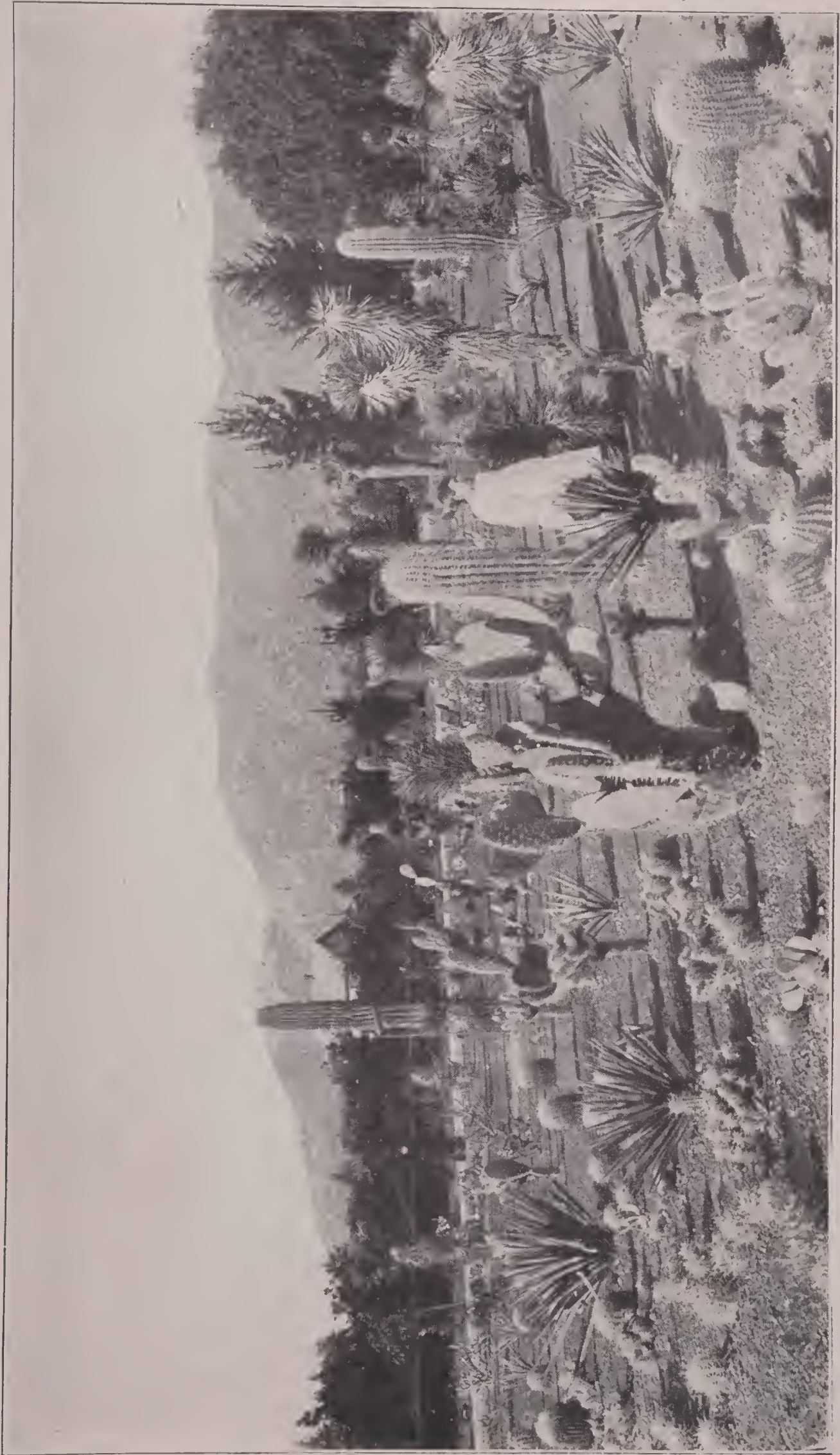
**CABLES**, the lines used to carry electric currents, either under water or underground. They are usually known as electric and submarine cables, and the former are used as conductors

of electric currents underground, while the latter are those laid on the bed of the ocean, or some other body of water. Electric cables consist essentially of one or more copper wires, frequently a hundred, surrounded by insulators, and the whole is protected by a lead sheathing or a thin coating of rubber. The construction differs very largely, depending upon the use for which the cable is designed. In the larger cities cables are used extensively to carry a number of telephone wires, usually from 50 to 400, each wire protected by insulation and the whole covered by a lead tube, and in this form they may be either aerial or underground. Other forms are used to carry main currents of electricity from the plant to points where it is needed for power. A cable well insulated and protected from the moisture in the atmosphere, attached to glass or porcelain insulators and suspended upon poles, carries an electric current at least 200 miles. By this means power is transferred from Niagara Falls to Buffalo and other points for use in propelling electric cars and machinery.

Submarine cables are imbedded in a compound of gutta-percha and resinous substances, the wires usually consisting of several strands twisted into a spiral, but they are separated from each other by thin layers of india rubber or other padding. External protection is furnished by a coat of Manila yarn or canvas soaked in asphaltum. The cable is thoroughly tested in every part before placing it in the water, and is dropped from a steamboat by means of machinery. It lies on the bottom and is not fastened, except where it lands, and the ends are connected with transmitting and receiving apparatus. The message is recorded in the Morse alphabet by means of ink and a glass tube in the form of a siphon on paper, which moves uniformly over a small platform or table as the message is written.

The lines of ocean cables operated in 1908 aggregated about 250,000 miles, about one-fifth of which were owned by governments and the balance by private corporations. These lines furnish communication with all the leading ports of the world. The Atlantic cable, from Heart's Content, Newfoundland, to Valentia Bay, Ireland, was the first of the great oceanic cables, completed in 1866, but others were laid and ample telegraph communication is now maintained among the leading seaports and commercial centers of the world. Two great cables were laid recently across the Pacific Ocean, the British cable and the American cable. The former is 7,986 miles long and was completed in 1902. It was constructed conjointly by the





RIVERSIDE PARK, CALIFORNIA, CONTAINING ABOUT 300 SPECIES OF CACTUS.







governments of Canada, Australia, Great Britain, and New Zealand. The line extends from Vancouver, British Columbia, by way of the Fiji Islands to the Norfolk Islands, whence branches extend to Queensland, Australia, and to New Zealand. The American cable is owned and controlled by the Pacific Commercial Cable Company. It is 7,613 miles long and was completed in 1903. This line extends from San Francisco, Cal., to Honolulu, thence to the Midway Islands, thence to Guam, and thence to Manila, the capital of the Philippine Islands.

The first experiment with a cable was made by S. F. B. Morse, of New York, in 1842, from Castle Garden to Governor's Island. Cyrus W. Field organized a company with a capital of \$1,750,000, in 1854, with the intention of constructing a cable across the Atlantic. This company began active work in 1857, but the effort was unsuccessful and resulted in a loss of 280 miles of cable. In the following year the first cable was completed from Newfoundland to Valentia. The first message, sent on August 6, was: "England and America are united by telegraph; Glory to God in the highest; on earth peace, and good will toward men." About 400 messages were sent across the ocean, when the cable failed to work. The next attempt was made in 1866, which resulted in an entire success. It was laid by the *Great Eastern*. The news of a treaty of peace between Prussia and Austria was the first message sent across the ocean.

**CABUL** (kā'b'l). See **Kabul**.

**CACAO** (kā-kā'ō). See **Cocoa**.

**CACTUS** (kāk'tūs), a genus of plants which are found in the arid regions of America and Africa. About 1,000 species have been studied,



CACTUS PLANTS.

Cactus *Opuntia*.

*Cereus*.

but they are distinctly American plants, except a few found in Africa. However, the prickly pear, a species of *Opuntia*, has been grown in Greece and Italy for many centuries. The *cacti* have large, succulent, and fleshy stems with a watery or milky juice of sweetish taste. They

thrive best in arid districts, usually in sandy, rocky soil. In size they vary from very minute organisms to great trunks thirty feet high. The structure of many species is complex. Some are inclosed with a tough and impermeable skin and covered by pricks and needles. Many species flower profusely, the blossoms opening at night and closing some time after sunrise. The prickly pear and other species are grown extensively as ornamental plants. Some species of the prickly pear bear an edible fruit known as Indian fig. The cardon forests of Mexico, which are confined to the basin of the Gulf of California, are dense and have extensive growths of a species of the *Cereus*. Similar plants are found in southwestern Texas, but the size diminishes gradually as we proceed north to Colorado and Nebraska. Some species possess medicinal properties. The stems of the larger varieties are used for fuel and fencing.

**CADDICE FLY** (kād'dīs), or **Caddis Fly**, a small insect which resembles the moth in many respects. The adult female lays its eggs in water, usually in the form of a double mass attached to the surface of some plant, and the larvae are submerged until they reach the pupa state. The larvae subsist mostly on vegetable forms, but also eat insects and the spawn of fish. About 150 species have been studied and classified. The adult insect has a hairy body and wings, and in some species the body is covered with small scales and is supplied with four wings.

**CADET** (kā-dēt'), the name applied to the younger son of a noble house to distinguish him from the elder. In France the term is applied to any junior officer. In the United States it is applied to a youth pursuing a course of study at a military academy or school, as, for instance, at the West Point Military Academy or the Naval Academy at Annapolis.

**CADILLAC** (kād'il-lāk), a city of Michigan, county seat of Wexford County, 95 miles north of Grand Rapids, on the Ann Arbor and the Grand Rapids and Indiana railroads. It is nicely situated on Little Clam Lake. The surrounding country produces lumber and cereals. Among the chief buildings are the county courthouse and a number of schools and churches. The manufactures include earthenware, machinery, and lumber products. It has modern municipal facilities, such as waterworks and electric lights, and has a growing trade in produce and merchandise. The first settlement was made on its site in 1871, and its incorporation dates from 1874. Population, 1904, 6,893; in 1910, 8,385.

**CADIZ** (kād'iz), a seaport city of Spain, capital of the province of Cadiz, on Cadiz Bay,



an inlet from the Atlantic Ocean. It is strongly fortified, has well paved streets, and is noted for its cleanliness. Among the principal buildings are several hospitals, the customhouse, the Capuchin convent, the public library, and the old and new cathedrals. It has a bull ring in which seating room is provided for over 12,000 spectators. The lighthouse of Saint Sebastian is a conspicuous and beautiful structure. The city has railroad facilities and an excellent harbor, which furnishes anchorage for a large number of vessels. It has long been the principal naval station of Spain. There are four well-constructed forts, two of which form a defense for La Carraca, an arsenal four miles from the city. Manufacturing is an important industry; the products include woolen cloth, silk fabrics, wine, leather, glass, and machinery.

Cadiz was founded about 1100 B. C. by the Phoenicians, who named it Gadir, and it was long one of the chief commercial cities of Europe. It was conquered successively by the Carthaginians, Romans, Goths, Moors, and Spaniards. The English occupied it in 1596, and in 1810 and in 1823 it was infested by the French. Its greatest prosperity was reached when Spanish-America was in its most prosperous state. With the independence of the South American republics, and the loss of territory in Central America, it began to decline gradually. Population, 1905, 71,240.

**CADMIUM** (kăd'mī-ŭm), a metal found in zinc ores and rarely as a sulphide, of which greenockite is an example. It is allied closely to zinc. The metal was discovered in 1818 while testing for arsenic in zinc wastes. In color it is white, or has a slight bluish cast. It has a high luster when polished and is some harder than tin. The salts of cadmium are serviceable in medicine. Cadmium sulphide is a powder with a lemon-yellow color of great permanency. It is used in coloring soap and in making a pigment known as *cadmium yellow*.

**CAEN** (kän), a city of France, capital of the department of Calvados, 148 miles northwest of Paris. It is on the Orne River, about nine miles from its entrance into the English Channel, and is located in the center of a fertile plain. The streets are clean and well paved with stone and asphaltum. Among the chief buildings are the Church of Saint Etienne, founded by William the Conqueror, a public library of 100,000 volumes, a university with 650 students, and a fine art museum. The manufactures include lace, cotton textiles, cutlery, clothing, and spirituous liquors. Trade is facilitated by several railroads and a maritime canal. In the vicinity are several large establishments devoted to the rearing

of Angora rabbits, the skins of which are used in making gloves. Population, 1906, 44,442.

**CAESAR** (sē'zēr), the title of the Roman emperors and of the heirs presumptive to the throne. The title was borne by Octavian, the adopted son of Julius Caesar, and passed to his own adopted son, Tiberius. Afterward it was borne by Caligula, Claudius, and Nero. It is perpetuated in the czar of the Russian emperors, and the kaiser of the Holy Roman Empire and of modern Germany.

**CAESAREA** (sēs-ā-rē'ā), the name anciently applied to a number of cities, among them the capital of Cappadocia in Asia Minor, Caesarea Philippi in Palestine, and Caesarea on the coast of Syria, thirteen miles north of Joppa, now called Kaisarieh. The last mentioned city was built by Herod the Great in 22 B. C., and named in memory of Caesar Augustus. It was once a beautiful city, but is now in decay. Saint Paul was imprisoned in it two years. The Crusaders held it and built a cathedral on its site. It is now inhabited by fishermen and has a small harbor.

**CAESAREA PHILIPPI**, an ancient town of Asia, in Palestine, twenty miles north of the Sea of Galilee. It is mentioned in Matthew xvi., 13, and it was the center of a region given in 20 B. C. to Herod the Great, who constructed a temple of white stone and dedicated it to Emperor Augustus. The place was given to Philip, son of Herod the Great, after the death of the latter, and became known as the Caesarea of Philip. Jesus disclosed his mission on earth to his disciples while at this place. It was named Neronias in honor of Nero, but is now a small village of poor huts known as Banias.

**CAESIUM** (sē'zī-ŭm), an alkaloid metal found in very small quantities in certain minerals and mineral springs. Deposits of it are most abundant on the Isle of Elba, where it occurs in the rare mineral pollux, which contains about thirty-four per cent. of caesium oxide. Chemically it is closely related to potassium and rubidium. Bunsen and Kirchhoff discovered it in 1860 and obtained it as an amalgam with mercury. It absorbs oxygen with great rapidity, has a specific gravity of 1.88, and melts at 80.6°.

**CAFFEINE** (kăf-fē'in), or **Theine**, the active principle of coffee and tea. It forms tufts of white silky needles. The taste is bitter. It forms double salts with platinum and gold chlorides. Caffeine is contained in coffee in the proportion of from one to four per cent., and in tea from two to four per cent. It is a methyl substitution compound of theobromine, and serves as a hypnotic and a nerve sedative.





STREET SCENE IN CAIRO, EGYPT.







**CAGLIARI** (käl'yá-rē), a city of Sardinia, capital of a province of the same name, situated on the southern end of the island. It has a good harbor on the Gulf of Cagliari. In the vicinity are extensive salt-producing lagoons. A railway line connects it with the principal cities of Sardinia, and it has steamboat and submarine cable service with the leading cities of Italy. The university, founded in 1596, has an attendance of 275 students. It is the seat of several consulates, has three theaters, and maintains several fine schools and churches. Ship-building, cotton mills, brickyards, and machine shops are among the enterprises. It has a brisk trade in flax, grain, salt, and textiles. The Phoenicians founded the city. Its fine cathedral dates from 1312. Population, 1906, 53,747.

**CAHORS** (ká-ôr'), a town of France, capital of the department of Lot, sixty miles north of Toulouse. It is situated on a rocky peninsula formed by the Lot River. The chief buildings consist of a cathedral, a normal school, a college, and an Episcopal palace, now the prefecture. It has manufactures of textiles and glass, and is the center of considerable trade in merchandise and country produce. It has a fine statue of Gambetta, who was born here. Population, 1906, 12,240.

**CAIBARIEN** (kī-vä'rê-ân), a seaport of Cuba, in the province of Santa Clara, about 100 miles southeast of Cardenas. It has a good harbor and railroad connections with the principal commercial centers of Cuba. The trade is chiefly in rice, tobacco, and merchandise. Profitable sponge fisheries are located off the coast. Population, 1906, 7,213.

**CAICOS** (kī'kōs), a group of islands at the southeastern extremity of the Bahamas. It includes about thirty small islands, only six of which are inhabited, and the area is 200 square miles. Grand Caicos, the largest island, is six miles wide and twenty miles long. Salt raking and sponge fishing are the chief industries. These products are exported principally to Canada and the United States. The Caicos islands are a British possession, and with the Turk Islands, lying southeast, are politically under the government of Jamaica. Grand Turk is the seat of government. Population, 4,975.

**CAIRN** (kârn), a name given to a heap of stones placed on a grave, or built up as a landmark. Cairns are quite numerous in many places of America, especially on the plains, where they are found on hills, usually marking a group of graves. In Europe the Druids and other primitive peoples built cairns over their graves and, like the American Indians, placed rude weapons, such as stone axes and

arrowheads, with the dead bodies. They are met with in many parts of Scotland and Wales. The most remarkable one is near Drogheda, on the Boyne River, which is in the form of a mound nearly eighty feet high.

**CAIRO** (kā'rō), county seat of Alexander County, Illinois, at the junction of the Mississippi and Ohio rivers, on the Illinois Central, the Mobile and Ohio, and other railroads. It is located on a low tract of land, a part of which was formerly subject to inundations, but extensive levees have been erected that protect against overflows, and the city is increasing rapidly in commerce and wealth. The chief buildings include the county courthouse, a public library, the customhouse, and a United States marine hospital. It has a large trade in grain, coal, lumber, and merchandise. The industries include iron foundries, furniture factories, lumber mills, and extensive commercial interests, while the surrounding country furnishes a large trade in agricultural products. Charles Dickens described Cairo as *Eden* in his "Martin Chuzzlewit." It was first settled in 1854 and became a city three years later. Population, 1900, 12,566.

**CAIRO** (kī'rō), the capital of modern Egypt, on the Nile, about ten miles above the delta and 150 miles southeast of Alexandria. Its history is interesting and dates from the year 969 A. D., when it was founded by the Arabs, who brought the bones of their ancestors from Kairon, and reigned over Egypt for ten generations. It was conquered by Saladin from the Fatimite caliphs in 1171, when he became master of Egypt. His descendants ruled until 1517, when the city was stormed and taken by Sultan Selim, after which it was governed by a succession of Mameluke kings. The French took it in 1798 and three years later it was captured by the British, who restored it to the Turks. In 1882 it was occupied by the British and has since been the center of British influence in Northern Africa.

The old portion of the city is divided into a number of quarters, and has tortuous and narrow streets, while the newer part has several modern streets that are platted on a regular plan and improved by modern facilities. The inhabitants consist largely of Moslems, Jews, and Christians, each occupying different quarters of the city. The buildings include some of the finest remains of Arabian architecture, among them about 400 mosques, several of which were built as early as 915 A. D. Among the most important is the great Mosque of Mohammed Ali. Within the city are many tombs of caliphs and mamelukes, some of which are finely built and of large size. Formerly it had many obelisks, but nearly all of them have



been transported to European and American cities. The great pyramids and sphinx are about ten miles from the city.

Most of the streets are crowded with Eastern merchants, who display their goods in open stalls



MOSQUE MOHAMMED ALI.

and conduct trade largely in bazaars and markets. A number of railroad lines connect the city with Alexandria, Siout, and the Suez Canal, but river navigation is also a factor in maintaining its importance commercially. It is the seat of a university founded in 971, which carries courses that are directed by Moslems. No tuition is charged and the teaching faculties receive no compensation, hence they make their living by doing clerical and other work. It has ample accommodation for 10,000 students.

The narrow streets of Cairo are traversed by camels, human beings, horses, and asses, thus affording a strange contrast when compared to the modern cities of Europe and America. Under European influence a public school system is developing, and many residences and office buildings have been erected. The newer portion has electric street railways, pavements, sewerage and electric lights. The citadel is an interesting point, located on Mokattam Hills, and near it is Saint Joseph's Well, cut in the rock to a depth of 270 feet. The city is a center of interest for travelers and is visited by many tourists. Besides, many thousands of Mohammedans flock there annually to worship or carry on trade. The language spoken is Arabic. The city is the residence of consuls general from France, Germany, Russia, and other European countries, and is the official residence of the

Khedive of Egypt. Its name in Arabic is Musr-al-Kahira, meaning the victorious city. Population, 1905, 581,380.

**CAISSON** (kās'sōn), in military, a wooden box to hold shells and loose powder, or an ammunition wagon. The term is applied in nautics to a boat gate for closing the entrance to a dry dock, and in engineering to a wooden frame or case sunk in the beds of rivers to keep out the water during the building of piers or foundations for bridges. Caissons of the latter kind are constructed of strong timbers closely and firmly joined together. Among the largest caissons ever constructed was the one used at the New York tower of the Brooklyn bridge across East River. It was 82 feet high, 173 feet long, and 102 feet wide.

**CAJEPUT** (kāj'ê-püt), or **Cajuput**, a kind of tree native to Australia and the East Indies. It grows to a height of thirty feet, has alternate leaves, and bears white flowers on pendulous branches. The leaves yield the valuable product known in pharmacy as oil of cajeput. It is used as a stimulant, and in the treatment of gout, rheumatism, dyspepsia, and toothache. The high price at which pure cajeput oil has been sold has caused it to be adulterated by adding turpentine, oil of rosemary, etc. The trees from which this product is obtained includes a large



CAJEPUT.

number of species, and in Australia they are commonly known as tea trees.

**CALABAR BEAN** (kāl'â-bär), the seed of an African plant allied to the kidney bean. The



bean is poisonous. It is used in medicine chiefly as an external application in rheumatism and neuralgia, and to induce the contraction of the pupil of the eye. In this respect it has the opposite effect of belladonna, which causes the pupil to be dilated. Superstitious tribes of Africa administer it as an ordeal to persons suspected of witchcraft. If the suspect is caused to vomit, innocence is declared; if it purges, or the patient dies, the suspect is declared guilty. The plant has brownish-red or ash-gray leaves.

**CALABASH TREE** (kāl'ā-bāsh), the common name applied to an American tree cultivated in the West Indies and other tropical regions. It attains a height of thirty feet, has flowers variegated with red, yellow, and purple, and bears narrow elliptical leaves. Its fruit resembles gourds and is used in making household utensils, such as basins, water bottles, and drinking cups. The pulp of the fruit is used as a purgative, and to some extent as a poultice in treating bruises and inflammations.

**CALABRIA**, the name given in Roman times to the southeastern peninsula of Italy. The district included within the Calabria of the Romans corresponded nearly to the modern province of Lecce. On the other hand, the modern Calabria is nearly coextensive with the ancient Bruttium. It includes the three provinces of Catanzaro, Cosenza, and Reggio di Calabria. This region is enclosed by the sea on all sides, except the north. It is separated from Sicily by the Strait of Messina and is traversed by highlands which reach an altitude of nearly 4,000 feet. The area is 5,819 square miles. Rice, grain, hemp, flax, fruit, and live stock are the chief products. It has mineral deposits of value, such as rock salt, marble, alum, gypsum, alabaster, and copper. Population, 1907, 1,411,348.

**CALAIS** (kāl'is), a city and seaport of Washington County, Maine, on the Saint Croix River, twelve miles from Passamaquoddy Bay. It has transportation facilities by the Saint Croix and Penobscot and the Canadian Pacific railroads. The principal industry is shipbuilding. It has machine shops, tanneries, ax factories, iron foundries, and lumber industries. Electric lights, pavements, and waterworks are among the municipal improvements. It is the seat of the Calais Academy, and has a number of excellent church and school buildings. Navigation on the Saint Croix River is open the greater part of the year. It has an abundance of water power for manufacturing purposes and a considerable trade. Population, 1900, 7,655.

**CALAIS** (kā-lā'), a fortified seaport city of France, on the Strait of Dover, in the department of Pas-de-Calais, 150 miles north of Paris.

The harbor is deep and has a lighthouse 190 feet high. Among the chief buildings are the Church of Notre Dame, the public library, and the Hôtel the Guise. It has an important commerce in eggs, wine, grain, vegetables, fruits, and other products of the farm and garden. The chief manufactures include cotton, silk, and woolen goods, laces, gloves, fabrics, and machinery. Many boats that visit the cod and herring fisheries of Iceland make their headquarters at Calais. A number of electric and steam railways connect it with the interior of France. Edward III. of England laid siege to it in 1347 for twelve months, and the latter country held it until 1558, when it was retaken by the Duke of Guise. Population, 1906, 66,627.

**CALAMANDER WOOD** (kāl'ā-mān-dēr), a kind of wood used extensively in making furniture, obtained from a tree similar to the ebony and persimmon trees. It resembles rosewood, takes a fine polish, and exhibits a variety of colors. This wood is so hard that it can be worked only with the best edged tools and is preferred to most varieties as a veneer. The supply is secured largely from Ceylon and southern India.

**CALAMIANES** (kā-lā-mī-ā'mēs), a group of islands belonging to the Philippines, between Palawan and Mindoro, from which it is separated by Mindoro Strait. The surface is hilly, but fruits, tobacco, rice, and sugar cane are produced profitably. Gold and iron deposits abound, but they are not worked to any great extent. The area is 340 square miles. Population, 20,200.

**CALAMINE** (kāl'ā-mīn), a mineral consisting essentially of zinc. The two species were formerly known as carbonate and silicate, but the former is now classed as *smithsonite* and the latter as *calamine*. Pure calamine contains fifty-two per cent. of zinc and is valuable as an ore of that metal. It is found in America and Europe, occurring mostly in small crystals.

**CALAMUS** (kāl'ā-mūs), the name commonly applied to a genus of palms from which rattan canes are made for caning chairs. These trees hold a place midway between the grasses and the larger palms. They yield material useful in the construction of cables and bridges. The term is also used to designate the aromatic *sweet flag* that is native to the swamps and ponds of temperate zones, which yields essential oils used in perfumes, and to sweet-scented grasses of India valuable in the manufacture of incense.

**CALASH** (kā-lāsh'), or *Caleche*, a carriage with low wheels, fitted with a top or hood, and furnished with seats for four inside. The driver occupies a seat in the front. Some are



constructed with a movable front, making it possible to use the vehicle either as an open or a closed carriage. The name is applied in Canada to a cart or carriage with two wheels, fitted with a seat for two passengers, and a single seat for the driver on the dashboard.

**CALCITE** (käl'sīt), the carbonate of lime, distinguished from aragonite in that it crystallizes in the hexagonal system. It is a general term used to describe a variety of minerals, such as marble, chalk, and limestone. The colors are usually white or pale shades of gray, but include violet, green, yellow, blue, and red, owing chiefly to the presence of impurities. Iceland spar is a colorless variety found in the basalt rocks in Iceland.

**CALCIUM** (käl'si-ŭm), the metal forming the base of lime. Combined with other substances, it is one of the most widely distributed and abundant, but is rarely found in the native state. It was first obtained in the metallic state in 1808 by Sir Humphry Davy, by decomposing the chloride by electricity, also by heating in a closed vessel iodide with sodium, but not in sufficient quantities to determine its properties. Pure calcium is of a pale yellow color and is a ductile and malleable metal. It occurs in nature as a carbonate, silicate, and sulphate, and forms a large constituent of all soils, ashes of plants, limestone, chalk, and marble. It is the main constituent of the mineral matter of the bones of animals, and forms large deposits as fluor spar, limestone, and gypsum. With carbon it forms the compound known as *calcium carbide*, which is used extensively in the manufacture of acetylene.

**CALCULATING MACHINE** (käl'kü-lā-tīng), a machine for making arithmetical calculations with speed and accuracy. Various devices have been made for this purpose, the simplest one being the abacus (q. v.). Leibnitz published the first description of a calculating machine in 1673. The British government employed Charles Babbage to construct a mechanism of this kind in 1821, and, after spending twelve years on the project, completed quite a satisfactory machine. Dorr E. Felt, in 1889, constructed a calculating machine with a keyboard resembling that of a typewriter, on which calculations can be made satisfactorily. By means of it operations in the fundamental principles of arithmetic can be performed, and the square and cube roots can be successfully extracted. The cash registers used in many business houses are a form of the calculating machine.

Calculating machines of a high grade are now in use in nearly all the banks, counting houses, and insurance offices. They have a keyboard

like that of a typewriter, but the keys have figures so arranged that they stand in columns from 1 to 9. The figures are impressed upon a strip of paper as the keys are touched. By pressing a special key, it is possible to obtain the results, or addition, subtraction, or even multiplication. Many complicated patterns are in use. Electricity is used in some styles to perform the operations.

**CALCULUS** (käl'kü-lūs), in mathematics, any branch which may involve or lead to calculation by algebraic symbols. The term is used to embrace the whole science with the exception of pure geometry. The leading divisions of the subject are the differential and integral calculus, which two divisions are included in the infinitesimal calculus. Newton wrote a treatise on the principles of the infinitesimal calculus in 1669, which was published a number of years afterward, and he is sometimes spoken of as the founder of this science of calculation. However, it was first discovered by Leibnitz, who published the discovery before that of Newton became known. The Leibnitz system contains the better method of notation and is now universally used.

**CALCUTTA** (käl-küt'tä), the capital of Bengal and of British India, on the Hugli River, a branch of the Ganges, about eighty miles from the Bay of Bengal. The river is about three-fourths of a mile wide at the city, which extends five miles along the river bank and includes a site equal to ten square miles. Near the city and on the opposite side of the river are a number of suburban towns which are connected with the city by bridges and electric street railway lines. The city was founded in 1686 by the East India Company, with Governor Charnock as principal executive officer. In 1720 three villages were annexed to the possessions of the company by the Emperor of Delhi, which were later fortified and named Fort William in honor of the King of England. In 1707 Calcutta became the capital of the Bengal presidency. It was attacked by Sorajah Dowlah in 1756 and after a siege of two days was surrendered. At that time occurred the tragedy of the Black Hole, in which 146 English prisoners were confined on a hot summer night, and all but twenty-three perished. The city remained in the hands of Dowlah for six months, after which it was retaken by Admiral Watson. It became the seat of the British government of India in 1772.

Calcutta is the commercial metropolis of Asia. Its advantages in water navigation are very extensive, including, besides the river, several canals to facilitate trade with the adjacent territory. Railroad lines penetrate from it in all



directions toward the north, east, and west, and facilitate a large interior, export, and import trade. Several botanical gardens and public parks beautify the city, while Bishop's College, a well-organized public school system, and several academies offer educational advantages in courses extending from the kindergarten to the university curriculum. It has many fine mosques, cathedrals, and churches, besides substantial government buildings and a university for higher education. In recent years a large number of learned societies have been organized for the study of antiquity, geology, astronomy, literature, history, and other lines of research. A number of daily newspapers, and many weeklies and other periodicals, are published. The hotel service and theater accommodations are modern.

Many of the streets are paved with stone, wooden blocks, and asphalt. Branches of the street railway system extend to all parts of the city. A number of suburban railroad lines are operated to accommodate large numbers of laborers that come from the surrounding country to work in the factories and industries of the city. The manufactured products are extensive, including fabrics, machinery, leather, ironware, furniture, opium, cigars, clothing, and canned fruits. There are exports of cotton, indigo, raw silk, opium, wheat, rice, tea, gunny bags, and live stock. The principal imports include cotton goods, salt, stationery, and wearing apparel. Fort William is a strongly fortified portion of the city, its fortifications costing \$10,000,000, and at it are stationed 15,000 men with 600 guns and 80,000 stands of arms. The city has a number of banks and insurance companies and a chamber of commerce. It is the seat of the supreme court of justice and of the court of appeals in the province of Bengal. The customhouse and public mint are among the many governmental buildings. Calcutta is called the "City of Palaces." The inhabitants are mostly Hindus and Mohammedans. Other classes include Jews, Parsees, Negroes, and about 30,000 Europeans. Population, 1905, 1,348,265.

**CALEDONIA** (kāl-ĕ-dō'nĭ-à), the name formerly applied to northern Scotland, by which it became known to the Romans. Tacitus gives a description of the defeat of the Caledonians in the year 84 A. D., on the Grampian Hills. The Romans, under Agricola, overran Scotland as far as the firths of Forth and Clyde, but never reduced the country to a Roman province. Caledonia is now the poetical name of Scotland.

**CALEDONIA, NEW.** See **New Caledonia.**

**CALEDONIAN CANAL,** a canal in Scotland, which connects the North Sea with the

Atlantic Ocean. It is made up largely of a chain of natural lakes about sixty miles long, which have been united by artificial canals, thus making a waterway of much importance. The cut is 17 feet deep, 50 feet wide at the bottom, and 120 feet at the surface. It serves to shorten the route, which was formerly 500 miles long, by way of the Hebrides, but the route of the canal from Moray Firth to Loch Linnat is about half that distance. The canal is popular as a route for summer tourists.

**CALENDAR** (cāl'ĕn-dĕr), a register or list by which the year is divided into months, weeks, and days, and showing the various civil and ecclesiastical festivals and holidays. It is so named from the Roman word *calends*, which was the first day of the month. The Egyptians based the year on the changes of the seasons, dividing it into 365 days, and these into twelve months of thirty days each, with five days added at the end of each year. Among the Jews it was customary to reckon twelve lunar months, adding a thirteenth to maintain the recurrence of particular days in consecutive seasons. The Greeks based their lunar months upon the fact that the new moon returned upon the same day of their year in a period of nineteen years. It was found to be about six hours too long and calculators still failed to estimate correctly the beginning of the seasons on the same fixed day of the year.

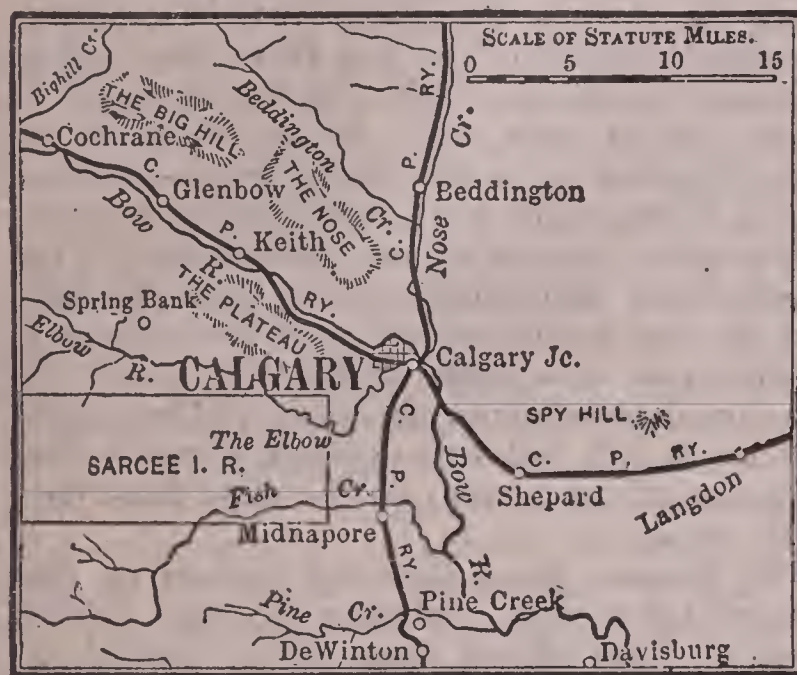
The Romans based their calculations on the year of ten months, including 365 days, which required about eleven days to be supplied at regular intervals. The great Greek astronomer Sosigenes, assisted by Marcus Fabius, at the request of Julius Caesar, devised the *Julian* calendar. In this system the equinox was restored to its proper place by counting two months between November and December, hence the year 707 (46 B. C.) contained fourteen months. The year was computed at 365 $\frac{1}{4}$  days; the quarter of a day was added to February as a single day every fourth year. The Julian calendar continued in use until the fall of the empire, and was used by Christians until 1582.

Pope Gregory XIII. abolished the Julian calendar in all Catholic countries and introduced a reformed calendar called the *Gregorian*. Accordingly, ten days were deducted from the year 1582, by which Oct. 5, according to the old calendar, was reckoned Oct. 15, 1582, by the new; and, to prevent displacement recurring, every fourth year was counted a leap year, in which February was assigned twenty-nine days instead of twenty-eight. Under this system, only one in four of the years ending centuries is a leap year; thus, 1700, 1800, 1900 were not leap



years; while 2000 will be. The Gregorian year contains 365 days, five hours, forty-nine minutes, and twelve seconds. To distinguish it from the other systems, it was designated the *new style*, and previous calculations became known as the *old style*. The new style was adopted in France, Spain, and Portugal in 1582, and in the Catholic portions of Germany, Switzerland, and the Netherlands in 1583. Poland adopted it in 1586; Hungary in 1587; Holland, Denmark, and Protestant Germany adopted it in 1700; Switzerland in 1701; England in 1752; and Sweden in 1753. Of the Christian countries, Russia retained the old style longest, until 1902.

**CALGARY** (käl'gä-rī), a city of Canada, in the province of Alberta, on the transcontinental line of the Canadian Pacific Railroad. It is in a



region that is devoted chiefly to cattle and horse ranching, 835 miles west of Winnipeg. The buildings are substantial and are constructed largely of light-gray stone. It has an electric light plant, a city waterworks, a sewer system, and several fine schools and churches. The chief enterprises are soap works, leather making, and railroad shops. It is important as a trade center for merchandise and as a shipping point for cereals and live stock. Calgary was incorporated in 1885. Population, 1906, 11,967.

**CALI** (käl'lē), a town of Colombia, in the department of Cauca, near the junction of the Cali and Cauca rivers. It occupies a fine site on a tableland about 3,150 feet above sea level, and has a brisk trade in grain and fruit. Transportation is furnished by a railway which connects it with Buenaventura, on Chocó Bay. The chief buildings include a college, the post office, and the Church of San Francisco. It was founded in 1556. Population, 15,800.

**CALICO** (käl'i-kō), the general name of cotton cloths having colored patterns printed on

them. Calicoes are coarser than muslin, and in Europe they include shirting and common white cotton cloth. Calico printing was first practiced in India and is used to some extent in stamping woolen, silk, and linen goods, but it is employed principally in stamping the cloth known in the market as calico. The process was brought to Germany and France by the Dutch, and later to England by a Protestant refugee who left France in 1696. Calico prints are now among the most staple articles of manufacture. The printing was first done by wooden blocks, on which the patterns were engraved. At the present time most of the printing is done by large machinery and cylinder presses, in which the colors are put on rollers and passed over the cotton cloth. There are as many rollers as colors to be printed, each roller containing a separate color, and each one filling its own place in the pattern.

Formerly as many impressions were made in printing as the number of colors that were required in completing the pattern, but by employing a number of rollers and the cylinder process all colors are printed by passing the cotton cloth through the press but one time. Each of the rollers is supplied with figures of the pattern raised above the surface of the roller, by means of which the dye colors or steam colors are fixed to the cloth in a becoming way. In printing the cloth passes through the machine, thence over a hot-air chamber, which dries the cloth. It is then steamed and washed and, after being starched and pressed, it is put in bales ready for the market. The colors used in printing are variously made of animal, vegetable, and mineral compounds, depending upon the class of prints to which they are to be applied. In the newer process of calico printing, which has largely supplanted all others, it is possible to combine printing and dyeing. Cloth on which the colors are merely stamped is apt to fade easily, and by the use of the newer process it is possible to obtain colors that will not fade, known in the market as *fast colors*. This process employs mordants to a large extent.

**CALICUT** (käl'i-küt), a city of India, in the Malabar district, 565 miles southeast of Bombay. It is important as a seaport and railroad center, and has a large trade in spices, cotton goods, lumber, and machinery. The manufactures include calico, utensils, cigars, clothing, and betel nuts. Calico cloth received its name from Calicut, where it was manufactured extensively at an early date. The Portuguese visited the city in 1486, when Pedro da Covilham landed here, and Vasco da Gama



reached the city on his tour after doubling the Cape of Good Hope. Population, 1906, 78,530.

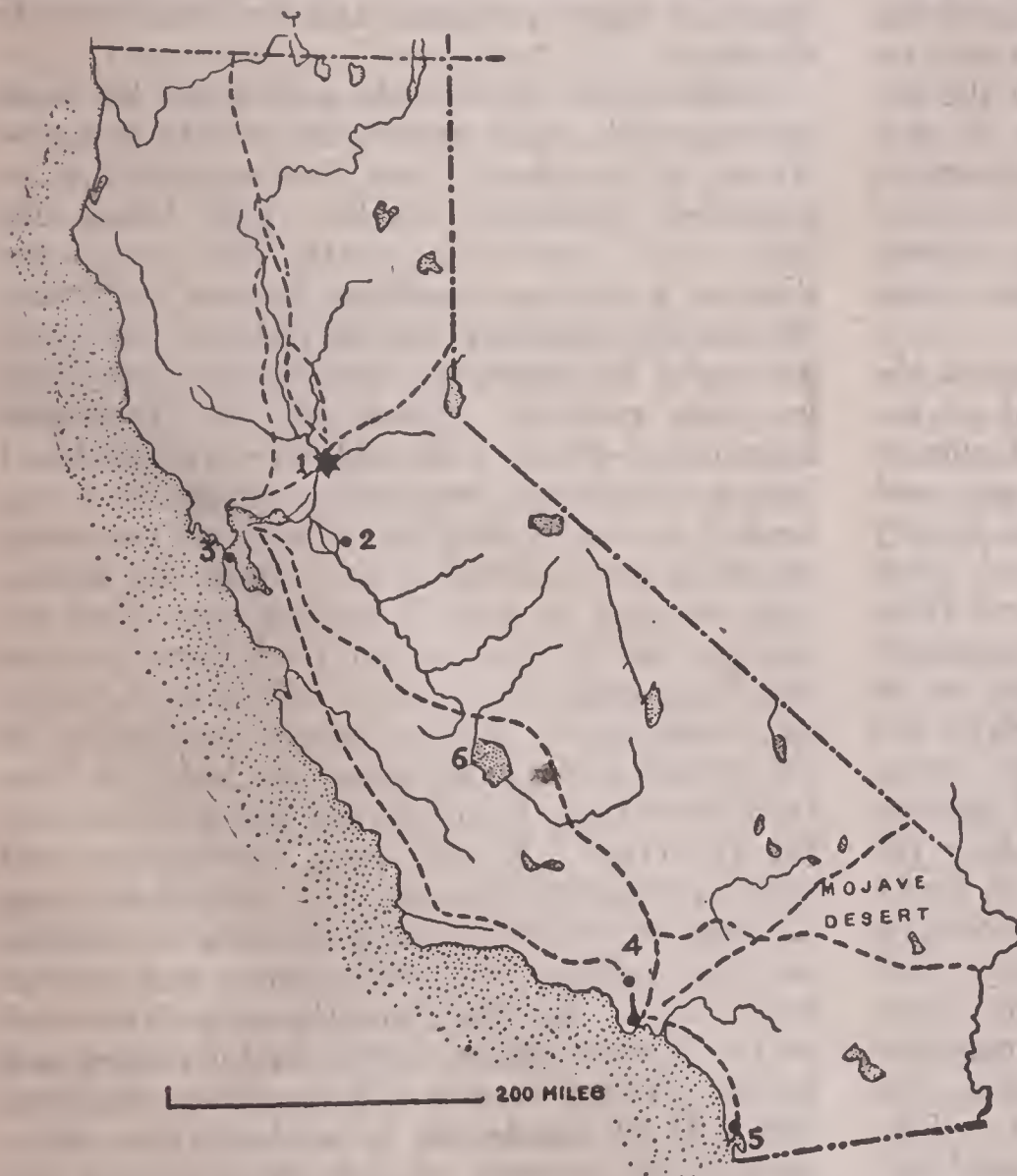
**CALIFORNIA** (käl-ī-fôr'nī-à), a State of the United States, on the Pacific coast, popularly known as the Golden State. It is bounded on the north by Oregon, east by Nevada and Arizona, south by Mexico, and west by the Pacific Ocean. The distance from north to south, measured through the center, is 750 miles, and the average width is 200 miles. The eastern boundary conforms quite nearly to the curve of the sea coast. The western shore is washed by the Pacific Ocean, from which the Bay of

Valley and the San Joaquin Valley, in which flow, respectively, the Sacramento and San Joaquin rivers, uniting near San Francisco Bay, with which their waters intermingle. Among the lofty peaks of the Sierra Nevada are Mounts Brewer, Tindall, Lyell, Dana, and Whitney, Merced Peak, Gray Peak, Pyramid Peak, Sonora Mountain, Stanislas Peak, and many others reaching heights of from 10,000 to 15,000 feet above the sea. Mount Whitney is the culminating peak, having an altitude of 14,868 feet. The Coast Range is less elevated, ranging from 5,600 feet to 9,214 feet, which is the altitude of Mount Pinos. Mounts Eddy, Scott, and China are elevated peaks of this system, which is connected by ranges of the Cascades, to which belong Mount Shasta, elevated 14,380 feet. The mountains abound in thermal and cold mineral springs with recognized medicinal virtues. They are utilized extensively for health and pleasure resorts. Between the mountain ranges are numerous scenic canyons and valleys, the most beautiful of the latter being the Yosemite and Hetch-Hetchy.

**RIVERS AND LAKES.** Besides the Sacramento and San Joaquin, which drain the great interior plain, formed of the Sacramento and the San Joaquin valleys, California has many rivers valuable for drainage and irrigation. The Salinas River drains the region lying west of the Coast Range, flowing into Monterey Bay, and in the northern part is the Klamath, which receives the drainage from the Trinity River and flows into the Pacific near Requa. The Kings is a tributary of the San Joaquin and the Kern, Eel, and Owens are other streams of importance. Many beautiful lakes are located in

different sections of the State, including lakes Tulare and Owens, in the central part; lakes Mono and Tahoe, near the eastern boundary; and lakes Honey, Eagle, and Middle, in the northern part. On the line between Oregon and California are Goose, Rhett, and Klamath lakes.

**CLIMATE.** The valleys of California have a delightful climate, and in most of these the year is divided into the wet and dry seasons. Rain falls chiefly from the middle of November till the early part of May, but of course is not continuous, and the average for the State is twenty-three inches, which is less than at Chicago or



1, Sacramento; 2, Stockton; 3, San Francisco; 4, Los Angeles; 5, San Diego; 6, Lake Tulare. Chief railroads are shown by dotted lines.

Monterey and the Bay of San Francisco are the principal inlets. Point Conception, Point Arena, and Cape Mendocino are the principal capes; the last named is the most western point in the United States proper. California has a coast line of 1,200 miles. The area is 158,360 square miles.

**DESCRIPTION.** Along the shore is a fertile coast plain, east of which, almost parallel to the coast, trend the Coast Range Mountains, and in the eastern part are the high elevations of the Sierra Nevada. Between the two great mountain ranges are the beautiful Sacramento



Montreal. The principal valleys and the sea-coast may be said to have sufficient rainfall, while many portions are adapted to irrigation by drawing water from the lakes and streams. Its great diversity of climate is due to the proximity to the sea and a vast difference in altitude of many localities. The greater part of the State has a very favorable climate, possessing all the elements essential to the growth of vegetation and the enjoyment of life. In some sections are desert regions from which the rainfall is almost entirely shut off by lofty mountains. The largest of these is the Mojave Desert in the south central part. The warm winds, influenced by the Japan Current, affect the coast region favorably, and here flowers bloom the entire year. Snow is almost unknown at San Francisco, where the average mean temperature is 49° in winter and 60° in summer. The plateaus have a temperate climate, while the mountains, especially the western slopes, have considerable snow.

**FLORA AND FAUNA.** Between the tropical climate of the Pacific coast and the cold of the elevated mountain peaks is a range of climate as great as that found between the tropics and the Arctic region, hence the plants are greatly diversified. All the forest trees are of great size. The redwood thrives along the coast from San Francisco Bay to the Oregon boundary, and east of the Coast Ranges are forests of fir and several species of conifers, especially the sugar and yellow pines. South of San Francisco Bay the coast plain is covered with grasses, though small groves of trees abound along the streams and among the hills. The oak is found in the northern part and in the Sierra Nevada are forests of sugar pine, cedar, cypress, and other woods, including the giant sequoia, ranging from thirty to thirty-four feet in diameter and reaching heights of 350 feet. These are the largest and oldest trees in the world. The State was formerly the home of many wild animals and still has quite a number of mammals, including the wolf, bear, lynx, puma, bighorn, deer, and beaver. Many species of birds abound, such as the quail, vulture, cuckoo, and woodpecker. Rattlesnakes, lizards, and turtles are among the reptiles. The fisheries of the inland waters and off the coast are important, especially those of the cod, herring, salmon, smelt, and trout.

**MINERALS.** Productive gold mines are worked in about thirty counties, and the State held first rank in the output of that mineral until 1897, when it was surpassed by Colorado. Formerly mining was confined to the river channels, and sluices were introduced as early as

1851, but now it is carried on by the most improved machinery, and the annual output averages about \$18,500,000. Most of the gold is obtained from the quartz and is produced extensively in Kern, Nevada, Trinity, Calaveras, Eldorado, and Sierra counties. Silver ore is not found in mines producing that metal exclusively, but is obtained in considerable quantities with other mineral products. The State ranks fourth in the production of copper, which is mined chiefly in Shasta County. Other minerals include quicksilver, petroleum, bituminous coal, gas, borax, manganese, and salt. Asphalt is found in large quantities and building stone is abundant.

**AGRICULTURE.** Interest in agriculture has been growing with rapid strides, due chiefly to an increase in population and the construction of extensive irrigation canals. The farms are quite large, averaging nearly 400 acres, but there is a constant tendency toward increasing the smaller holdings, chiefly because the profit in careful husbandry is very marked, especially in fruit growing. South of the Tehachapi Mountains, where fruit culture has developed into an important enterprise, irrigation is depended upon very largely. The State has about 250,000 acres devoted to the culture of grapes, and the crop is used in making wine and for raisins. In the production of beet-root sugar the State takes first rank. Wheat is the most important cereal and is grown extensively in the central valley, and steam machinery is utilized extensively in tilling the soil and harvesting the crops. Barley, oats, alfalfa, rye, and corn are grown more or less extensively, and all kinds of vegetables yield abundantly. Prunes, lemons, oranges, almonds, walnuts, and peaches are grown. All the domestic animals common to the United States thrive, and dairying and poultry raising receive a large share of attention. Truck gardening is an important enterprise in the vicinity of Los Angeles and San Francisco.

**MANUFACTURING.** Few states have better prospects in the line of manufacturing than California, being favored by an abundance of timber and minerals. Gas, and petroleum are factors in developing this enterprise, and the power of mountain streams is utilized in propelling mills and electrical machinery. San Francisco has extensive shipyards, where some of the largest seagoing vessels and warships are constructed. In sugar refining it takes first rank, and its output of canned fruit and lumber is extensive. Other manufactures embrace railway cars, flour, cured meat, molasses, leather, clothing, and machinery.



**TRANSPORTATION.** The Sacramento River is navigable from its mouth to Red Bluff and the Colorado, which forms a part of the western boundary, is important as a highway for commerce the entire course along the border. Few waters are more important than the Bay of San Francisco, which is a busy water commercially, and furnishes good harbors for San Francisco, Oakland, Martinez, and other centers of commerce. San Diego, Eureka, San Pedro, and other points on the coast have a large shipping trade. Electric railways are abundant in the cities and many interurban points, and few states are more favorably situated in respect to railroad transportation. Important lines cross the State in many directions, connecting the chief business centers with each other and with the cities of all parts of the country. The electric lines have 2,120 miles and the steam lines 6,750 miles.

**GOVERNMENT.** The State is governed under a constitution which was ratified by a popular vote and became operated in 1879. By its terms the chief executive authority is vested in the governor, lieutenant-governor, controller, attorney-general, treasurer, surveyor-general, and secretary of State, each elected for a term of four years. The Senate consists of forty and the General Assembly of eighty members, the former being elected for four and the latter for two years. Meetings of the Legislature are held biennially, beginning the first Monday of January of even years. The supreme court consists of a chief justice and six associates, elected for twelve years. It is divided into two departments and holds sessions either separately or as one court. A superior court is maintained in each county, elected for six years, and inferior courts are established by the Legislature. Local government is in the hands of municipal, township, and county corporations. The right of suffrage is extended to all males who can read the constitution and write their own names, with the requirement that they have resided in the voting precinct thirty days, in the county ninety days, and in the State one year, but Chinese are not permitted to vote.

**EDUCATION.** The educational institutions of California are organized on a satisfactory basis and are liberally supported by taxation and public appropriations. A State superintendent of public instruction is at the head of the educational system. District schools are maintained in all the populated rural districts of the State. The towns and cities have graded and high schools, and ample provision has been made for State support to colleges, normal schools, and universities. The State has five normal schools

for the training of teachers, and additional facilities are supplied by a number of private institutions. At Berkeley is located the University of California, which is aided by the government, and the Leland Stanford, Jr., University is at Palo Alto, and ranks as one of the leading centers of education in the United States. Lick Observatory, an adjunct of the State university, is located on Mount Hamilton.

The State maintains prisons at Folsom and San Quentin, a home for the feeble-minded at Glen Ellen, a State reform school at Whittier, and a number of orphan asylums. Asylums for the insane are located at Agnew, Napa, Stockton, and Ukiah; the institution for the deaf, dumb, and blind is at Berkeley; and the Preston School of Industry is at Ione City. All of the leading scientific, religious, and educational societies are well organized. Encouragement is given to libraries in the municipalities and the public schools, and the State maintains a fine library with about 100,000 volumes at Sacramento.

**INHABITANTS.** In population California holds twenty-first rank among the states. It is the most populous of the states in the far west. Fully one-fourth of the people are of foreign birth, including chiefly Germans, Irish, and English. It has 45,700 Chinese and 10,150 Japanese. Sacramento, the capital, is located on the Sacramento River. San Francisco, on the Bay of San Francisco, is the largest city of California and of the Pacific coast. Other cities of importance include Los Angeles, Oakland, San José, San Diego, Stockton, Alameda, Berkeley, Fresno, Santa Rosa, Pasadena, and Eureka. Population, 1910, 2,377,549.

**HISTORY.** The region now included in the State was first visited by Spaniards in 1534, and the Gulf of California is thought to have been surveyed by Cortez two years later. Sir Francis Drake cruised along the coast in 1578. The first settlement was made at San Diego in 1796 by Spanish priests, who established mission stations with the view of converting the Indians to Christianity. California belonged to Mexico during the early period of American history and with it became independent of Spain in 1822. After the Mexican War it was ceded to the United States along with other territory, and was admitted to the Union as a State in 1850. The first great rush of immigrants came to California in 1848, following the discovery of large gold deposits, and the State was soon settled by gold seekers and adventurers. In early history a spirit of lawlessness prevailed, which was eventually overcome by the establishment of societies and the building of cities.



It is now one of the richest and most productive states.

**CALIFORNIA, Gulf of**, an inlet from the Pacific Ocean, between Mexico and the peninsula of Lower California. It is from forty to one hundred miles wide and 700 miles long. It abounds in fish and is rich in oysters and pearly products. The principal rivers that flow into it are the Colorado, Altar, Miguel, and Yaqui. Among the chief seaports are La Paz, Guaymas, and, near its entrance, Mazatlan. Point Eugenia is an important cape on its western shore, north of which is Sebastian Vizcaino Bay.

**CALIFORNIA, Lower**, a territory of Mexico, located south of California, between the Pacific Ocean and the Gulf of California. It has an area of 58,785 square miles. The surface is mountainous, reaching its greatest elevations along the eastern coast and on the peninsula south of Sebastian Vizcaino Bay. The mountains are exceedingly rich in the mineral deposits that are common to California, but mining is yet in a primitive state. Most of the coast lands and valleys are fertile, in which are fine farms and productive orchards and vineyards. A large portion has a dry climate, but the greater part of the territory contains nutritious grasses for pasturage. Pearl fishing and whaling are profitable industries. A number of extensive colonies from the United States are building up various industries. La Paz is the capital. Other towns include Saint Felipe, Saint Lucas, and Saint Quintin. The population is 42,590, a large per cent. of which are Indians.

**CALIFORNIA, University of**, an educational institution at Berkeley, Cal., founded as a State university in 1868. It was organized as a college of agriculture under an act of Congress passed in 1862 and the College of California was united with it. At first it was located at Oakland and it was removed to its present site in 1873. A tax of two per cent. is collected for its support on the assessed valuation of the State, and it receives special State appropriations, government aid, and the benefit of certain endowments, including the income of large gifts by Mrs. Phoebe A. Hearst.

This institution has an astronomical department on Mount Hamilton, in Santa Clara County, which includes the Lick Observatory. It contains the departments of social sciences, natural sciences, agriculture, mining, commerce, mechanics, chemistry, civil engineering, and the college of letters, at Berkeley; and the Hastings College of Law, Mark Hopkins Institute of Art, medical department, dental department, post-graduate medical department, and California College of Pharmacy, at San Francisco. In

addition to these is the department of anthropology, which pursues linguistic and ethnological investigations and gives attention primarily to research of antiquities in Peru, Egypt, and North America. The faculty of instructors and professors consists of 480, the attendance is about 3,600, and the library has 120,000 volumes. Admission is free to residents of the State, while nonresidents pay a nominal tuition fee. The endowments aggregate \$3,500,000, its total income is \$560,000, and the value of the buildings and grounds is \$4,650,000. M. Emile Bénard, of France, laid out the plans, which provide for buildings and improvements that require an ultimate expenditure of about \$10,000,000.

**CALIPH** (kā'lif), a title of office assumed by the successors of Mohammed in temporal and spiritual power. From this name the early governments of Islam came to be known as the *Caliphate*. This title of office was assumed by three large divisions of Mohammedans. These included the Oriental, established at Medina in 632, which was afterward removed under the Ommyiades to Damascus and finally to Bagdad under the Abbassides; the caliphs of Cordova, founded by Abu al Rahman in 756; and the caliphs of Egypt, or the Fatimites, founded by Obeidallah in 909. With the Turkish conquest in the 16th century, the title was assumed by the Sultan, who retains it to the present time. Emir and Shah are other titles peculiar to the Mohammedan countries.

**CALISTHENICS** (kāl-īs-thēn'iks), the exercise of the body and limbs to promote health and grace, including the lighter forms of gymnastics, especially for girls. American colleges for girls contain departments in which members of the classes are trained by instructors. The results have been found wholesome, not only in increasing physical strength, but mental vigor. Calisthenics is now a department of all the larger colleges of America where females are admitted.

**CALIXTINES** (kā-līks'tīnz), the name given to the followers of Georg Calixtus, a Lutheran theologian of the 17th century. The same name refers to a sect of Hussites in Bohemia, who were so called from *calix*, the Latin word meaning cup, owing to their belief that communicants should partake of both the wine and bread in the Lord's Supper.

**CALKING** (kāk'ing), the process of driving a quantity of tarred oakum into the seams between the planks of ships, in order to render the joints water-tight. The oakum is drawn out and laid over the seams, and is then driven by a wedge-shaped instrument called the calking-iron. When sufficient oakum is forced into the seams,



it is covered with melted pitch to prevent water from getting to it. Calking is employed in making water-tight the edges of both wooden planks and iron plates, and in the latter the calking-tool straddles the seam or is driven under the lap of one of the plates, depending upon the construction of the ship.

**CALLA** (käl'là), a plant native to the temperate regions of most continents, found usually in the northern section in swamps and marshes.



CALLA LILY.

The leaves are heart-shaped, the rootstalk is creeping, and the fruit is a small red berry. It has a spreading spathe, and the oblong spadix is covered entirely with flowers. This plant is found in the northern part of Europe and North America, and the root

yields a starch used as food. The beautiful calla lily, known in South Africa as the Ethiopian lily, extensively cultivated for its fine flowers, is sometimes classed with the calla, though it is a different plant.

**CALLAO** (käl-lä'ò), a city of Peru, of which it is the principal seaport. It is situated on Callao Bay, seven miles west of Lima, and is the capital of the province of Callao. The harbor is safe and spacious, and the island of San Lorenzo furnishes a natural breakwater. It has connections with the interior by several railroads, is well fortified, and carries a brisk export and import trade. The manufactures consist chiefly of ironware, clothing, leather, and sugar. Some of the streets in the older part are narrow and poorly improved, but those in the newer part are broad and cross each other at right angles. The customhouse and several schools and churches are among the chief buildings. Callao is an old city, dating from the early part of the seventeenth century. It was destroyed several times by earthquakes and was a Spanish city until 1826. The fleet of Chile bombarded and captured it in 1890. Population, 1905, 31,690.

**CALLIOPE** (käl-li'ò-pè), in mythology, the chief of the Muses, daughter of Jupiter and Mnemosyne (Memory), who presided over eloquence and heroic poetry. She was the mother of Orpheus. The name calliope is now applied

to a musical instrument consisting of a series of steam whistles, toned to the notes of the scale, and played by keys like those of an organ.

**CALMS, Region of**, the parts of the Pacific and Atlantic oceans which are subject to total absence of winds for long periods of time. They are found between the region of trade winds and that of the variable winds. In the North they are known as the Calms of Cancer, and in the South as Calms of Capricorn. During former times, when navigation was carried on wholly by sail boats, these regions were dreaded by seamen as much as the regions of storms, for the reason that ships would lie at rest for several weeks, often exhausting food and water before sufficient movement of the air enabled sailing. With the introduction of large steamboats the former difficulties have been overcome. It is common for violent storms to follow calms that occur unexpectedly. See **Wind**.

**CALOMEL** (käl'ò-mël), a compound of mercury and chlorine, known to chemists as mercury subchloride. It is insoluble in water and is blackened by ammonia. A preparation of calomel is used extensively in medicine for liver complaints, as a vermifuge, and as a purgative. It should be taken with precaution, as it is likely to produce salivation. The calomel of the market is a white powder.

**CALORIMETER** (käl-ò-rim'è-tër), an instrument for measuring the amount of heat in bodies. The measurement of heat is divided into *thermometry* and *calorimetry*, the former having reference to the measurements of differences of temperature, and the latter to the quantity of heat which disappears when work is done, or develops when energy is expended. These instruments are known as water, ice, and steam calorimeters. In water calorimeters, a known mass of water is used to determine the amount of heat developed or expended; in ice calorimeters, the heat of fusion of ice is the basis of measurement; and in steam calorimeters, some liquid, usually water, furnishes the heat of evaporation to determine the quantity. Electro-calorimeters are used to measure the heat generated in an electric circuit.

**CALUMET** (käl'ù-mët), a kind of pipe used for smoking tobacco by the North American Indians. The bowl is generally made of stone and the large stem is ornamented with feathers. It serves as the emblem of peace and hospitality. The acceptance of it is the sign of friendship and peace, and the refusal of it is the proclamation of war and enmity. It is offered to strangers as a signal that they may travel with safety among the members of the tribe.

**CALVARY** (käl'vá-rÿ), the name applied to



the small eminence on the north side of Jerusalem on which Christ was crucified. It is the Latin translation of the Hebrew word *Golgotha*, meaning a skull. In Catholic countries the term is applied to the vicinity of a chapel, erected on a hill near the city as a place of devotion in memory of the Savior. It is common to decorate these places with three crosses, symbolic of Christ and the two thieves, and sometimes other figures are added to represent those who took part in the crucifixion.

**CALVINISM**, the system of thought named from John Calvin. The prominent tenets of Calvinism were presented by the Remonstrance at the Synod of Dort in five points, embracing the doctrines of the Original Sin, Total Depravity, Election or Predestination, Effectual Calling, and Final Preseverance of Faith. The doctrines of Calvin stand in contradistinction to those of the Lutheran and Anglican churches. The Westminster Confession of Faith is the most formal expression of the doctrines of Calvinism that exists. It is the standard of the Presbyterian churches, some holding to all the articles and others supporting them in a modified degree. A number of the branches have shown a tendency to Unitarianism, but this confession still stands as one of the most powerful creeds of the Reformation.

**CALYCANTHUS** (kāl-ĭ-kān'thūs), a genus of shrubs native to Asia and America. They have opposite leaves and purple flowers, and both the bark and leaves have an aromatic fragrance. Some species are cultivated in gardens for their flowers and foliage. The genus includes about six species, four of which are native to the United States. The bark is known as Florida allspice, or Carolina allspice.

**CALYX** (kā'liks), the name applied in botany to the outermost covering of a flower, consisting of an envelope that incloses and supports the whorl of leaves known as the corolla. The leaves of the calyx are called sepals, and are either united at the margins or are separate from each other. The sepals are less delicate than the corolla and are of a greenish color. In some flowers the calyx is united with the corolla and is difficult to distinguish, when the whole is called perianth. It usually falls off after flowering, but in some plants, as in the poppy, it remains until the fruit is ripe, while in others it becomes fleshy and forms the fruit, as in the rose and apple.

**CAM** (kām), a contrivance for changing motion in machinery, usually consisting of a small turning or sliding piece or of a projecting part of a wheel. The shape of its face or periphery is such that it imparts or receives vari-

able or intermittent motion by coming in contact with a rod or lever, or is in the form of a projection of some moving piece of machinery so shaped that it gives alternate motion to another piece against which it acts. Many forms of cams and cam-wheels are employed for various purposes in machinery.

**CAMBAY** (kām-bā'), a city, gulf, and district at the northwestern point of the peninsula of Hindustan. The district is a feudatory state of British India and is under the Bombay presidency. It has an area of 352 square miles and a population of 91,500. The city was formerly the chief seat of commerce. It is situated at the head of the Gulf of Cambay, and now contains a population of 34,160. The gulf is 25 miles wide and 85 miles long, separating the peninsula of Kathiawar from the northern coast of Bombay.

**CAMBODIA** (kām-bō'dī-à), or **Camboja**, a province of French Indo-China. It has an area of 37,400 square miles. The soil is fertile, producing coffee, pepper, sugar cane, cotton, indigo, rice, tobacco, betel, maize, and tropical fruits. Gold and precious stones are the chief minerals. It contains a number of beautiful lakes in which fish abound and has extensive marshes infested by crocodiles. The district is watered by a number of streams, contains evidences of ancient prosperity, and constitutes a valuable and productive region. It has been a French protectorate since 1863, though it is ruled by a native king. In 1887 it was united with Tonquin and Anam into a customs union, the three constituting a district under the direction of the supreme council of Indo-China. Railroads, canals, highways, and public schools have been established since French occupation. Kampot, on the Gulf of Siam, is the seaport, and Pnum Penh, on the Mekong, is the principal city. The inhabitants consist chiefly of native races. Population, 1905, 1,503,500.

**CAMBRAI** (kōn-brā'), or **Cambry**, a city of France, in the department of the Nord, 45 miles north of Saint Quentin. It is nicely situated on the Scheldt River, has extensive railroad conveniences, and is a center of trade. The manufactures include soap, leather, sugar, and machinery. The cathedral contains the remains of Fénélon, who was Archbishop of Cambrai. It has many buildings of stone and cement, including a town hall and a number of schools. It was the seat of an important conference in 1508, when the League of Cambrai was organized, which included the Emperor of Germany, the Pope, and the kings of Spain and France, and its object was to disrupt the republic of Venice. Population, 1906, 23,510.



**CAMBRIAN** (kām'brī-ən), in geology, a division of time, the earliest in which fossils of plant and animal remains are now distinguishable. The Cambrian Period was so named from Cambria, in Wales, where the system of rocks belonging to this age or time were first examined and studied. It is closely associated with the Silurian Period, which some writers regard more recent, and the rocks of this system are immediately below those of the Silurian. They contain fossils of crustaceans, corals, sponges, hydrozoans, starfishes, gastropods, brachiopods, and cephalopods. In Newfoundland the thickness of this system is about 6,000 feet, whence it thickens toward the south and west, being about 7,000 feet in New York and 10,000 feet in British Columbia.

**CAMBRIC** (kām'brīk), a very fine fabric of linen, named from Cambrai, France, where it was first made. Switzerland is now the leading center of manufactures of this article, and it is made extensively in Flanders and other countries. The name *cambric* is now applied to a fabric made of cotton in imitation of the linen product, such as Scotch cambric, which is a muslin made by twisting the cotton fibers very hard.

**CAMBRIDGE** (kām'brīj), a city of Massachusetts, in Middlesex County, separated from Boston by the Charles River. It is entered by the Boston and Maine and the Boston and Albany railroads, and has connection with Boston and other cities by electric railways. Cambridge is a suburb of Boston and the seat of the celebrated Harvard University. It includes Old Cambridge, North Cambridge, East Cambridge, and Cambridgeport. The university is located in Old Cambridge. Its beautiful campus is adorned by magnificent buildings, and its numerous excellent trees are among the most interesting of many noted objects of the city. The famous Wadsworth House, built in 1726, is located on the east end of Harvard Square, and is noted as the residence of the presidents of Harvard College for more than 125 years. A marble slab located under an elegant and venerable tree, surrounded by an iron fence, contains the inscription: "Under this tree Washington first took command of the American army, July 3, 1775." Cambridgeport is located between Old Cambridge and the West Boston bridge, and is noted for its factories, while North Cambridge is the most important commercial center of the city. East Cambridge is the newer portion and contains the public buildings.

The manufactures of Cambridge include machinery, steam boilers, packed meat, clothing, musical instruments and steam engines. It has a number of iron foundries and book publish-

ing houses. The municipal utilities include waterworks, stone and macadam paving, and an extensive sewer system. Cambridge was settled by Governor Winthrop and other men of the Colonial Period in 1630. At first it was known as New Town, but the name was changed to Cambridge in 1683. The Americans occupied it at the time Boston was held by the British, in 1775-76. It was chartered as a city in 1846. Population, 1905, 97,426; in 1910, 104,839.

**CAMBRIDGE**, a city of Maryland, county seat of Dorchester County, 60 miles southeast of Baltimore. It is on the Choptank River and on the Seaford and Cambridge Railroad. The surrounding country is agricultural, producing fruit and cereals, and it is a brisk market for merchandise and produce. Among the chief industries are oyster canneries, flouring mills, and factories producing clothing and machinery. The first settlement was made on its site in 1684 and it was incorporated as a colonial town, but its present charter dates from 1900. Population, 1900, 5,747.

**CAMBRIDGE**, a city in Ohio, county seat of Guernsey County, 58 miles north of Marietta, on the Pennsylvania and the Baltimore and Ohio railroads. It has a public library, a county courthouse, and a municipal system of waterworks. In the surrounding region are deposits of coal, gas, and petroleum. The manufactured products include pottery, machinery, cigars, ironware, and utensils. It was settled in 1806 and became an incorporated town in 1837. Population, 1900, 8,241; in 1910, 11,327.

**CAMBRIDGE**, a town of England, in Cambridge County, 48 miles north of London. It is supported mainly by the great university that bears its name. Trumpington Street, its principal thoroughfare, is lined on both sides by many fine buildings. Besides the University of Cambridge, it has a public library and the Church of the Holy Sepulcher. It has a considerable jobbing trade, modern municipal improvements, and a number of manufacturing interests. The surrounding country is fertile and produces large quantities of cereals and fruits. Cambridge was known as *Camboritum* by the Romans. It was chartered by King John in 1200. Population, 1907, 35,275.

**CAMBRIDGE, University of**, one of the two great institutions maintained in England for many centuries, located at Cambridge, on the Cam River, 48 miles north of London. It was founded at the beginning of the 12th century, tradition fixing the time at 1129. The entire university comprises twenty different corporate bodies, called colleges, founded in the following order: Saint Peter's College, 1257;



Clare College, 1326; Pembroke College, 1347; Gonville and Caius College, 1348; Trinity Hall, 1350; Corpus Christi College, 1351; King's College, 1441; Queen's College, 1448; Saint Catherine's College, 1473; Jesus College, 1496; Christ's College, 1505; Saint John's College, 1511; Magdalene College, 1519; Trinity College, 1546; Emmanuel College, 1584; Sidney Sussex College, 1598; Downing College, 1800; Cavendish College, 1876; Selwyn College, 1882; and Ayerst Hall, 1884.

Each of the colleges has a special governing body as well as teachers and students, but all are subject to the laws of the university as a whole. The university is governed by a senate, which is constituted of all the doctors and masters, but the electoral right is limited to those who reside in Cambridge. This body governs through the council of the senate, which is constituted of the chancellor, vice chancellor, four heads of colleges, four university professors, and eight associates. The ordinary administration of the university is exercised by the chancellor, the high steward, and the vice chancellor, the last mentioned being the head of some college. The discipline of the students is superintended by two proctors. Women are admitted to the examinations after having filled the commissions of standing and residences, but no degrees are conferred upon them, their names being published and certificates are issued. Girton and Newnham are two colleges that have been established for women, but they form no part of the university, though students of these colleges are admitted to many of the university lectures.

The university has an annual income of about \$300,000, which arises from fees at matriculation, for degrees, and from various other sources. There are about 3,000 undergraduates, 45 professors in the various departments, and over 400 fellowships. A beautiful botanical garden, an observatory, and an anatomical school are maintained to further study and for pleasure. The libraries contain over 200,000 volumes and include more than 10,000 manuscripts, while the laboratories for study and the museums are among the best in England. The branches studied cover all the arts and sciences, both ancient and modern. Among the eminent men who studied at Cambridge are Byron, Pitt, Chaucer, Bacon, Newton, Spencer, Ben Jonson, and Milton. Two members of Parliament are sent from the university, who receive their election by the votes of the members of the senate. See **Oxford, University of**.

**CAMDEN** (kăm'den), a city in New Jersey, county seat of Camden County, on the Delaware

River, opposite Philadelphia, with which it is connected by ferry boats. It is on the Pennsylvania, the West Jersey and Seashore, and the Atlantic City railroads. The industries include foundries, boot and shoe factories, machine shops, shipyards, and railroad works. There are no less than eight shipyards in the city, with dry docks and marine railways. Among the principal buildings are the West Jersey Orphanage, the city hall, the county courthouse, the public high school, and many schools and churches. The city has a Carnegie library and a fine Federal building. It has an excellent street railway service and electric and gas lighting, and is the center of a good jobbing trade. It was first settled in 1773 by Jacob Cooper and was incorporated in 1828. Population, 1905, 83,363; in 1910, 94,538.

**CAMDEN**, a city of South Carolina, county seat of Kershaw County, 32 miles northeast of Columbia. It is located on the Wateree River, which is utilized for navigation, and is on the Southern and the Seaboard Air Line railroads. The manufactures embrace cotton and woolen goods, brick, and machinery. It is popular as a winter resort, having a pleasant and healthful climate. It has a monument erected to the memory of De Kalb in 1825, when Lafayette laid the corner stone.

Camden is noted on account of two battles fought here in the Revolutionary War. The first took place on Aug. 16, 1780, when Lord Cornwallis with a force of 2,000 British defeated 3,000 Americans under Gen. Gates. In this engagement Baron De Kalb was mortally wounded. The second Battle of Camden took place on April 25, 1781, between a force of 950 British under Lord Rawdon and 1,400 Americans under Gen. Greene, in which the Americans were repulsed and fled in confusion. In the Civil War, while on the famous march to the sea, Gen. Sherman, on Feb. 25, 1865, entered Camden and destroyed many buildings and about 2,000 bales of cotton. Population, 1900, 2,421.

**CAMEL** (kăm'el), a large cud-chewing animal found native in Asia and Africa. The two species are known as the Arabian camel and the Bactrian camel. They belong to the ruminant quadrupeds, and are known by their long and arched neck, absence of horns, possession of incisive, canine, and molar teeth, upper lip fissure, and one or two humps on the back. These animals are native to an extent of country from Morocco to China. The dromedary, a species of fleet camel, has a single hump or protuberance and is found in a zone nearly 2,000 miles wide. The common, or Arabian, camel, has one hump and is found from Turkestan to China. The



Bactrian camel is larger and more powerful, and is taken as the best beast for service. Owing to its great utility in desert regions it is often referred to as the ship of the desert.



BACTRIAN CAMEL.

The camel travels from three to five days without drinking and with a small quantity of food. It is capable of carrying from 700 to 1,000 pounds 25 miles a day, while those trained for speed often travel from 60 to 100 miles a day.

Its power to endure thirst is due chiefly to the structure of its stomach, which is capable of draining off and storing water for future use by means of little pouches or water cells. The food is of the coarsest kind and consists of grasses, shrubs, twigs,



ARABIAN CAMEL.

and nettles. In a domestic state it subsists on the same general classes of foods as are fed to horses and cattle. Though appearing quite curved, the backbone is almost straight, the apparent curvature being due to its humps. These consist of accumulations of nutritious fat which is stored for future use. The owner of a camel carefully examines the humps before starting on a long journey. When they are plump and in a good condition, the animal possesses accumulated means of support and is able to endure long journeys and much exertion.

The camel lives from 30 to 50 years. It is not

as intelligent as the horse or elephant, and is quite vindictive when injured. Its milk is a nutritious and common food of its owner, while its flesh is highly esteemed. The hide of the camel is useful in manufactures, and the hairs serve a valuable purpose in making carpets and wearing apparel. Its nostrils and eyelashes are fitted to endure the sand storms of the desert. The sense of smell and sight are well developed. At night and when resting it chews its cud much like cattle and sheep. The llama and alpaca of South America belong to the same genus, but have no humps. The camel is used very extensively in Eurasia, Africa, and parts of South America, and has been introduced in Australia. It is one of the most valuable animals.

**CAMELLIA** (kă-mě'l'li-à), a genus of hardy evergreen shrubs or trees native to Asia, so named from G. J. Kamel, a German missionary in the Philippines. It includes many species, of which a large number are cultivated as greenhouse shrubs. The popular camellia has beautiful, double flowers, and was originated from the camellia of China and Japan. Under cultiva-



CAMELLIA.

tion it has developed red, yellow, white, and variegated colors, which differ somewhat in the form and position of the petals. These plants flower profusely in different seasons of the year, and thrive best in cool houses. They may



be propagated by layers or cuttings, and the single camellia is grown largely by planting the seed or by grafting. These plants are closely related to the tea-plant.

**CAMELOPARD** (kă-mě'l'ô-părd), the name sometimes applied to the giraffe, because it is formed like a camel and spotted like a pard. See **Giraffe**.

**CAMEO** (kăm'ě-ô), the general name given to gems cut in relief, in distinction from those hollowed out like a seal. The stones used have two or more different colored layers. The art of cutting is designed to show a layer of color with another color as a background, or an alternation of colors. In stones containing more than two colors one or more are cut so as to form ornamental wreaths or figures, as cups, flowers, or vases. Cameo cutting is of great antiquity. It was practiced by the Babylonians and from them passed down to all succeeding peoples. Some very fine specimens have been found in the ruins of Egypt and ancient Greece. Among the most celebrated cameos is the Gonzaga at Saint Petersburg, which is thought to represent Ptolemy I. and Eurydice. In the Marlborough collection of England is the "Cupid and Psyche," made by Tryphon, who lived in Macedon about the time of Alexander. Glass cameos are manufactured. The art of cutting cameos from shells of mollusks has long yielded excellent specimens.

**CAMERA LUCIDA** (kăm'ě-râ lû'si-dâ), an instrument invented by Dr. Wollaston about 1804, designed to facilitate sketching objects from nature by producing upon paper a reflected picture of them. The instrument contains a glass prism of such a form that its base has the general angles of  $90^\circ$ ,  $67\frac{1}{2}^\circ$ ,  $135^\circ$ , and  $67\frac{1}{2}^\circ$ . The objects, placed in a horizontal direction at the proper distance from one of the planes inclosing the right angles, convey rays, which in their passage through the prism are twice totally reflected, and finally, reaching the observer's eye, placed near one of the acute angles and, looking downward, enable it to see the object of which it is in quest, on a surface placed in proper focus beneath. This camera is usually called the "clear chamber" and has undergone a number of modifications, particularly in the improvement made by the addition of a glass prism, which enables the operator to observe both the figure and the point of the pencil at the same moment and greatly facilitates in sketching the objects. The camera is portable and may be carried to different points with facility.

**CAMERA OBSCURA** (ôb-skû'râ), an optical instrument by which the distant image of an object is thrown on a sheet of paper for con-

venience in sketching or for the purpose of viewing distant scenery. It was invented by Friar Bacon in the 13th century, but has been largely modified and improved. The simple form consists of a chamber from which light is everywhere excluded except at an opening about an inch in diameter, through which rays of light cast the image of the object on the opposite wall or screen. The form used for sketching usually consists of a tent surrounded by opaque curtains, at the top of which a mirror is placed in an inclined position. The light from a distant object is reflected from the mirror to the lens of a revolving lantern placed at the top of the tent, and behind it is a mirror at a slope of  $45^\circ$ , which transmits the image of the object to a sheet of paper placed at a suitable distance below.

Photographers employ the camera obscura, the form consisting of a box with two slides arranged to fit into each other, to one of which a tube is attached, containing an object glass at its extreme end. The camera is focused by sliding the two parts of the box and by means of moving the tube with a pinion. The image of the object is thrown on a ground glass slide in the back of the box. When the image has been focused to its clearest and sharpest point, a sensitive plate is exposed, which receives and retains an impression of it. In recent years the kodak, an instrument constructed on this plan, has come into general use for outdoor photography. See **Photography**.

**CAMEROON**. See **Kamerun**.

**CAMOMILE**. See **Chamomile**.

**CAMPAGNA DI ROMA** (căm-păn'yâ dê rō'mâ), the name applied to the plain surrounding Rome, which nearly coincides with the ancient province of Latium. It embraces the coast region of central Italy, a tract of country about 100 miles long and 30 to 40 miles wide. The northeastern part, lying on the slopes of the Apennines, is pleasant and healthful, but the lowlands are affected by malaria. Within the district are included the Pontine Marshes, formed by a number of small streams, which, having no outlet to the sea, spread over the land. The land is volcanic and a number of lakes, including Albano and Regillus, occupy the craters of volcanoes. It is certain that the plain was dry as late as 312 B. C., when the region was cultivated and the Appian Way was extended over a portion of it. The aqueducts of ancient Rome stretched across it, but the lines are now destroyed and only broken arches remain. The modern towns included in this region are Ostia, Frascati, Tivoli, and Palestrina.

**CAMPANIA** (kăm-păn'yâ), a portion of



ancient Italy, lying southeast of Latium, from which it was separated by the Liris River. The region was popular among the ancient Romans on account of its equable climate and great fertility. The scenery and soft sea breezes made it a favorite place for the residence of the wealthy, who erected villas of great splendor and employed slaves to cultivate the soil. Among the lakes, most of which fill the craters of extinct volcanoes, are Avernus, the fabled entrance to the lower world. Within it stands Mount Vesuvius, near which are the buried cities of Pompeii and Herculaneum. Capua, founded by the Etruscans; Cumae, the oldest Greek settlement in Italy, and Baiiae, the famous watering place of the ancient Romans, are among the noted cities. The Romans called it Felix in song and oratory, from its scenery and fertility, and it is still the *Campagna Felice* of Naples.

**CAMPANULA** (kām-pān'ū-lā), a genus of plants found widely distributed, including nearly 300 species. The plants are mostly herbaceous and many are cultivated. The flowers are greatly variegated, including blue, white, and violet, and are favored for bordering beds. The *Bellflower* is a common species in America, growing profusely in the temperate climates, and the *Canterbury bells* is a species common to Europe. The *harebell* is indigenous in Canada, the United States, and Great Britain.

**CAMPECHE** (kām-pā'chā), or **Campeachy**, a seaport of Mexico, on a bay of the same name, in the northern part of Yucatan, at the mouth of the San Francisco River. The chief buildings include a college and a cathedral. It has manufactures of cigars, machinery and clothing. Its shipyards are among the most extensive in Mexico. Lumber and fruit are produced in large quantities in the adjoining region. It is connected by railways with interior points and has a considerable foreign trade. Population, 1905, 17,248.

**CAMPECHE, Gulf of**, the name of the southern part of the Gulf of Mexico, situated south of north latitude 21°. It is bounded by the three Mexican states of Campeche on the east, Tabasco on the south, and Vera Cruz on the west. In the southeastern part is the Bay of Campeche, from which extends Laguna Terminos into the state of Campeche. Frontera, Campeche, and Vera Cruz are the principal ports.

**CAMPINE** (kām-fēn'), a purified oil of turpentine obtained by distillation over quicklime, or by rectifying it over dry chloride of lime. It forms camphor when united with oxygen. It was formerly used in lamps for light-

ing, but, owing to its explosive gases, it has been superseded for that purpose by kerosene or refined petroleum.

**CAMPHOR** (kām'fēr), a translucent substance obtained by distilling with water the leaves and wood of the camphor tree. It is whitish in color, difficult to powder, has a peculiar odor, and is slightly soluble in water. In alcohol, ether, and strong acetic acid it is highly soluble. It is used to preserve clothing, textiles, and books from ravages of insects. In medicine it is one of the most useful substances, being prescribed for many ailments, such as fever, hysteria, epilepsy, and whooping cough.



CAMPHOR: FLOWER AND FRUIT.

If taken in large doses it lowers the pulse, enfeebles the circulation, and even causes death. It is used both externally and internally. To animals and plants of the lowest forms it is a poison. Camphor is made in large quantities in Borneo, Japan, and China. The roots and wood of the tree are cut in small pieces before distillation is attempted. The best camphor is made from a natural exudation of the camphor tree which abounds in Borneo.

**CAMPOBELLO** (kām-pō-bēl'lō), an island of Canada, belonging to New Brunswick, near the mouth of the Passamaquoddy Bay, an extension from the Bay of Fundy. It is about ten miles long and three miles wide, and has a well-wooded interior. The minerals include lead and copper, but fishing is the chief industry. At the northern extremity is a lighthouse 60 feet



high. The island is popular as a summer resort, being nicely improved with walks and drives, and the permanent population is about 1,200.

**CAMPOFORMIO** (käm-pō-fôr'mê-ō), a village in northern Italy, in the province of Udine, 65 miles northeast of Venice. It is celebrated for a conference held here on Oct. 17, 1797, between representatives of France and Austria. By the terms of the treaty concluded, Austria received Istria and Dalmatia. Lombardy was made a part of the Cisalpine Republic, and France received Venice and the Belgian Netherlands.

**CAMPO SANTO**, meaning holy field, the Italian name of a burying ground. However, it is usually applied only to the burial grounds that are richly adorned and surrounded with arcades. Pisa contains the most remarkable campo santo. It was established in the 12th century, and walls richly frescoed were constructed around it in the 14th century. Genoa also has one of remarkable beauty.

**CAMPUS MARTIUS**, one of the most famous public parks of ancient Rome. It was located outside the walls of Rome, and was inclosed between the Capitoline, Quirinal, and Pincian Hills, and the Tiber River. The park was set apart for military purposes. It was sacred to the god Mars, and was one of the most noted meeting places for the people. In it were several crystal lakes and baths and it contained botanical gardens, theaters, and a race course. It now serves as a part of the site of modern Rome.

**CAMWOOD** (käm'wōd), or **Barwood**, a kind of wood used in making a brilliant red color, which, however, is not a permanent red. When prepared with the sulphate of iron, it yields the red color of the bandanna handkerchiefs. The red obtained from this wood is richer than that produced by Brazil wood.

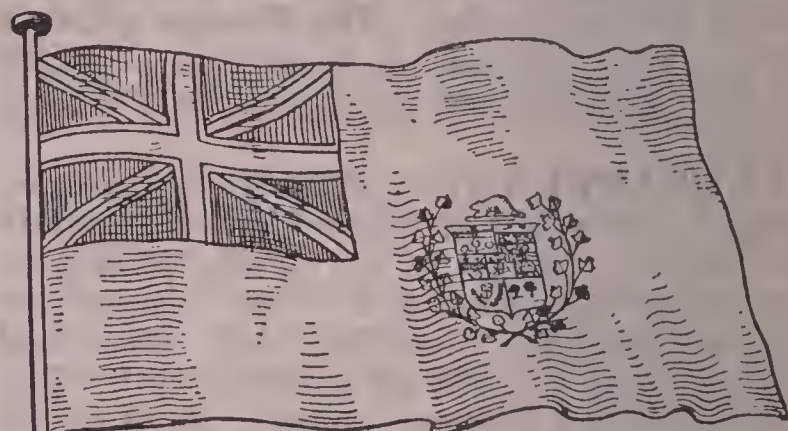
**CANA** (kā'nā), an ancient village of Galilee, about six miles north of Nazareth, the scene of the first miracle of Jesus mentioned in John ii. It is called Cana-el-Jelil by the natives. Another village of the same name was located about three miles north of Nazareth, which some regard as the scene of the miracle mentioned.

**CANAAN** (kā'nān), meaning low land, a portion of the promised land of the Israelites, located between the Mediterranean and the Shur and Syrian deserts, bordering on the Jordan River. It was so named from Canaan, the youngest son of Ham (Gen. ix., 18), and was occupied by the tribe which descended from him.

The Canaanites were a heathen people, and at the time of the invasion of the Israelites were divided into the four nations known as the

Hivites, Hittites, Amorites, and Jebusites. It is probable that the different branches were mixed more or less with immigrants from other countries. They used the Babylonian language in diplomacy, and like the Phoenicians engaged largely in commercial pursuits. Their cities were protected by walls and fortresses, and more recent research has demonstrated that they were dependents of Egypt in 1400 B. C. They worshiped Baal and Astrate. After the Israelitish invasion, they were gradually conquered, and in the reign of Solomon all paid tribute to that king.

**CANADA** (kän'ā-dā), **Dominion of**, the region which includes all the British possessions of North America north of the United States,



FLAG OF CANADA.

except the crown colony of Newfoundland, of which Labrador is a part. The northern boundary is formed by the Arctic Ocean, Baffin Bay, and Davis Strait; eastern, by the Atlantic Ocean, Labrador, and Newfoundland; southern, by the United States; and western, by Alaska and the Pacific Ocean. North of the mainland is the great Arctic Archipelago, containing many islands of considerable size, among them Prince Albert Land, Baffin Land, Prince of Wales Island, Southampton Island, and Melville Island, and on the west are Vancouver Island and the Queen Charlotte Islands. The most prominent coast indentations are Hudson Bay, on the north, and the Gulf of Saint Lawrence, on the east. In extent it is the largest country of North America, being larger than the United States and almost as large as the whole of Continental Europe. The greatest length from east to west is 2,700 miles and from north to south, 1,600 miles. The area is 3,745,574 square miles, of which one-seventh is water.

**DESCRIPTION.** The surface of Canada is divided into the mountain regions of the east and of the west, and the great plain of the interior. These sections are distinguished by differences in climate, surface, and geological structure. Eastern Canada is not generally elevated, rang-





DUKE OF CONNAUGHT.

Arthur William Patrick Albert, Duke of Connaught, third son of Queen Victoria, was born in 1850. He studied at the Military Academy at Woolwich, after which he became general of brigade. In 1874 he was created Duke of Connaught and Strathern and Earl of Sussex. He became commander-in-chief of the forces in Ireland, in 1900, succeeding Lord Roberts, and in 1910 was appointed Governor-General of Canada.







ing from the narrow Atlantic coast plain to the highest points of Labrador, which do not exceed a height of about 8,000 feet. Most of the region ranges between 1,200 to 3,000 feet, with the depression chiefly toward the shores of Hudson Bay. North of the Saint Lawrence River, trending almost parallel to it, are the Laurentian Hills, which form the watershed between the basin of the Saint Lawrence and the rivers which drain into Hudson Bay and Ungava Bay. The altitudes do not exceed 4,000 feet, and detached from them are buttes or summits that trend toward the west, including Mount Royal, at Montreal, and a number of others south and west of that city. Near Niagara is the eastern extremity of a plateau, over the brink of which flow the waters from four of the Great Lakes, and thence it may be traced northward, where it finally rises and forms a series of rocky hills. The eastern shores, including the islands of Anticosti and Newfoundland, are extensions of the Appalachian Mountains, ridges of which appear to be partly submerged.

In the western portion of Canada are the elevated regions of the Rocky Mountains, many of which are covered with snow and glaciers. These extend into Canada from Montana, entering at the boundary between Alberta and British Columbia, whence they have a general direction toward the northwest to the vicinity of Mackenzie Bay. Immediately west of them, in southern British Columbia, are the Gold and Selkirk ranges, and near the coast, trending parallel with it, is the Coast Range. Mount Logan, in the southwestern part of Yukon, belonging to the Coast Range, is the highest peak, having an altitude of 19,514 feet above the sea. Other peaks are Mount Brown, 16,000 feet; Mount Murchison, 15,789 feet, and Mount Hooker, 15,700 feet. The summits of the Selkirks and Rocky Mountains are less elevated, ranging from 9,000 to about 14,000 feet. Among the highest peaks are Mounts Alberta, Forbes, Bryce, and Columbia.

The great central plain is a continuation of the plains extending northward from the United States. It lies between the Rocky Mountains and Hudson Bay, and continues to the shores of the Arctic Ocean. A slightly elevated ridge runs almost through the center, dividing the drainage between the eastern section, which flows largely into Hudson Bay, and the western section, which drains southwest into the Pacific Ocean and northwest into the Arctic Ocean. This region is a vast expanse of great fertility. It is covered with nutritious grasses in the southern part and with stretches of valuable forests in the northern section.

**RIVERS AND LAKES.** The rivers of Canada include some of the largest and most important streams of North America. In the eastern section is the Saint Lawrence, which, with its tributaries, is the chief highway of commerce. It furnishes transportation facilities by way of the Welland Canal from the Great Lakes to the Atlantic. Its northern tributaries include the Saint Maurice, the Ottawa, the Saguenay, and the Outarde, while those from the south are the Saint Francis and the Richelieu. Hudson Bay receives all of the drainage of the southeastern part of the great central plain, including the waters from the Saskatchewan, Nelson, Churchill, Hayes, and Severn. Drainage from the western part of the central plain is carried northwest by the Athabasca, Peace, Great Slave, Mountain, and Mackenzie rivers. British Columbia has two river systems, the Fraser in the southern part and the Nelson in the northern part, and the northwestern portion is drained into the Pacific by the Skeena and Stikine. Practically all of Yukon is in the valley of the Yukon, which rises in the southern portion and carries the drainage northwest through Alaska.

All parts of Canada are more or less diversified by lakes, except the regions of the far north. A number of small lakes are abundant in the eastern part, including the Payne and Michikamau lakes of Ungava; and the Mistassini and Saint John lakes of Quebec. Lake Nipigon is located in western Ontario; lakes Manitoba, Winnipeg, and Winnipegosis, in Manitoba; lakes Athabasca and Reindeer, in Saskatchewan; Great Bear and Great Slave lakes, in Mackenzie; lakes Okanogan and Kootenay, in British Columbia; and Lake Kluahne, in Yukon. On the southern boundary are lakes Ontario, Erie, Huron, Saint Clair, Superior, and Lake of the Woods.

**CLIMATE.** In extent north and south, Canada lies between the north latitude 40° and the north pole, though a large part of the southern boundary is formed by the Great Lakes and parallel 49°, the international boundary. The warmest climate is in the southwestern part, at Victoria, where the temperature ranges from 37° to 60°. From the Pacific coast, modified by the warm Japan Current, the Chinook winds move eastward and temper the severity of the winter, reaching as far east as Alberta. In Saskatchewan and Manitoba, which lie a considerable distance from the sea, the climate is less equable and is marked with greater extremes. At Winnipeg and the country west and for some distance north, the climate is warm in the summer and cold in the winter, reaching from 90° in the growing season to a point as low as 50° below zero in the winter. The arid condition



of the atmosphere, however, has a modifying effect and the cold appears less severe. In the southeastern part the climate is quite equable and is highly favorable to the arts of civilization, especially in all of Ontario and the larger part of Quebec, while the cold currents of the Atlantic cause Nova Scotia, part of Quebec, and all of Ungava to have a damp and cold climate. The northern section of Canada has an arctic climate, with reasonably warm summers in some localities, while in others the ground remains frozen the entire year and the thermometer frequently registers 75° below zero.

The rainfall is abundant in all parts of the Dominion, except in a number of localities of the plains. The arid region is chiefly in Alberta and Saskatchewan, where irrigation is employed, and a number of sections of British Columbia have a scant precipitation. In the eastern part rain and snow are abundant and the shores abound in fogs. The section between the Laurentian Hills and Hudson Bay has ample rainfall, but the soil is poor or rocky.

**FLORA AND FAUNA.** Large forests originally covered the eastern part of Canada, extending from the Atlantic through the Saint Lawrence valley and most of Ontario. Large areas have been cut, but this section, especially Ontario, is still rich in timber. Manitoba has groves and belts of timber along the streams and in the vicinity of the lakes, but a large part of it and much of Saskatchewan and Alberta are comparatively treeless. However, these prairies are covered with nutritious grasses valuable for stock raising. A belt of timber extends from Hudson Bay through the northern part of Saskatchewan and Alberta to the Rocky Mountains, most of which lies north of the Saskatchewan, made up chiefly of poplar, spruce, and tamarack. Vast forests of evergreen trees, such as cedar, pine, and spruce, abound in the Rocky Mountains and the Coast Range. Along the Fraser and other valleys are many specimens of the Douglas spruce that attain heights of from 200 to 300 feet.

The animals are quite similar to those of Northern Asia and Europe, and include many valuable fur-bearing species, such as the mink, sable, ermine, lynx, fox, and bear. In some sections of the Rocky Mountains the puma is still abundant, and the beaver inhabits a large part of the Dominion. The bighorn, elk, goat, antelope, and pronghorn inhabit the western section, and in the Arctic region are such animals as the moose, caribou, musk ox, and white bear. Smaller game, such as the duck, goose, snipe, brant, and grouse, are abundant. Few species of the reptiles are represented, but the country

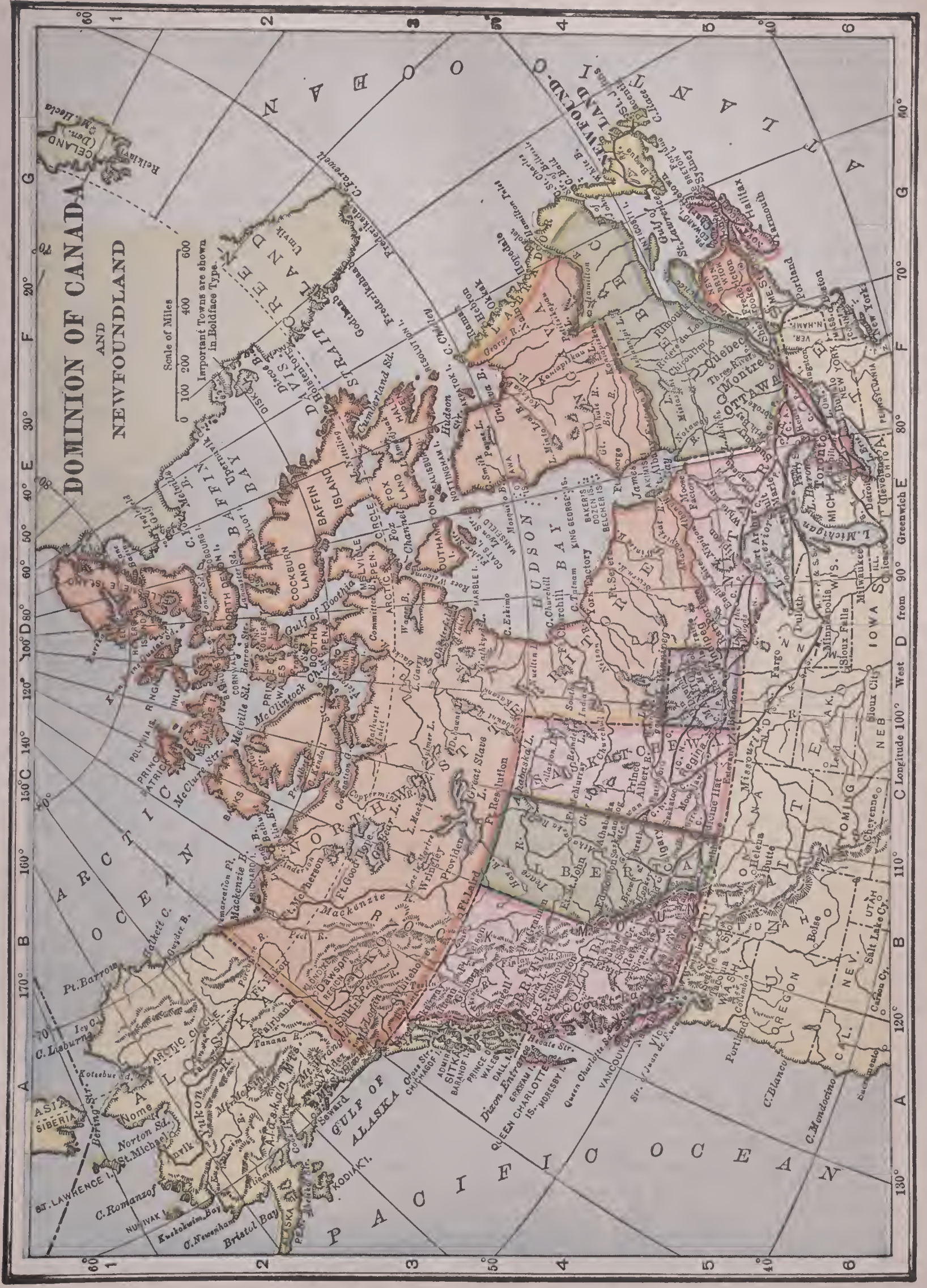
is rich in birds of song and plumage. All the inland and coast waters have valuable fisheries.

**MINERALS.** Canada is rich in minerals. It may well be said that all of the more valuable classes used in the industries are represented. Bituminous coal is abundant, but is confined largely to Nova Scotia and British Columbia, the two extremes of the country, and lignite coal is found in Saskatchewan and Alberta. Anthracite coal of a good quality is obtained at Calgary, Alberta, and in the Queen Charlotte Islands. Iron is mined in Ontario, Quebec, and British Columbia, and is probably the most widely distributed of the minerals. The output of iron is not large, due chiefly to the fact that coal for smelting cannot be obtained at a moderate rate. The output of gold takes first rank, having an annual value of about \$22,500,000, and the mining is done chiefly in British Columbia and the Klondike and other regions of Yukon. In the value of the produce coal ranks next to gold, averaging annually about \$19,500,000. Copper is mined in Ontario and British Columbia, but the ore is transported largely to the United States for refining. Ontario produces large quantities of salt and petroleum, and lead is obtained with silver in the Kootenay district of British Columbia. Nearly one-half of the world's supply of nickel is obtained from the mines in Ontario, which center largely in the Sudbury district northeast of Lake Huron. Quebec produces asbestos of a high grade. Other minerals mined more or less extensively are mica, graphite, gypsum, and pyrites. Building stone of a very high class is abundant, and quarrying is developed to a large extent in Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia.

**FISHERIES.** Few countries are favored like Canada in the quality and quantity of its commercial fish. The Great Lakes, the interior waters, and the coasts are productive as fisheries. In 1908 the output was valued at about \$29,500,000. Cod and lobster are the most important fisheries of the eastern coast, where the output is large, and in addition there are valuable catches of the hake, smelt, haddock, mackerel, and sardine. Trout, pike, and pickerel are caught in the Great Lakes, and the whitefish is the most prolific in the lakes of Manitoba. Salmon fishing is of first importance in British Columbia. Pelagic sealing is a productive enterprise, and off the northern coast is the best whale-fishing region in the world. The minister of marine and fisheries has general oversight of the fish industry, which is wisely guarded by the government.

**LUMBERING.** Lumber has been one of the





**DOMINION OF CANADA  
AND  
NEWFOUNDLAND**

Scale of Miles  
0 100 200 400 600  
Important Towns are shown  
in Boldface Type.



CELAND (Den.)  
M. Hecla  
Rethby

ST. LAWRENCE I.  
C. Romanzof  
NUNIVAK I.  
Kookwikim Bay  
C. Newenham  
Bristol Bay

ASIA  
SIBERIA  
Nome  
Norton Sd.  
St. Michael

ARCTIC OCEAN  
Pt. Barrow  
C. Lieburny  
Kotzebue Id.

ARCTIC OCEAN  
POLYNIA RING  
PRINCE PATRICK I.  
McClure Strait  
Banks

ARCTIC OCEAN  
C. Foxe  
C. Melville  
C. Lockhart

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chief sources of wealth in Canada since its early settlement. Many of the forests of the eastern section have been exhausted, but partial protection against wastage is furnished by the laws now in force. The government has reserved as public property a large area of the public domain, and lumbermen secure it by paying a license to cut. For some years the value of lumber exports have had an average of about \$38,500,000, most of the shipments being in the form of sawed products. Ontario, Quebec, and British Columbia have the most important lumbering industries, but timber extends across the continent in a belt ranging from 150 to 300 miles, and the north central section bids fair to furnish heavy competition when railroads are more generally constructed. The most important varieties of timber utilized include the Douglas fir, balsam, pine, spruce, hemlock, and many kinds of hardwoods.

**AGRICULTURE.** Agriculture is the leading enterprise, and about seven-tenths of the people pursue this occupation. A wide range of climate makes it possible to greatly diversify the crops. Farming is carried on in the valleys of Nova Scotia, New Brunswick, Prince Edward Island, and other portions of the Maritime Provinces. The narrow valley of the Saint Lawrence River has the largest interests in agriculture that have been developed at this time in Quebec, and here general farming has attained a high degree of perfection. Ontario is the leading province in agriculture and has a very large output of oats, barley, wheat, and peas. It is practically the only section where corn is raised profitably. In Manitoba, Saskatchewan, and Alberta especial attention is given to the culture of wheat, oats, flax, and barley. British Columbia has some exceptionally rich valleys, notably that of the Fraser River, and is leading in the production of fruits.

The eastern section is most particularly concerned in general farming, and the agriculturist diversifies both the crops and the live stock, while farming in the interior consists more generally in special lines, such as growing cereals or conducting ranches as distinct enterprises. Truck farming is carried on largely in southwestern Quebec and many parts of Ontario. All classes of domestic animals are grown, and bee-keeping and dairy farming receive studious attention. In the exportation of cheese, Canada takes first rank among the countries of the world.

**MANUFACTURING.** Canada is favored in having an abundance of natural resources, including a vast number of raw materials, hence has a future of great promise in the manufacturing

enterprises. Lumber products take rank as the most important at present, and large quantities of sawed timber are exported. Salmon canning and pork packing are well represented, the former in British Columbia and the latter in Winnipeg and Toronto. Montreal and Quebec are centers in the manufacture of woolen goods, boots and shoes, and iron and steel products. Nova Scotia, having both coal and iron ore, has large developments in the manufacture of hardware and machinery. Other products include leather, furniture, cotton fabrics, paper, soap, cigars, chemicals, and clothing.

**TRANSPORTATION.** The Great Lakes and the Saint Lawrence River are important as natural highways, and with the construction of a system of canals it has been made possible for vessels drawing fourteen feet of water to pass from Lake Superior to the Atlantic. Montreal is at the head of ocean navigation and is the seat of a large commerce, being favored by its location on the direct route to the Great Lakes and a number of extensive railway systems. Vessels from Montreal to Port Arthur pass from Lake Ontario by the Welland Canal to Lake Erie, thence by the Detroit River and Saint Clair Lake and River to Lake Huron, thence by a ship canal along the east bank of the Saint Mary's River into Lake Superior. Navigation by water is possible for long distances on many of the rivers, including chiefly the Fraser, Thompson, Athabaska, Yukon, Mackenzie, and Saskatchewan. Transportation is important on the lakes of Manitoba, with which Winnipeg is connected by the Red River of the North. The Canadian Pacific Railway has been operated as a transcontinental line since 1887, having its eastern terminus at Halifax, in Nova Scotia, and its western at Vancouver, in British Columbia. The Grand Trunk Railway is the second line across the continent of Canada, extending from Quebec and Portland, Me., to Prince Rupert, on the Pacific. These great railways and others have numerous branches, and the latter has a line projected to Dawson, in the west central part of Yukon, which will be connected with navigation on the Yukon River.

Canada has an extensive foreign trade. The imports somewhat exceed the exports, which approximate an annual value of \$360,500,000, while the imports average about \$295,540,000. Animals and animal products are the chief exports, and next in order are lumber, cereals, dairy products, minerals, paper and wood pulp, leather, and fresh and canned fish. Among the chief imports are cotton and woolen fabrics, coffee, coal, tea, iron, machinery, and raw cotton. Great Britain and the United States have the



principal share of the foreign trade, and the former has a preferential tariff in its favor, goods being admitted about one-third less than the tariff rates on imports from foreign countries. The rate of postage and the monetary system are similar to those of the United States.

**EDUCATION.** The minister of education has general oversight of the public schools, though no centralized system of education is maintained for the whole Dominion. Each province has charge of its own system of schools and public instruction, and attendance is free in all the provinces, most of which have a nominal compulsory attendance law. The provincial superintendent and his council have general supervision, while the separate schools are looked after locally by trustees elected in the districts. In the rural communities each township is divided into school sections and three trustees manage the school affairs of each section, while the municipalities have a board of school trustees, who have general supervision, and usually place the direct management of instruction in the hands of principals and superintendents.

Canada has many institutions of higher learning as well as numerous academies and denominational schools. The Dalhousie College, Nova Scotia, founded in 1820, was the first to be established. The University of Toronto, Ont., was founded in 1828; Queen's College, Kingston, Ont., in 1841; Laval University, Quebec, in 1852; the University of Manitoba, in 1877; and the Royal Military College, Kingston, Ont., in 1874. Many educational and scientific societies are maintained. These include the Nova Scotia Institute, the Royal Society of Canada, the Natural History Society of Montreal, the Scientific and Historical Society of Winnipeg, the Canadian Institute of Toronto, and the Society of Natural History in Victoria.

All religious beliefs are tolerated and no state church is maintained. The province of Quebec has a large per cent. of Roman Catholics, who are guaranteed the privileges enjoyed while it was a colony of France. A larger per cent. of the people belong to the Roman Catholic church than to any other denomination, numbering about 2,230,000. The second in numerical strength are the Methodists, who have a membership of nearly half that number. Next in order are the Presbyterians, Anglicans, Baptists, Lutherans and Congregationalists. Comparatively few Catholics reside in Ontario, Manitoba, and Saskatchewan. The Methodists have the largest membership in Ontario and the Presbyterians are most numerous in Nova Scotia.

**INHABITANTS.** The government of the Dominion and of the provinces has encouraged

immigration and investments. The influx from foreign countries has been increasing steadily, and is largest from the United States, England and Wales, Scotland, Ireland, France, and Germany. Immigration from the United States may be said to date from about the beginning of the present century, when settlers were attracted by the fertile lands and vast resources of the western part of Canada. The Europeans represented most largely are the Germans, 310,501; the Scotch, 800,154; the Irish, 988,721; the English, 1,260,899; and the French, 1,649,371. These figures are based on the census of 1901, when the English of Canadian parentage included 683,480 and the French of Canadian parentage, 635,972 people. In that year the total number of persons of foreign birth was reported at 278,804. The Indian population is 107,978. These people consist chiefly of the four branches known as Algonquins, Eskimos or Innuites, Huron-Iroquois, and Tinnehs or Dine Dinijes. The Chinese and Japanese numbered 22,050, most of whom are in British Columbia.

Ottawa, the capital of the Dominion, is a thriving city on the Ottawa River, in Ontario. Montreal, the largest city, is at the head of ocean navigation on the Saint Lawrence, in Quebec. Toronto, the second city, on the north shore of Lake Ontario, is a center of commerce and manufacture. Other cities of importance include Quebec, Hamilton, Winnipeg, Halifax, Saint John, London, Charlottetown, Vancouver, Victoria, Kingston, Brantford, Brandon, and New Westminster. The population of the Dominion in 1901 was 5,371,315.

**GOVERNMENT.** For the purpose of government, the Dominion is divided into provinces and territories. The following table contains a complete list together with the area of each division, as reported by the latest census:

PROVINCES.	
Alberta.....	253,540
British Columbia.....	312,630
Manitoba.....	73,732
New Brunswick.....	27,985
Nova Scotia.....	21,428
Ontario.....	260,862
Prince Edward's Island.....	2,184
Quebec.....	351,873
Saskatchewan.....	250,650
Yukon (Territory).....	196,976

UNORGANIZED DISTRICTS.	
Franklin.....	500,000
Keewatin.....	516,571
Mackenzie.....	562,182
Ungava.....	354,961

The government is administered under a constitution drafted in 1864 and embodied in the act of 1867, when the union of the leading colonies created the Dominion of Canada, which was subsequently increased by accessions of territory.



Executive authority is vested in the Governor General, who is appointed by the King of England. He is assisted by a Privy Council composed of a premier and 15 ministers, 13 of whom are heads of departments. The departments consist of those of justice, state, trade and commerce, railways and canals, marine and fisheries, militia and defense, posts, finance, agriculture, interior, public works, customs, and internal revenue.

Appellate civil and criminal jurisdiction is exercised in all parts of the Dominion by the supreme court, which has its seat at Ottawa, and an exchequer court has general powers of admiralty. Each of the provinces has a judiciary system, including justices of the peace, police magistrates, county courts, and a supreme court, but the judges of the two courts last mentioned are appointed by the Governor General of the Dominion. All the provinces have a Lieutenant Governor General appointed by the Governor General of the Dominion and a legislative department, which consists of two branches in some of the provinces and in others only one chamber, as in Ontario and British Columbia.

A Parliament, consisting of two houses, the Senate and the House of Commons, has legislative authority in the Dominion. All bills providing for revenues must originate in the House of Commons, and the Senate may not amend these bills, though it has power to initiate legislative action in many matters. The Governor General may disallow a bill passed by the two branches, or he may refer it for consideration to the home government, but the former is not exercised in practice, and the latter is employed only where a measure has direct reference to the interests of the empire at large, or affects its relations to foreign powers. Members of the Senate receive their appointment from the Governor General. They must reside in the province from which they are chosen, be born or naturalized subjects thirty years of age, and possess property valued at not less than \$4,000. Membership in the House of Commons is based upon the population of the provinces, and the election is for five years by popular vote. The Senate consists of 87 members, of whom 24 are from Quebec, 24 from Ontario, 10 from New Brunswick, 10 from Nova Scotia, 4 from Prince Edward Island, 4 from Manitoba, 4 from Alberta, 4 from Saskatchewan, and 3 from British Columbia. Representation in the House of Commons is as follows: 110 members for Ontario, 89 for Quebec, 28 for Nova Scotia, 23 for New Brunswick, 14 for Manitoba, 10 for British Columbia, 10 for Saskatchewan, 8 for Prince Edward

Island, 8 for Alberta, and 1 for Yukon, making a total of 301.

The right of franchise extends to all male citizens 21 years of age, but various restrictions are imposed by the provinces, such as residence for a specified time and registration on the assessment rolls. The King of England is the commander in chief of the naval and military forces, but they are under the control of the Dominion Parliament. The militia include all British subjects between the ages of 18 and 60, and there is no standing army, except a garrison of British troops at Halifax. The active militia is limited by law to 40,000 men, who are raised by voluntary enlistment or by draft. No navy is maintained by the Dominion, and the naval defense of the country is entirely under the direction of the imperial government, which maintains forts at Halifax, in Nova Scotia, and Esquimalt, in British Columbia.

LITERATURE. The literature of Canada dates from the early settlements made by the French in the valley of the Saint Lawrence, and much of the product is still in the French language, although many writings of value have been published in the English. An Ursuline convent and Laval University were founded in the seventeenth century and became the center of educational influences at an early date. Many of the earlier writings treat of discovery, history, and tradition of the Indians. Champlain published a description of his first voyage and many interesting narratives in 1601, and his writings were edited and published in six volumes by Laberdère in 1870. Lescarbot, one of the settlers in Acadia, published "The History of New France." Another noted historical work is Gabriel Sagard's "Relations des Jésuites," which is replete with thrilling incidents of the life and adventures of missionaries. A line of poetic productions, interesting for their description of the scenery and the spirit of progress in the new land, were issued in the course of time. Ernest Gagnon, in 1865, published a collection of these popular songs. They were translated by William McLennan under the title "Songs of Old Canada."

After Canada became English territory under the Treaty of Paris in 1763, it lost much of its literary spirit by the strife between the French and the English. However, the contention was happily overcome when the provinces were united as the Dominion of Canada in 1867. This event was followed by a new era in the literature of the country. French Canada still holds its own language and has many native-born writers. In the list may be named Michel Bibaud, author of "Histoire du Canada sous la



dominion anglaise," and François Xavier Garneau, the writer of "Histoire du Canada." Other writers in the French language include Abbé Faillon, Benjamin Sulte, Abbé Tanguay, and Faucher de Saint-Maurice. Many newspapers and other periodicals are published in the French language, most of which are centered in Quebec and Montreal. The French writings are not only rich in history and romance, but include many poetic works in a finished style.

The English portion of Canada is settled largely by English, Irish, Scotch, Germans, and immigrants from the United States, though the last mentioned are most numerous in the western part. Samuel Hearne (born in 1745), though of English birth, is one of the earliest Canadian writers in that language. His "Account of a Journey from Prince of Wales' Fort in Hudson's Bay to the Northwest" is one of the earliest accounts of travels and explorations. William Smith, in 1815, published his "History of Canada." Another work of merit is David Thompson's "War of 1812," which was issued in 1832. Joseph Howe is among the early orators, and his speeches delivered in the Parliament of Nova Scotia were published in a collected form in 1858. Among the eminent statesmen may be mentioned Alexander Mackenzie, Sir Charles Tupper, Sir John Macdonald, and Sir Wilfrid Laurier. Goldwin Smith, an eminent journalist, is well known from his historical work, "The United States; an outline of Political History." Other historical writers include Robert Christie, William Kingsford, Henry Scadding, George Bryce, and G. M. Adams. "Canada Under British Rule," published by J. G. Bourinot in 1900, is one of many commendable historical writings.

The books on general literature, especially novels and romances, are very numerous. However, the works in fiction are comparatively recent. John Galt, who lived for three years in Ontario, published an account of frontier life in his "Lawrie Todd." Mary Catherwood published "The Romance of Dollard" and "The Lady of Fort Saint John." G. M. Adams, the Canadian journalist, completed "An Algonquin Maiden" in 1886. Sir Gilbert Parker is the author of "The Right of Way," "When Valmond Came to Pontiac," and "The Seats of the Mighty." Among the poetical writers may be mentioned Isabella Valancy Crawford, W. W. Campbell, Sir Gilbert Parker, Bliss Carman, and Charles Sangster. The later poets and historians take cognizance of the combined national elements in the Dominion.

**HISTORY.** The Norsemen were the first to visit the eastern coast of Canada, on which Bjarni

Herjulfson is thought to have landed in 986. Leif Ericson came across from Greenland in the year 1000, and is thought to have touched the shores of Newfoundland and Nova Scotia. John Cabot, a Genoese by birth and an Englishman by residence, sailed from Bristol and in 1497 landed on the coast of Labrador, claiming that district for England. Basque and Breton fishermen established cod fisheries off Newfoundland in 1504, and Jacques Cartier, the French navigator, came to Quebec in 1534 and took possession of the country for Francis I., King of France. He made a second voyage in 1535 and ascended the Saint Lawrence as far as Montreal.

Marquis de la Roche was commissioned as lieutenant governor of Canada by the King of France in 1598. He bargained to colonize New France, as the country was called, and planted a settlement on Sable Island, but this was not permanent. Sir Humphrey Gilbert made a settlement at Saint John's, Newfoundland, in 1583, but this did not prove successful. Samuel Champlain made his first voyage to Canada in 1603, sailed up the Saint Lawrence under the direction of the French, and in 1608 founded the first permanent settlement in Canada, at Quebec. A few years later he discovered lakes Champlain, Huron, and Erie, and in 1611 planted a settlement at Montreal. He concluded a treaty with the Hurons and Algonquins, which ultimately brought the French into conflict with the Iroquois, who formed alliances with the Dutch and afterward with the English.

The Jesuits came from France in large numbers in 1625, and for nearly half a century predominated over religious and secular affairs at Quebec. In 1627 the Company of New France was organized by Richelieu and held sway until 1663, when it was superseded in control by the government of France, though a new corporation, known as the Company of the West, was established in 1664, and, like its predecessor, exercised a monopoly over the fur trade. Louis XIV., who had sent Colbert to America, looked upon New France as a valuable possession and sought to establish a permanent foothold on the Saint Lawrence and the Great Lakes. Frontenac was sent to America in 1672 and gave new life to the enterprise of strengthening the colony. He coöperated with LaSalle in exploring the Mississippi and some of its tributaries, and in the establishment of military posts at Niagara, Mackinac, and within the territory of the United States.

The effects following the explorations of Henry Hudson and the settlements by the English in Virginia caused a feeling of rivalry



between England and France, and subsequently caused the so-called French and Indian Wars. The first clash took place as early as 1629, but France continued to retain a strong foothold until 1759, when Wolfe captured Quebec. The Treaty of Paris in 1763 ceded Canada, including all the territory between the Alleghenies and the Mississippi, to Great Britain, retaining only the city and district of New Orleans. From 1760 to 1764 Canada was entirely under military control, and in the latter year a provisional government was organized, which remained in force until 1774, when the Quebec Act was passed by the British Parliament. This legislation recognized the civil laws and institutions of the French in Canada, and provided that the Roman Catholics should exercise their religious practices without interference.

The American colonies that declared independence from England in 1776 tried to form an alliance with Canada, but it remained loyal throughout, and many loyalists left the United States during the Revolution. The number of immigrants from the United States within this period aggregates between 30,000 and 40,000, and these people not only founded New Brunswick and settled large parts of Ontario, but their descendants continue to constitute an influential element in the commercial and political affairs of the Dominion. The area of Canada was reduced by the Treaty of 1783, when the British relinquished their claim to the region now included in the states of Ohio, Indiana, Michigan, Illinois, and Wisconsin.

The provinces of Ontario and Quebec were founded in 1791 by an act of Parliament which divided the region into the two sections known as Upper Canada and Lower Canada. At that time the former was populated almost entirely with people of English descent, while the latter was inhabited by descendants of the French. In the War of 1812, between Great Britain and the United States, Canada was the scene of many battles, among them those of Chippewa, Queenstown, Lundy's Lane, and Moravian's Town. Lower Canada, or Quebec, had a popular assembly constituted largely of French, while the governor and legislative council was almost exclusively English. This caused much racial antagonism and in 1837 a considerable party under the leadership of Louis J. Papineau rose in revolt against the British authority, but the imperial government intervened and suppressed the revolutionary rising. It soon became apparent to the government that to unite the two sections would be the wisest policy, which was brought about under an act passed in 1839, and the union was completed in 1841. The Maritime

Provinces, which included Nova Scotia, Cape Breton, New Brunswick, and Prince Edward Island, meanwhile retained their separate governments. Under the new union the crown appointed the governor and a legislative council, while the upper and lower branches of the legislative assembly were constituted of members elected by popular vote.

The Dominion of Canada was created in 1867 by the Act of Union passed by the British Parliament, and at that time consisted of the provinces of Quebec, Ontario, Nova Scotia, and New Brunswick. British Columbia was united in 1871 and Prince Edward Island became a province of the Dominion in 1873. However, Newfoundland refused to enter the union and still comprises an independent colony. The more recent accessions are Alberta and Saskatchewan, which were united as provinces of the Dominion in 1905, formed of the region formerly included in the four territories of Alberta, Assiniboia, Athabasca, and Saskatchewan. At the same time the region known as the Northwestern Territory was reorganized, which is now embraced in the Territory of Yukon, and the two unorganized districts of Mackenzie and Keewatin. Two other unorganized districts, Ungava and Franklin, are included in the Dominion, the former lying north of Quebec and east of Hudson Bay, and the latter embracing Baffin Land and the islands of the Arctic Archipelago.

The Treaty of 1783 did not fix definitely the boundary between the United States and Canada, which was the subject of much contention for many years. However, the Ashburton Treaty, concluded in 1842, finally settled the northeastern boundary, and the northwestern boundary was finally adjusted in 1846. Treaties affecting the right of fishing in the Bering Sea and elsewhere have been the cause of some friction between the two countries. Reciprocal trade relations were established in 1854 and 1866, under which trade and commerce between Canada and the United States grew to much importance. In 1869 the Dominion acquired the vast territory held by the Hudson Bay Company since 1670, and this was followed by an uprising under Louis Riel in 1870, who headed a large number of discontents and organized a government in the territory now included in Manitoba, of which he was declared the president. A British army under Sir Garnet Wolseley was dispatched to the seat of trouble, and Riel fled to the United States.

**CANADA BALSAM** (baɪ'sam), a transparent liquid obtained from a species of fir native to Canada and the northern part of the



United States. It is resinous, has a pale yellow color and an acrid taste, and closely resembles turpentine. The name was derived from the balsam fir, from which it was first obtained, but it is likewise secured from the hemlock spruce and other species. It has the consistency of honey when it exudes from the bark, but becomes solid after exposure to the air. This product is valuable in making varnishes, in photography, and to some extent in medicine.

**CANADA GOOSE**, a wild goose which inhabits North America, breeding in the north and moving southward to the warmer region in autumn. It is about thirty-five inches long. The plumage is gray, with black on the head and the tail. Flocks of these geese begin to move north about the 1st of April, and are frequently seen at a considerable height, led by a gander who utters a loud honk at frequent intervals. These birds are hunted for their flesh, which is highly nutritious.

**CANADA HEMP**, a species of herbs native to America, belonging to the dogbane family. It abounds throughout the western part of Canada and the United States, and furnishes a fiber used by the Indians in making nets and numerous articles. The bark of its root has tonic properties.

**CANADIAN THISTLE**. See **Thistle**.

**CANADIAN RIVER** (ká-nā'dê-an), a river of the United States, 900 miles long. It rises near the line between Colorado and New Mexico, thence flows through New Mexico, Texas, and Oklahoma. It receives the North Fork of the Canadian River in Oklahoma, and flows into the Arkansas River about fifty miles west of Fort Scott.

**CANAL** (ká-nāl'), an artificial water course or channel. The construction of canals is of great antiquity. The earliest known in history were those built by the Babylonians, who utilized them for navigation and drainage. The Egyptians connected the Nile and the Red Sea by a canal at a remote period. Although it fell into decay through the fortunes of war, it was reopened by Pharaoh Necho about 605 B. C., and at intervals by others after him. Most of the ancient nations constructed canals. The great canal of China is 825 miles long. It was commenced in the 7th century A. D. and was completed in the 9th. Canals were first built in France, Germany, and England by the Romans, the canal at Caderike being the first artificial channel used for navigation in the British Isles. The Whitham and Trent rivers were joined by a canal in 1134, and in 1759 the Bridgewater Canal was commenced. The Erie

Canal of New York was begun in 1817 and was completed in eight years. Many noted canals were built in the 17th and 18th centuries in Holland, Germany, Belgium, and other countries of Europe. The construction of canals has been greatly modified since the beginning of the era of railroad building, though, instead of being lessened, the tendency has been to build larger canals than at any time in previous history. Canals are now built mainly as aqueducts and for boats, ships, drainage, water power, and irrigation.

**AQUEDUCTS**. Aqueducts are designed to carry canals across waterways or depressions in the ground. The Peruvians, Romans, and Grecians constructed aqueducts on a large scale, carrying water by these means for the irrigation of arid lands and to supply cities. Some of the most noted aqueducts of America are those of New York, Baltimore, and Saint Louis. They are maintained as a means of supplying water for city use. An aqueduct differs from a canal



LIFT LOCK CANAL.

mainly in that it is shallower and is built so the water will flow by gravitation in its entire course. Many large cities have one or more aqueducts. One of the most noted of recent construction is across the River Loire in France. It is 2,175 feet long, and 21 feet wide, and carries eight feet of water. Its importance is not in its size, because other similar constructions are much larger, but from the fact that it is constructed almost entirely of steel plate. Instead of having solid masonry, it contains piers of masonry and its several parts are riveted together.

**BOAT AND DRAINAGE CANALS**. Boat canals serve for transportation purposes, in which vessels are often drawn by horses or mules on a towpath. The Erie Canal of New York is one of the notable artificial channels of this class in America. It is 351 miles long and connects the Hudson River at Albany with Lake Erie at Buffalo. The State of New York appropriated \$9,000,000 in 1895 to deepen the canal and other-



wise improve it for the use of larger vessels. It is now nine feet deep. Most drainage canals are constructed for sanitary and drainage purposes, but in some cases they are used partly for navigation. Many of this class of canals penetrate various parts of the Netherlands. The canal which carries the surplus water from Lake Zumpango, in Mexico, was commenced in 1607. Many years were required for its construction, being completed in 1789, a period of 182 years. The canal was greatly improved by an expenditure of \$3,500,000 in 1889. It carries the sewage of the city of Mexico and drains the adjacent valleys. The greatest work ever attempted in this line is the Chicago Drainage Canal, which extends from the south branch of the Chicago River to the Des Plaines River, at Lockport, a distance of 28.05 miles. It was completed in eight years, beginning in 1892, at a cost of \$42,000,000. By means of this canal water from Lake Michigan flows into the Chicago River and carries the sewage from Chicago through the Des Plaines to the Illinois River, and is intended eventually to provide water navigation from the Great Lakes to the Mississippi River.

**SHIP CANALS.** Ship canals are constructed for the passage of the largest ocean vessels. The Suez Canal, connecting the Mediterranean with the Red Sea, is the first large ship canal to be completed in modern times. It was opened in 1869, is 99 miles long, 327 feet wide, and 26 feet deep. The Kaiser Wilhelm Canal, in Germany, was opened in 1895. It connects the North and Baltic Seas, passing through Schleswig-Holstein. It affords passage for the largest vessels afloat, and its opening was one of the most important events in the commercial history of Europe. The project to cut a canal across the Isthmus of Panama, with the view of connecting the Atlantic with the Pacific, was long a subject for serious discussion. The first attempt was made in 1878 under the French engineer, M. de Lesseps, the builder of the Suez Canal. The work was commenced in 1881 with the design of completing it in 1904, but the company became involved in monetary difficulties and by 1889 only one-third of the work had been completed, with an expenditure of \$156,400,000. In 1904 the project of constructing the canal was undertaken by the government of the United States, under whose direction the work is progressing with good prospects of eventually completing the enterprise. The Welland Canal, which connects lakes Erie and Ontario, is an important waterway of Canada.

**OTHER CANALS.** Water power canals are con-

structed to supply water power in propelling machinery. Among those noteworthy is the Sault Sainte Marie Canal, by which the water of the Saint Mary's River is utilized and furnishes force equal to 40,000 horse power. However, it is more important as a ship canal. It has an enormous traffic and the largest lock in the world. Irrigation canals were built by the Ptolemies in Egypt, and have been constructed more or less in all arid countries. The most extensive irrigation canals in America are located in Colorado, Nevada, Utah, California, and Alberta, where large areas of arid and desert land have been reclaimed and now yield abundantly, supporting large farming and dairying enterprises. Most of the boat and ship canals contain lift locks, by means of which navigation may be successfully promoted through hilly countries. A lift lock consists of a trough or tank holding water, into which vessels are floated, and which are raised and lowered bodily between the two canal levels by hydraulic or other power, aided sometimes by counterweights or flotation tanks. See **Suez Canal, Panama Canal, Welland Canal**, etc.

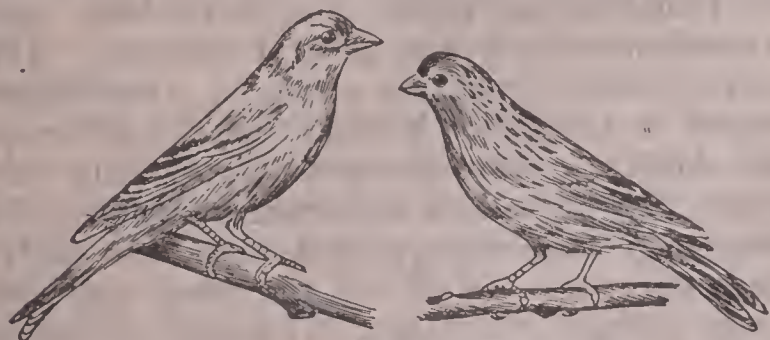
**CANAL DOVER** (dō'vēr), a city of Ohio, in Tuscarawas County, seventy-five miles south of Cleveland. It is situated on the Tuscarawas River, the Ohio Canal, and the Baltimore and Ohio and other railroads. In its vicinity are coal and iron mines. The manufactures include flour, wagons, carriages, boilers, and machinery. It has a number of substantial business buildings and is a trade center for produce and merchandise. The city has public waterworks and other utilities. The first settlement on its site was made in 1807, and it was incorporated in 1865. Population, 1900, 5,422.

**CANANDAIGUA** (kăn-an-dā'gwā), the county seat of Ontario County, New York, twenty-nine miles southeast of Rochester, on the Northern Central and the New York Central railroads. It has a fine courthouse, an orphan asylum, a public library, the Canandaigua Academy, and several charitable institutions. The manufactures include brick, leather, tinware, clothing, and malt liquors. The surrounding country is agricultural. It has a good jobbing trade in merchandise. The vicinity was settled in 1789 and it was incorporated in 1815. Population, 1900, 6,151; in 1910, 7,217.

**CANARY** (kā-nā'rŷ), a singing bird of the finch family, native to Madeira and the Canary Islands. It is easily tamed, thrives well in cages, and lives from twelve to sixteen years in captivity. It was introduced into Europe about 400 years ago, and is now extensively bred in all civilized countries. A large number of species



have been studied and the training of canary birds has long been a subject of much interest. In the wild state these birds frequent the vicinity of houses, where they build their nests. They feed on the seeds of grasses, buds, and insects. The size has been enlarged by domestication, some measuring five inches in length, but it is doubtful whether the musical tones of



GOLDFINCH CANARY.

WILD CANARY.

their voice have been improved. Large interests are vested in raising canary birds in some parts of Europe, especially in Great Britain and the Harz Mountains of Germany. The male birds of a yellow color bring the largest prices in the market, often as much as \$150 for a single bird. Other favorite colors are red, brown, and black. The seed of millet and canary grass is the favorite food.

**CANARY GRASS**, an annual grass native to the Canary Islands, cultivated for its seed, which is much used as food for cage birds. It has been introduced and is cultivated in many parts of Europe and America. A fine flour is obtained from the seed and is used for glue or sizing in making fine cotton textiles and finishing silken stuff. A species known as southern canary grass is abundant in the southeastern part of the United States, from Florida to South Carolina, and in many localities as far west as California. The ribbon grass cultivated in gardens is a variety with white-striped leaves.

**CANARY ISLANDS**, anciently called Fortunate Islands, a group of thirteen islands lying about seventy miles from the northwestern coast of Africa. The area is 2,808 square miles. The most important of the group are Teneriffe, Fuerteventura, Grand Canary, Lanzarote, Palma, Gomera, and Hierro or Ferro. The islands are of volcanic origin, and have a mountainous surface with precipitous cliffs near the sea. Among the most important peaks are Pico de Teyde, 12,190 feet, El Cumbre, 6,650 feet, and Mount Mudo, 2,160 feet. They have a mild and favorable climate and the soil is fertile. The exports aggregate nearly \$2,000,000 annually, and consist principally of cereals, potatoes, wine, raw silk, cochineal, and tropical fruits.

The Canary Islands were discovered by the Spaniards in 1316, who conquered the native tribes known as the Guanches, and have since been under the control of the Portuguese or Spaniards, who now constitute the principal part of the population. Laguna is a pleasant city and the seat of the resident Roman Catholic bishop. Santa Cruz is a well fortified city and the capital of the island group. The government is administered by a local governor under the supervision of Spain, to which country the islands belong. Population, 1905, 358,692.

**CANCELLATION** (kăn-sěl-lā'shŭn), the process of shortening indicated division by rejecting the same factors from both dividend and divisor. It depends upon the principle that if the same factor be rejected from the dividend and the divisor both terms are divided by that factor, or dividing both dividend and divisor by the same number does not affect the quotient. Cancellation was formerly treated by itself in a chapter in elementary text-books, but it is now generally placed with the definitions of elementary processes. The following serves as an illustration of the process:

$$\frac{\cancel{3} \times 7 \times \cancel{8}}{\cancel{3} \times \cancel{8}} = 7$$

**CANCER** (kăn'sēr), the popular name of a malignant tumor found in different parts of the body. Physicians generally divide the disease into two classes, the *sarcoma* and the *carcinoma*. The former is not considered a true cancer, since it is more vascular than the true cancer and is not epithelial in character. As a rule, it occurs before the age of forty years, while the true cancers occur most frequently after the age of forty. It frequently is caused by injury and is not hereditary. In many cases it does not affect the skin, but when the skin gives way the sarcoma is exposed as a mass of bleeding animal matter.

The true cancer is a tumorous growth and is composed essentially of epithelial cells. It has a central mass, or *aveoli*, from which isolated groups of cancer cells extend to the neighboring structures. The cause of this disease is not definitely known, but is variously assigned to heredity, constitutional vices, injury, and parasitic influences. The two general forms are known as *scirrhous*, or hard cancer, and *medullary*, or soft cancer, though there are several varieties of the latter. The hard cancer most frequently affects the axilla, the parotid glands in the neck, and the female breast; the soft cancer generally frequents the internal organs, such as the stomach, spleen, kidneys, liver, and oesophagus. Hard cancer mostly affects people



over fifty years of age and lingers many years, while the soft occurs mostly in those younger and is quite often of short duration. There is no definite cure; the chief remedy is excision, though the cancer often returns. In recent years it has been possible to obtain good results by the application of the X-rays, but the permanent cures have not been numerous.

**CANCER**, in astronomy, the fourth sign of the zodiac. The northern tropic is known as the Tropic of Cancer. See **Zodiac**; **Tropics**.

**CANDIA** (kǎn'dī-à). See **Crete**.

**CANDLE** (kǎn'd'l), a cylinder of wax or fatty matter containing a wick used for lighting. Candles are made principally of tallow, paraffin, bleached wax, spermaceti, bayberry tallow, palm oil, and stearin. They are primarily divided into *dipped* and *molded* candles, according to the mode of their manufacture. Dipped candles are made by stretching a number of wicks on a frame, and dipping them into melted tallow from time to time until a sufficient amount has accumulated around the wicks to form candles. Molded candles are made by melting the tallow and casting it in molds, in which the wicks have been previously fixed, and when cooled the candles are withdrawn. In ancient times candles formed the principal means of lighting. They were used very generally up to about the middle of the last century, when they began to be displaced by mineral oils. At present gas and electricity in cities and mineral oils in country districts have largely displaced the commercial importance of candles.

**CANDLEBERRY**, or **Bayberry**, a small tree native to the eastern part of North America, but most abundant in the southern part of the United States. It attains a height of about eighteen feet, but is usually a low-spreading shrub and has oblong evergreen leaves. The fruit consists of small berries, which, when ripe, are covered with a greenish-white wax, known as bayberry tallow. Four or five pounds of this product is obtained from a bushel of berries. It is used for candles, which burn slowly and emit a pleasant odor, and in some localities it serves to make a soap. A species of this tree, native to Japan, attains a height of fifty feet, and is cultivated to some extent in California for its edible fruit.

**CANDLEFISH**, a fish native to the Pacific Ocean, off the western coast of North America, from Oregon to Bering Sea. It is classed with the smelt family, has a somewhat pointed and conical head, and grows to a length of fifteen inches. The flesh is preferred to that of the trout, and an oil is obtained from it quite similar to cod-liver oil. The oil in these fish is used

by the Indians for lighting. A rude light is obtained by drawing a piece of rush pith through the fish, which, in burning, gives out a light quite suitable for the tents of the natives.

**CANDLEMAS** (kǎn'd'l-mas), the feast of the purification of the Virgin Mary, instituted in the year 492. It is observed on February 2. The feast is kept by the Roman Catholic Church. In its observance lighted candles are carried in a procession, and the candles to be used the ensuing year are consecrated on that occasion.

**CANDLE NUT**, a tree native to the East Indies and Madagascar. It bears a nut with a hard shell about the size of a walnut, the kernel of which is used as food and for the manufacture of oil, known as walnut oil and kekune oil. The natives obtain lampblack from the shell, and in some localities burn the kernels as torches.

**CANDY** (kǎn'dÿ), a form of crystallized sugar used as an article of confectionery. It is made by boiling sugar or syrup to render it hard and transparent. The industry of candy making has assumed large proportions and is an important enterprise in many countries. The people of France engage in the industry more extensively than any other. The candy market is well represented in nearly every country of the world. In most places candy is sold in connection with other articles, usually in drug and grocery stores, but in the larger cities it has come to be handled to a large extent as a distinct line. A place in which candy is the leading article of trade is generally known as a *candy kitchen*.

The art of candy making is concerned in producing a large variety of confections. Many of the sweetmeats are flavored with fruits or essences, such as lemons, strawberry, peppermint, vanilla, etc. The nuts, such as peanuts and walnuts, are used in making choice candies. Among the fancy varieties are caramels, chocolate creams, and rock candy.

In making candy the sugar is usually dissolved in water with a small amount of glucose added to give the necessary consistency, and this is boiled until the proper thickness is secured. It is next poured on slabs of marble to cool, after which it is worked to give it hardness and the desired color. It is cast in cornstarch molds to give it form and size, and a press is used to form figures or mottoes. The manufacture has grown to such an extent and has assumed such various forms that many classes and kinds of candy are produced, some of which are beautiful and quite nutritious. The harm attending the consumption of candy is due altogether to several unwholesome coloring substances often used, and to an excess in eating it.



**CANELLA** (kā-něl'lá), a small tree native to the warmer part of North America, often called wild cinnamon in Florida and the West Indies. It bears a small black berry, and its bark is known in commerce as white-wood bark. All parts of the tree are highly fragrant and the bark has an acrid, pungent taste. It is employed as a stimulant tonic.

**CANIS MAJOR** (kā'nīs mā'jēr), a constellation of the Southern Hemisphere, located under the feet of Orion. Its principal star, Sirius, is the brightest of all the stars. Near the constellation of Canis Major, just below Gemini, is Canis Minor, which contains Procyon, a star of the first magnitude.

**CANKERWORM** (kā'n'kēr-wûrm), the larvae of two species of moths, sometimes called measuring worms from their peculiar locomotion. They are abundant in Canada and the northeastern part of the United States, where they attack fruit trees, especially apples and pears. The eggs are deposited by the wingless female in orchard trees, and the larvae are de-



CANKERWORM.

1, Adult Male; 2, Larva; 3, Adult Female; 4, Eggs.

structive to the foliage in the early period of their life, but later they descend to the ground, where the metamorphosis takes place. Many fruit trees and current bushes are stripped of leaves in the spring by these insects, which are very voracious.

**CAN MAKING**, the art of making vessels for holding and carrying liquids, usually of tinned iron or other sheet metal. This enterprise has grown remarkably since the industry of canning vegetables, fruits, meats, milk, spices,

varnishes, and paints has been developed. In the United States there are ten or twelve large establishments engaged in can making for supplying canning factories. The larger establishments have a daily output of over 100,000 cans. Oysters, fruits, and vegetables are packed in round cans of various sizes, mostly from one to three pounds each, but some are as large as a half gallon or a gallon. Fish, sardines, and meats are packed in oval cans. Can making is carried on entirely by automatic machinery, which is used both in cutting and soldering the cans. The tops and bottoms are stamped by foot power, a boy or man being able to stamp a thousand cans per day.

**CANNAE** (kā'n'nā), an ancient town in Italy, on the Aufidus River, now called Ofanto, which became famous on account of a great victory won by Hannibal over the Romans, Aug. 2, 216 B. C. He commanded the Carthaginian army of 10,000 cavalry and 40,000 infantry. The Roman army under Aemilius Paulus and Terentius Varro consisted of 6,000 cavalry and 80,000 infantry. By skillful maneuvering Hannibal was able to force the Romans into a position in which they were required to face the sun and a strong wind, while he occupied points of advantage and led the attack with fearful slaughter to the Romans. Fully 70,000 Romans were killed and the Carthaginians lost only 6,000.

**CANNEL COAL** (kā'n'něl kōl), a variety of bituminous coal which is very dense and compact. It is of a dull bluish or grayish black color and has little luster. It is used mostly in the manufacture of gas and oils. On distillation it yields from forty to sixty-five per cent. of volatile matter. The cannel coal fields of the eastern part of Kentucky are the most extensive in America, but it is found in smaller deposits in Ohio, Indiana, and Scotland.

**CANNES** (kā'n), a city of France, in the department of Alpes-Maritimes, twenty-two miles southwest of Nice. It is located on the Mediterranean, has railroad facilities, and is the seat of considerable export and import trade. The vicinity produces large quantities of olives, figs, oranges, and other fruits. The chief building is the Abbey of Donjon, built about 1070. Among the newer structures are a library, a town hall, and a museum of antiquities. Cannes is the place where Napoleon landed in 1815, when he returned from Elba. Population, 1906, 30,318.

**CANNIBAL** (kā'n'nī-bal), one who eats human flesh. The practice of eating human flesh has existed from very ancient times, but the name now applied to it was originated about the time when Columbus discovered the



West Indies, where the Caribales were a man-eating race. The practice was known in the time of Homer, and he ascribes it as an unnatural attribute to Polyphemus. Cannibalism was practiced in North America by the Atakapa Indians and other tribes on the coast of the Gulf of Mexico. The Aztecs made human sacrifices to their gods and afterward the bodies were eaten by the populace. Cannibalism still prevails among certain tribes of Australasia and Central Africa. When a number of African tribes war with each other, they consume the slain and captives as food.

**CANNING** (kăn'nĭng), the industry of preserving fish, meats, fruits, and other articles of food in air-tight cans. Nicholas Appert, a Frenchman, discovered this process in 1795, and it was introduced in Canada and the United States in 1815. In canning it is necessary to destroy the germ which causes fermentation, which is done by cooking the product to be canned, either before or after it is placed in the can. The cans used in the industry are manufactured in large establishments and sold to canning factories. In canning vegetables or cereals they are placed in cans by machinery, after which the cans are carried to soldering machines and soldered by automatic devices. The labels are put on the cans by a machine, which spreads the paste and adjusts the label to its proper place. The most important products canned are fish, beef, corn, tomatoes, peas, beans, and fruits.

In the United States there are over 2,250 canning factories, the largest number being operated in Maryland, but there are more or less in all the states. The following states lead in the industry: Maryland, Maine, New York, Virginia, New Jersey, Delaware, and California. There are no less than 28,000 fishermen employed in gathering mackerel, white fish, salmon, and other fish for canning purposes, using 3,000 fishing vessels, while about 21,500 men are employed in dredging for oysters. The lands used in producing vegetables and cereals for canning purposes aggregate 1,500,000 acres. It is shown by the census that 3,000,000 persons are indirectly connected with the business, while 1,000,000 secure employment during the canning season. The canned meat produced annually is valued at \$25,000,000, while the fish, fruit, and cereals aggregate much more.

**CANNON** (kăn'nŭn), a conical tube for discharging projectiles. Cannon were first used in Europe in the 14th century, sometime after powder had been introduced as an ammunition of war. Those used at first were made of longitudinal iron bars hooped with rings, in which

the charge was placed in the socket of the breech, the shot consisting of stone, lead, or iron. They were employed successfully by Edward III. at Calais in 1346 and by the Turks at Constantinople in 1394, after which they came into general use. In the 15th century brass guns capable of throwing a thirty-pound shot were introduced, and soon after the balls were increased to forty-five pounds. At Edinburgh cannon of twenty-inch caliber were made before the end of the century, while those made at Ghent were twenty-six inch. In the early part of the 16th century bronze and iron guns were made in Western Europe, some of which were portable and others were used as siege guns, capable of throwing an eighty-pound ball. The guns of the 17th century were made lighter, with the object of having them more easily portable for field use, and cartridges were invented and successfully used in action. The guns made in the 18th century were cast solid and afterward bored, these containing smooth bores. Rifled field guns were first introduced in 1859, since which time rifling has been employed in making cannon of all calibers.

The cannon used in early times were known as bombard. They were short and clumsy, with a larger opening at the mouth than at the breech, and were held together by large hoops. Those used by modern nations include the *howitzers*, *mortars*, *Rodman*, *field* and *Gatling*. Howitzers are intended for short range and are used to throw shells into the enemy's ranks when near at hand. Mortars are intended to throw bombs or shells so as to fall into fortified places and do damage by exploding. They have short barrels with very large bores to admit large missiles. Some forms are used to shoot shells at the enemy horizontally. The Rodman gun is mounted on a carriage and is used at fortifications. Field guns are mounted on gun carriages and are drawn by horses from place to place as the requirement may demand. In some countries mules are used extensively for conveying cannon, being deemed more reliable in action than horses.

The Gatling gun has a number of barrels, usually ten, which are made to revolve on an axis by mechanical arrangement, and as each barrel passes an opening it receives a cartridge and is fired. It has a capacity of 400 shots per minute. The Armstrong and Krupp are the most celebrated guns of modern manufacture. The latter is especially popular. It is manufactured in Essen, Germany, at the most extensive cannon factory in the world. The largest size weighs 125,000 pounds, carrying a cannon ball about 9,000 yards, and is capable of penetrating



a 25-inch sheet of iron at a distance of 1,500 yards. The larger cannon are used at fortifications and on warships. All of the cannon of modern manufacture are rifled with a spiral groove to give the ball a rotary motion. They are cast solid and then bored by being made to revolve in a drill. Recently the Vickers-Maxim breech mechanism has been adopted for use in the large guns of the navy, which not only ejects the exploded primer automatically, but in addition raises the new load into position at the breech of the gun.

**CANOE** (kā-nōō'), a small boat that is narrow in the beam and is propelled by paddles. The name was derived from the boats made by uncivilized people. Many were constructed by laying thin strips of wood across each other at various angles, which were tied together, and then covered with pieces of bark or hide. They were generally propelled by paddles, but some of the larger ones carried sails. The American Indians made canoes of cedar wood covered with an unbroken sheet of the bark of the white birch, while the Indians of the plains used buffalo hides. Strong and durable canoes were made in forest districts by hollowing out birch logs, and this kind was probably the best made by primitive people. The Feejee Islanders now construct boats of very large size, some a hundred feet in length. The Society Islands contained a naval force, at the time they were visited by Captain Cook, consisting of 1,700 war canoes, manned by 68,000 soldiers. The Eskimos make canoes of walrus and seal skins stretched over whalebone, while those constructed by the natives of the Polynesian Islands are made of planks. Stanley, in his African travels, found canoes used by the natives on inland lakes that consisted of very light material, often of seaweeds, and larger ones of skin and bark capable of carrying eight or ten men.

The name *canoe* is now applied to any small boat made of paper, tin, wood, India rubber, or canvas, and used for making long voyages or in pleasure exercises. John Macgregor traveled 3,000 miles in his Rob Roy canoe. Some are made for only one person, while others are for two or more, with a seating convenience in the center. The American Canoe Association has several thousand members, and its official magazine, *The American Canoeists*, is devoted to the interests of sports and pleasures with the canoe. Other American organizations are the Northern Association of Canada and the New York Canoe Club. Indeed, many canoe clubs are maintained wherever lakes and rivers are accessible. An open and undecked canoe known as

the *Canadian canoe* is used extensively in canoeing.

**CAÑON** (kā-nyōn'), or **Canyon**, the Spanish name applied to a tube, and used by Spanish-Americans to designate deep ravines or gorges worn by water. It is now in general use in America. The cañons of the Rocky Mountains are particularly grand. The Grand Cañon of the Colorado, in Arizona, consists of immense gorges 200 miles long. It is from five to twelve miles wide, and from 5,000 to 7,000 feet deep. Many of the towering walls are sedimentary rock of gorgeous purple and vermilion color. Others are narrow channels cut several thousand feet deep, with terraced sides or perpendicular walls. These remarkable phenomena are widely distributed throughout the Cordilleras of America from Alaska to Panama. The most remarkable in the eastern part of the United States is the one in central New York, known as the Glen, at Watkins, near the headwaters of Seneca Lake.

**CANON** (kān'ŭn), a rule or ordinance made by an ecclesiastical council in relation to religious matters. A canon rule instituted by Gregory the Great provided for the celebration of the mass with more splendid accompaniments than had hitherto been used, while others of the Catholic Church constitute laws and regulations for observance by the lay members. Other canons of historical interest include those passed for the government of the Church of England and the anciently adopted Old Testament and New Testament canons. The Old Testament Canon, anciently adopted on the authority of the Jewish Talmud tradition, was designed to give public sanction to the Pentateuch. The New Testament Canon came into force about 170 A. D., by which the books of the New Testament were declared to be canonical.

**CAÑON CITY**, county seat of Fremont County, Colorado, on the Arkansas River, forty miles west of Pueblo. It is on the Denver and Rio Grande, the Atchison, Topeka and Santa Fé, and other railroads. The site of the city is 5,340 feet above the sea, surrounded on three sides by mountains, and is noted as a pleasure and health resort. The Royal Gorge and Grand Cañon are one mile distant. Cold and thermal mineral springs abound in the vicinity. The chief buildings include the public library, the high school, and the State penitentiary. Coal, iron, silver, copper, petroleum, and building stone are obtained in the vicinity. Population, 1900, 3,775.

**CANOPY** (kān'ō-pŷ), in architecture, an ornamental arched or rooflike projection, with a niche or doorway. The term is applied in



Gothic architecture to the rich covering over tombs, doors, and windows. In Germany and France the canopies of early times were elaborate and complicated, while those of England are usually simple in form. The cathedrals of Europe as well as many of the larger churches furnish examples of canopies.

**CANSO** (kǎn'sō), a seaport of Nova Scotia in Guysborough County, near Cape Canso. It has considerable trade in merchandise and is the seat of several consular agents. The waters of its coast have valuable fisheries. Canso is the landing place of several cables belonging to the trans-Atlantic lines. Population, 1905, 1,565.

**CANSO, Strait of**, a narrow channel separating Nova Scotia from Cape Breton Island. It is about two miles wide and seventeen miles long, and connects Chebucto Bay with the Gulf of Saint Lawrence. Cape Canso, the eastern extremity of Nova Scotia, is the east of Chebucto Bay, projecting into the Atlantic Ocean.

**CANTABRIAN MOUNTAINS** (kǎn-tā'-brī-an), a range of highlands in the northern part of Spain, near the shore of the Bay of Biscay. They extend a distance of 300 miles, from the Pyrenees to Cape Finisterre, and their loftiest summits are near the central part. Many promontories characterize the coast, but the slopes toward the east and south are gradual and have valleys of much fertility. The altitudes range from 2,675 feet to 8,790 feet.

**CANTALOUPE** (kǎn'tā-loōp). See **Musk-melon**.

**CANTATA** (kǎn-tā'tā), a poem or dramatic composition set to music, in which solos and choruses are rendered. It originally assumed the form of an opera, with voice parts and accompaniments of the violin and other instruments, but is now shorter than either opera or oratorio. The cantata includes compositions of either sacred or secular choral works, and may be lyric or dramatic. It differs from opera in having no stage accessories.

**CANTEEN** (kǎn-tēn'), a vessel of metal or leather used by soldiers in the army, which serves to carry water or some other potable liquid while on duty. It is made in the form of a flask or bottle and is strapped to the waist belt or strung about the neck. The capacity is two or three pints.

**CANTERBURY** (kǎn'tēr-bēr-ī), a city of England, 55 miles southeast of London, noted for its magnificent cathedral. The cathedral was founded in 596 by Saint Augustine. It was ravaged by the Danes in the 8th, 9th, 10th, and 11th centuries, but was enlarged to exceed that of London at the time of the conquest. It is 530 feet in length and 154 feet in breadth,

and has a tower 235 feet high. The Canterbury Cathedral was long an important ecclesiastical place, but lost a part of its prestige with the murder of Thomas à Becket. It has excellent painted glass windows. The chambers are the finest in England and are beautified by several chapels. Near by the cathedral is King's School, founded by Henry VIII., in which David Copperfield attended. The city has railroad facilities, a library, and several fine institutions of learning. Population, 1907, 26,208.

**CANTILEVER** (kǎn'tī-lēv-ēr), a bracket of wood, iron, or stone used in architecture for supporting balconies and cornices. The cantilever has been utilized in the construction of bridges, in which two brackets are built out, one from each side of the ravine to be spanned, to meet at the center without the support of intermediate piers. The first great bridge built in America in which the cantilever principle was used is the one which spans the Niagara River a short distance above the Whirlpool Rapids. It was completed in 1883 and is entirely of steel. The length is 910 feet; the two projecting arms or cantilevers are each 175 feet; and the truss span which they support is 175 feet long. The bridge is 245 feet above the water and is crossed by a double railway track. Another bridge of this class crosses the Saint John River, in New Brunswick. It is 813 feet long and the main span has a length of 477 feet. The Poughkeepsie Bridge is the longest structure of this class. It crosses the Hudson River with five spans and has a total length of 6,767 feet.

**CANTON** (kǎn-tōn'), an important commercial city and port in southern China. It is located in the province of Kwangtung, on the Si-kiang River, about 32 miles from the China Sea. The city is of great antiquity and is mentioned in history as early as 250 B. C. It became an important market and seaport in 700 A. D., and was long celebrated as a trading point for Arab voyagers. In the 16th century it was visited by the Portuguese and a hundred years later by the Dutch. England monopolized its commerce from the 17th century up to 1834, when trade with other European nations became important. In 1857 it was captured by the allied forces of French and English and was garrisoned by them until 1861, since which time it has been open to the commerce of all nations.

The city is surrounded by walls twenty feet thick and from twenty to forty feet high, with a partition wall dividing it into the old and new parts. The wall contains many gates, which are closed at night and open during the day. Many



of the streets are tortuous and some are less than eight feet wide. In the old portion of the city are many Buddhist temples, about 200. The largest of these is located on Honam Island, covers seven acres, and is called the "Temple of the Ocean Banner." It is one of the most celebrated Buddhist temples, with fine ornamentations, and 175 priests. Another famous temple is situated in the western suburbs, called the "Temple of Five Hundred Gods," in which 500 statues are located to commemorate Buddha and his disciples. The city has remarkable examples of life upon the water, a large number of residences being constructed of boats that occupy a space of four or five miles on the river opposite the city. No less than 40,000 of these residences are in the city, and the population occupying them aggregates 200,000.

Canton has large industries for the manufacture of porcelain, paper, glass, silk, cotton goods, sugar, ivory carvings, lacquered ware, and utensils. It was the chief city for foreign commerce of China until 1850, when it was surpassed by Shanghai, but its annual imports and exports still aggregate about \$40,000,000. Many foreign mercantile houses, among them German, French, British, and American, occupy the southwestern part of the city, and the consulates of foreign governments are also located in that portion. The religion of the Chinese in Canton is largely Buddhism. Education is provided for in elementary schools, and a number of institutions disseminate knowledge in the higher learning and the arts, especially sculpture and painting in the Chinese style. Population, 1908, 905,500.

**CANTON** (kǎn'tūn), a city of Illinois, in Fulton County, about 25 miles southwest of Peoria, on the Toledo, Peoria and Western and Chicago, Burlington and Quincy railroads. It has a growing trade in grain, lumber, and merchandise. The manufactures include cigars, brooms, machinery, marble products, tile, and flour. A fine high school is maintained. The city has a public library, waterworks, and gas and electric lighting. It was settled in 1832 and incorporated in 1849. Population, 1900, 6,564; in 1910, 10,453.

**CANTON**, a city in Ohio, county seat of Stark County, sixty miles southeast of Cleveland, on the Pennsylvania, the Cleveland, Canton and Southern, and the Baltimore and Ohio railroads. It is surrounded by a fertile farming and stock-raising country, and in the vicinity are deposits of clays, limestone, and coal. The chief buildings include the post office, the county courthouse, the city high school, the Aultman Hospital, and the city hall. Nimisilla Park is a fine public resort. It has a large public library

and several monuments, including one erected to the soldiers of the Spanish-American War and the fine monument dedicated to President McKinley in 1908. The manufactures include brick, tile, cigars, roofing material, clothing, saddlery and harness, machinery, agricultural implements, and railroad cars. It has an extensive trade in farm produce, merchandise, and machinery. The municipal improvements include sewerage, waterworks, gas and electric lighting, stone and asphalt pavements, and electric urban and interurban railways. It was first settled in 1805 and was incorporated in 1822. Canton was the home of William McKinley. Population, 1900, 30,667; in 1910, 50,217.

**CANVAS** (kǎn'vas), a kind of coarse cloth made of flax or hemp. It is used largely to make sails for ships. The strips are usually narrow; several are sewed together to make the large sails used on boats and ships. A similar cloth is used for tents and awnings, and a finer variety called *duck* is employed in making clothing for men and women. The canvas used by artists in painting is stretched on wooden frames the size of the picture desired. Its surface is made smooth by chalk and size, or white lead. The widths are from 28 to 94 inches.

**CANVASBACK**, a species of duck native to North America. It is about twenty inches long. The color is diversified. The male has reddish plumage on the head, the bill is nearly black, and the back and sides are grayish with sparse wavy lines, similar in appearance to the surface of coarse canvas. The female has more grayish plumage than the male and is somewhat smaller. They frequent the inland waters and estuaries of rivers, where they feed on roots and crustaceans, and visit fields in the spring and fall in search for grain. These birds are migratory, moving northward to breed the latter part of March, and are highly prized for their flesh.

**CAOUTCHOUC** (kōō'chōōk), an article used extensively in the arts. It is an elastic, gummy substance and is obtained from the juices of several species of trees found in South America. This product was first exported to Europe in the 18th century, and became useful in erasing pencil marks, bread crumbs having been previously used for that purpose. It is now employed largely in the manufacture of lead pencils, erasers, nonconductors of electricity, and many other purposes. Caoutchouc is of value in making waterproof fabrics; a patent for a process of this kind was granted to Samuel Piat in 1791. In 1823 Mackintosh was granted a patent on waterproof material known by his name, while Charles Goodyear invented the vulcanizing process by which caout-



chouc is rendered as hard as horn. Soft vulcanized rubber is made by adding twenty-five per cent. of sulphur and heating to about 270°. In making hard vulcanized rubber or ebonite, fifty per cent. of sulphur is added and it is heated to 300°. See **India Rubber**.

**CAPE ANN**, a cape in the northeastern part of Massachusetts, 30 miles northeast of Boston. It is the eastern point of Essex County, and the name is generally applied to the whole rocky peninsula, which extends about ten miles into the Atlantic Ocean. This peninsula contains the towns of Rockport and Gloucester, which are connected by railway with Salem and other cities of the State. Valuable stone quarries are worked, and off the coast are extensive fisheries. Cape Ann is popular as a summer resort.

**CAPE ARAGO**, or **Gregory**, a cape of Oregon, at the south side of Coos Bay, on the west shore of Coos County. Near this cape is a lighthouse 84 feet above the sea.

**CAPE BARROW** (bǎr'rō), or **Point Barrow**, a cape in the Arctic Ocean, the most northerly point of Alaska. The United States government located a signal service station here in 1881, and near it is the village of Barrow, a whaling station.

**CAPE BLANCO** (blǎn'kō), the name of three capes in Africa and one in North America. Cape Blanco, the most northerly point of Africa, is on the northern coast of Tunis and projects into the Mediterranean. Another cape of the same name is on the west coast of Morocco, and a third is on the western shore of the Sahara, near the boundary between the possessions of France and Spain. Cape Blanco, in America, is the most westerly point of Oregon, south of the mouth of the Sixes River, thirty miles north of the mouth of the Rogue River. At the western extremity of the cape is a lighthouse 256 feet above the sea.

**CAPE BRETON** (brī'tūn), an island of British America, at the northeastern end of Nova Scotia, to which it belongs. It is separated from Nova Scotia by the narrow Gut of Canso, about one mile wide, and has an area of 3,120 square miles. The coast contains a large number of bays, the most important of which is Bras d'Or, which forms an inland lake about fifty miles long and twenty miles wide. It is of much value for interior navigation. A canal has been cut to connect the lake with Saint Peter's Bay on the south coast, making it important as a connection with the Atlantic Ocean. The surface is rugged, but agriculture is carried on in the valleys and on the coast plains. The minerals consist of iron and coal, while the

waters yield an abundance of fish. The principal exports are coal, timber, and fish. It belonged to France from 1632 to 1763, with the seat of government at Louisburg, then an important military post. Though taken by the British in 1745 it was not finally ceded by France until 1763. The most important business centers are Sydney and Port Hood. Several railroad lines connect the principal business centers with Nova Scotia and other portions of British America. For the purpose of local government it is divided into the four counties of Inverness, Victoria, Cape Breton, and Richmond. Population, 1906, 98,345.

**CAPE CATOCHE** (kā-tō'châ), the northeastern point of Yucatan, a state of Mexico. It was discovered by the Spaniards in 1517, and was the first landing place of the Spanish explorers on the American continent. This cape must be rounded in sailing from the Caribbean Sea to the Gulf of Campeche.

**CAPE CHARLES**, a cape of Virginia, the southern point of Northampton County, 25 miles northeast of Norfolk. It is at the northeast side of the entrance of Chesapeake Bay, and across the bay, almost directly south, is Cape Henry.

**CAPE CLEAR**, the southern extremity of Ireland, located about seven miles southwest of Baltimore. It is at the southern extremity of Cape Clear Island, which is about a mile wide and three miles long. The cape is a rocky promontory and rises 400 feet above the sea, and near it is a lighthouse 455 feet high.

**CAPE COD**, a peninsula extending from the southeastern part of Massachusetts into the Atlantic Ocean, forming Cape Cod Bay between its northern arm and the mainland. It was so named from the great abundance of codfish caught off the shores of the peninsula. It was first discovered May 15, 1602, by Bartholomew Gosnold, and was the landing point of the Mayflower on Nov. 9, 1620. The surface is largely barren, owing to its sandy soil, but it is populated and has railroad connection with several cities, including Chatham and Woods Hole. The peninsula comprises the whole of Barnstable County, of which Barnstable is the county seat. A canal extends across the narrow isthmus between Cape Cod Bay and Buzzard's Bay.

**CAPE COLONNA** (kō-lōn'nà), a rocky cape of Greece, extending into the Gulf of Aegina, at the southern extremity of Attica. It is so named from the white marble columns of a temple of Minerva, which are the remains of that famous structure anciently erected on the summit of the cape.



**CAPE COLONY**, or **Colony of the Cape of Good Hope**, a British colony in the southern extremity of Africa. It is situated between south latitudes  $25^{\circ}$  and  $34^{\circ} 50'$ , and east longitude  $16^{\circ} 25'$  and  $30^{\circ}$ . The northern boundary is formed by German Southwest Africa, Bechuanaland, Orange River Colony, and Natal. It is bounded on the southeast by the Indian Ocean and on the southwest by the Atlantic Ocean. The Orange River forms a large part of the northern boundary. Walfisch Bay, on the western coast of German Southwest Africa, is included with this colony. The area is 276,750 square miles.

**DESCRIPTION.** The surface is diversified by a range of mountains trending nearly parallel to the southern coast. Along the coast and through the mountain ranges are belts of fertile land, and in the south central part is the plateau of Great Karroo, which has an average width of sixty miles. The surface rises gradually toward the interior, such as the Snow Mountains culminating in ranges from 6,000 to 8,500 feet high. These ranges include several elevated peaks, of which Compass, elevation 8,500 feet, is the loftiest summit. In the western part trend several ranges, including the Karre Bergen and the Roggeveld mountains. The Kathlamba Mountains are in the northeastern part and extend into Natal, where they are known as the Drakenberg Mountains. In the northern part, along the Orange River, is a valley diversified more or less by fertile tracts and sandy and elevated regions. On the southern shore is Algoa Bay, the principal inlet. False Bay and Walkers Bay are near the southern extremity, and Saint Helena Bay is in the western part. It may be said that the coast as a whole is regular and characterized by few indentations.

The drainage may be divided into three sections, including the rivers that flow into the Indian Ocean, those that discharge into the Atlantic, and the Orange River and its tributaries. The drainage into the Indian Ocean is by numerous small rivers, none of which is navigable. They include the Breede, Couritz, Gamtoos, Great Fish, and Great Kei. Most of the drainage into the Atlantic is carried by the Olifants River. Among the tributaries of the Orange River are the Hartebeeste and the Ongaars. The plateau of Great Karroo has a number of dry basins in which water gathers at some seasons of the year, and there are no lakes aside from a number of lagoons in the upper course of the Hartebeeste River.

The climate is healthful, being temperate in the southern part and semitropical in the north-

ern section. Rainfall is insufficient to produce a large variety of vegetation in the higher regions, but in the moderately elevated sections it is abundant. Irrigation is used extensively for the improvement of lands for cultivation and pasturage, and by means of it large areas have been made productive. Snow covers the higher summits a large part of the year. At Cape Town the average temperature is  $65^{\circ}$ .

**FLORA AND FAUNA.** Marked differences in elevation and in the character of the soil account for vegetation being considerably diversified. The coast region has many varieties of useful wood, such as palms, ironwood, and many species of hard timber. The acacia, aloe, and many bulbous plants thrive in the more elevated regions, especially in the vicinity of the Great Karroo. Many species of wild animals were abundant before the territory was occupied by Europeans, including the giraffe, rhinoceros, lion, elephant, and hippopotamus, but all of these have practically disappeared. Those still found include the hyena, jackal, and many species of monkeys. Birds are numerous, and fish are abundant in the streams and off the coast.

**MINERALS.** Mining is an important industry. The diamond fields, situated in West Griqualand, are the most important in the world. The exportation of this product aggregates about \$20,000,000 per year, and the total value of the output from 1867 to 1908 is placed at \$525,000,000. Kimberley, between the Vaal and Modder rivers, is the center of the diamond fields. Copper is mined chiefly in Namaqualand, and coal is found abundantly, the principal mines being in the Stromberg Mountains. Other minerals include gold, lead, iron, and salt.

**INDUSTRIES.** Mining ranks as the chief industry, but much attention is given to mixed agriculture. A large part of the country is well adapted to grazing, hence the rearing of horses, sheep and cattle is carried on extensively. Many large ranches are used in sheep raising, some including 15,000 acres. Ostriches are grown for their feathers, the number of these animals being about 300,000. Considerable revenue is secured from the growing of goats, chiefly the Angora, and mules and swine. Cereals are cultivated in the regions having sufficient rainfall and where irrigation is possible, and they consist chiefly of wheat, rye, barley, maize, and oats. Tobacco, hay, and fruits are grown profitably.

Manufacturing is limited to the products used in home consumption. They embrace chiefly flour, leather, clothing, tobacco, butter, and spirituous liquors. Transportation is favored by an extensive coast line and by numerous rail-



ways in all the sections where settlements are well established. Cape Town, the southern terminus of the Cape-to-Cairo Railway, is important as a seaport and has transportation facilities by rail to Kimberley, Bloemfontein, Johannesburg; and other cities of the interior part of the British possessions in Southern Africa. A number of railways extend inland from the southeastern coast, including lines from East London and Port Elizabeth, the chief seaports on the Indian Ocean. Fewer lines have been constructed in the northwestern section, but connections are made with the interior from Port Nolloth, a seaport on the Atlantic, about 50 miles south of the mouth of the Orange River. Foreign trade is largely with Great Britain and Holland, and the exports exceed the imports. The export trade is chiefly in minerals, hides, wool, and ostrich feathers, and the imports are principally foodstuffs, textiles, hardware, and machinery.

**GOVERNMENT.** The Governor of Cape Colony is high commissioner for the British possessions in South Africa. He holds office under appointment by the crown and is assisted by a ministry, which consists of the prime minister and treasurer, colonial secretary, attorney general, secretary of agriculture, and commissioner of public works. Two houses make up the Parliament; these are known as the Legislative Council and the House of Assembly. Members in the former are elected for seven years and are presided over *ex officio* by the chief justice, and members in the latter are elected for five years. Both the English and Dutch languages are used in the government. The Supreme Court is presided over by a chief justice and eight associate judges. For the purpose of local government, the country is divided into districts and municipalities, and these are governed largely by officials elected by the people. No distinction is made on account of race or color in extending the right of suffrage, and the qualifications for voters is based chiefly on citizenship.

**INHABITANTS.** The inhabitants include a large number of natives and their descendants, among them the Kaffirs, Bechuanas, Malays, and Hottentots. Most of the Europeans are Dutch or the descendants of Dutch settlers, and these are known as *Afrikanders*. About one-fourth of the people are whites, nearly all of whom are Protestants. The communicants of the different protestant denominations number about 975,000, while the Roman Catholics include about 25,500, the Mohammedans about 15,500, and the Jews about 3,250. Support is given to schools by the government of the colony, but attendance is not

compulsory and the rate of illiteracy is quite large, even among Europeans. The superintendent general has charge of the department of public instruction, which has general supervision of educational affairs, and local inspection is provided by deputies and officials elected by the people. Several institutions of higher learning are maintained, at the head of which is the University of the Cape of Good Hope. Cape Town, the capital and largest city, is near the southern extremity, on Table Bay. Kimberley, the center of the diamond fields, is near the Orange River, and Port Elizabeth, the second seaport, is on Algoa Bay. Other cities of importance include East London, Grahamstown, Paarl, and Port Nolloth. Population, 1904, 2,409,804.

**HISTORY.** The region included in Cape Colony was first visited in the 15th century by Dias, a Portuguese navigator, who doubled the Cape of Good Hope. Vasco da Gama landed on its shores in 1497, and trade was developed to some extent the following century by English and Dutch merchants. The colony was first organized in 1652 by the Dutch East India Company and was controlled by that organization until 1795, when it was annexed by the British, but was restored to the Dutch in 1802. Owing to trade difficulties, contentions soon arose between the colony and the British. It was annexed to England in 1806 with the understanding that the inhabitants should preserve all the rights and privileges enjoyed by them prior to that time, and since then it has been under British control, though it was not recognized as British territory until the peace treaty of 1815.

The history of Cape Colony is intermingled with accounts of many wars with the Kaffirs and other tribes. Many Dutch burghers became dissatisfied with British rule about 1836, and emigrated to the region now included in Natal, Transvaal Colony, and Orange River Colony. Immigration has been quite steady since the discovery of diamonds at Hopetown in 1867, and much development has been made in the cultivation of its soil and the building of cities. The colony is in a prosperous condition, showing a healthful growth in commercial and social affairs. The colored population is increasing faster than the whites, owing to the extensive employment of this class of laborers and the peculiar adaptation of climatic conditions to the development of the races native to the country.

**CAPE COMORIN** (kōm'ō-rin), the most southern extremity of India, in the Travancore. Comorin Peak, the highest elevation, is about eighteen miles north, and within a short distance of the cape is the town of Cape Comorin,



made up largely of fishermen's houses and several ancient temples.

**CAPE DIAMOND**, the extremity of a promontory in Canada, at the junction of the Saint Charles and Saint Lawrence rivers. It rises about 300 feet above the river and on it stands the citadel of Quebec. West of it are the plains of Abraham, where Wolfe with a British force defeated the French under Montcalm in 1755.

**CAPE FAREWELL**, the southern extremity of Greenland, near the entrance to Christian Sound. The locality is dangerous for navigators on account of the strong currents which flow around Greenland into Davis Strait.

**CAPE FEAR**, a cape in North Carolina, at the southern extremity of Smith Island, near the mouth of the Cape Fear River. Currents and breakers make the surrounding waters dangerous to navigation.

**CAPE FEAR RIVER**, a river of North Carolina, formed by the Hawk and Deep rivers, which unite in Chatham County, near the central part of the State. It has a general course toward the southeast and discharges into the Atlantic Ocean, near Smith Island. The principal towns on its banks are Wilmington, Elizabethtown, and Fayetteville. It is about 250 miles long and is navigable to Fayetteville, about 120 miles.

**CAPE FINISTERRE** (fīn-īs-tār'), or **Land's End**, a cape in the northwestern part of Spain, in the government of Coruna. Near it were fought two naval battles between the English and the French, in 1747 and in 1805, in which the former were victorious.

**CAPE FLATTERY**, a cape in the State of Washington, the extreme western point of the United States. It is located on the Strait of Juan de Fuca, at its southern entrance. About half a mile distant, on Tatoosh Island, is a lighthouse 155 feet above sea level.

**CAPE GIRARDEAU** (jē-rār-dō'), a city of Missouri, in a county of the same name, fifty miles above Cairo, Ill., on the Saint Louis, Memphis and Southern and other railroads. It is located on the Mississippi River in a fertile farming country, and is the seat of a brisk trade in cotton, cereals, and merchandise. The manufactures include flour, machinery, and earthenware. It is the seat of a normal school, Saint Francis Hospital, Saint Vincent's College, and the Convent of the Sisters of Loretto. Population, 1900, 4,815; in 1910, 8,475.

**CAPE HAITIEN** (hē'tē-ĕn), or **Haytien**, a city of Haiti, on the northern coast. It has a safe and spacious harbor, and inland are a number of elevated mountain peaks. The

streets are well platted and improved, but the buildings are low. It has an important export trade in coffee, sugar, cacao, and logwood. An earthquake destroyed most of it and killed several thousand people in 1842. Population, 1908, 29,150.

**CAPE HATTERAS** (hăt'tēr-ās), a cape at the eastern extremity of North Carolina, projecting into the Atlantic Ocean from Hatteras Island, which is separated from the mainland by Pamlico Sound. Many shoals abound near it, and storms and gales acting with the Gulf Stream make navigation dangerous. A lighthouse 191 feet above the sea is maintained near the outer point.

**CAPE HENLOPEN** (hĕn-lō'pen), a cape at the south side of the entrance to Delaware Bay, on the east coast of Delaware. It is about twelve miles southwest of Cape May, the nearest point in New Jersey, across Delaware Bay. The lighthouse maintained here is 126 feet above the sea.

**CAPE HENRY**, a cape of the United States, on the eastern coast of Virginia, at the south entrance to Chesapeake Bay, across which is Cape Charles. It has a sandy beach and a life-saving station. The lighthouse is 157 feet above sea level.

**CAPE HORN**, the southern point of Horn Island, an island of the Archipelago of Tierra del Fuego, noted as the southern extremity of South America. The headlands consist of precipitous cliffs 600 feet high. It was discovered by Sir Francis Drake in 1578. The Dutch navigators Lemaire and Schouten first doubled it in 1616, and named it from Hoorn, their native town. Steamboats now sail through the Strait of Magellan, thus gaining considerable advantage over the old route around the cape.

**CAPE LISBURNE** (līs'bŭrn), a point of land extending into the Arctic Ocean from the northwestern coast of Alaska. Near it are important coal mines, which furnish a supply of fuel for whaling and explorations in the Arctic Ocean. A strong current flows past it from Bering Strait.

**CAPE LOOKOUT**, a cape of North Carolina, about eighty miles southwest of Cape Hatteras. It has a lighthouse 156 feet above the sea.

**CAPE MAY**, a watering place and health resort on the point of land known by the same name. It is located at the southern end of New Jersey, in Cape May County, near the entrance to Delaware Bay, 81 miles by railroad from Philadelphia. The transportation facilities are by the West Jersey and Seashore and the Atlantic City railroads. Tourists find recreation



in fishing in the beautiful lagoons toward the inland, and in bathing and driving. Extensive hotel accommodations and many summer villas are located on the beach. Cape May has a number of industries, such as fish and oyster canning and gold beating, but it is more important as a resort for health and pleasure. Population, 1905, 3,005.

**CAPE MENDOCINO** (mĕn-dō-sē'nō), the most western point of California, in Humboldt County. It is a high promontory, 428 feet above the sea, and has a first-class lighthouse.

**CAPE OF GOOD HOPE**, an important promontory near the southwestern extremity of Africa, next to Cape Agulhas, the most southern point of the continent. It is the end of the Table Mountain, which recedes inland and rises 3,585 feet above the level of the sea, while the promontory rises nearly 1,000 feet above the sea. Near it is a British naval station. It was discovered by Bartholomew Diaz in 1486 and named Cape of the Storms, but its name was changed to Cape of Good Hope by John II. of Portugal. This name was applied because it marks the change of direction in sailing from south to east on the voyage from Europe to India. The completion of the Suez Canal has greatly diminished its commercial importance.

**CAPE PALMAS** (pāl'màs), the southern extremity of Liberia, Africa. It is near the place where the colony of Negroes from the United States landed in 1834.

**CAPE NOME** (nōm), a cape of Alaska, near the city of Nome, extending into Norton Sound. It is noted for the rich deposits of gold in the sand near the sea coast.

**CAPE PRINCE OF WALES**, a cape of North America, the extreme western point of that continent and of Alaska. It is opposite East Cape in Siberia, and between the two points is the narrowest water which separates the two continents. Dangerous shoals are located north of it, but toward the south is a deep sea.

**CAPE RACE**, a cape at the southeastern extremity of Newfoundland, extending into the Atlantic Ocean. It has a revolving lighthouse 180 feet above the water.

**CAPERCALLY** (kā'pĕr-kāl-lŷ), or **Caper-cailzie**, a species of grouse native to Europe, and quite generally known as *cock of the wood*. It has brownish-black plumage, a small scarlet patch of naked skin near the eye, and weighs about ten pounds. Its food consists largely of berries and insects, and it frequents the boughs of tall trees. These birds are highly favored for their flesh and may be easily domesticated. They are native to both Asia and Europe, and

are found chiefly in the forests of regions not generally settled. Quite a large number inhabit the northern part of Scandinavia, Russia, and the timbered sections of Siberia.

**CAPERNAUM** (kā-pĕr'nā-ŭm), an ancient city of Palestine, in Galilee, on the northwestern coast of the Sea of Galilee. Jesus made his home at Capernaum after leaving Nazareth (Matt. iv., 13), and it was the scene of many of his miracles and discourses. It had a synagogue, a customhouse, and a Roman garrison. Capernaum was the home of Andrew, Matthew, and Peter, and it is related that Matthew was at the custom station when called to be an apostle.

**CAPE SABLE**, the name of two capes in North America, one in Nova Scotia and one in Florida. Cape Sable, in Nova Scotia, is on Cape Sable Island, in Shelburne County, and off its shore are important fisheries. Cape Sable, in Florida, is at the most southern point of the State and of the United States.

**CAPE SAINT VINCENT** (sānt vĭn'sent), a headland at the southwestern extremity of Portugal, in the province of Algarve. It is noted for the victory of the British navy under Sir John Jervis over a Spanish fleet on Feb. 14, 1797.

**CAPE SAN LUCAS** (sān lōō'kās), the most southern point of Lower California, in Mexico. It is a rocky promontory of volcanic origin, almost directly west of Mazatlan, Mexico.

**CAPE SAN ROQUE** (rō'kâ), a cape in the northeastern part of Brazil, in the state of Rio Grande do Norte, north of the city of Natal.

**CAPE-TO-CAIRO RAILWAY**, a trunk line projected in Africa to furnish a direct means of transportation from Alexandria to Cape Town. It is the first direct transcontinental railway projected to extend from north to south, and will furnish an admirable line by which to cross the equator. It was first proposed by Cecil Rhodes, who looked upon it as an avenue by which British commerce and dominion could be enlarged. The cost was originally estimated at \$60,000,000 and it was thought possible to complete it by 1906, but the capital required will be more than double that sum.

The accompanying map shows the waterways and railroads in Africa in 1905. From Alexandria to Khartum, a distance of 1,300 miles, the line was built by the Egyptian government and has been in operation several years. The southern extension from Cape Town to Bulawayo, about 1,600 miles, is entirely in British territory. From Bulawayo lines have been built to Salisbury and Broken Hill, and the latter of



these will be constructed along the east side of Lake Tanganyika, through German East Africa, Uganda, British East Africa, and thence along the Nile to Khartum. It is likely that for some years advantage will be taken of navigation on lakes Nyassa, Tanganyika, and Victoria Nyanza. A line already extends through British East Africa, from Mombasa to Lake Victoria Nyanza, which will be a feeder to the main railway. The length of the Cape-to-Cairo Railway is 6,600 miles. By looking over the

Cape of Good Hope. It is the southern terminus of the Cape-to-Cairo Railway. The town was first built of poorly constructed houses with flat roofs, whitewashed on the outside. Later a site was platted in which the streets intersect each other at right angles, and many modern edifices have been constructed. It is now an important seat of commerce and manufactures. The modern facilities include sewerage, waterworks, electric and gas lighting, electric street railways, and extensive tele-



CAPE-TO-CAIRO RAILWAY.

map it will be seen that railroad construction in Africa is limited to the territory settled more or less by Europeans, but this line will extend fully 2,000 miles through a region totally undeveloped.

**CAPE TOWN**, the capital and seat of government of Cape Colony, at the head of Table Bay, on the north side of the peninsula formed by Table Mountain, thirty miles north of the

phone and telegraph connections. The Parliament building, the seat of justice, the public museum, the gallery of fine arts, and the public library are among the most important structures.

Cape Town has a fine school system, a number of high school buildings, and several colleges and institutions of higher learning. The university, founded in 1873, has an attendance of 700 students. It is beautified by a number



of parks, paved streets, and boulevards. The trade from the interior and its foreign commerce are alike extensive. What the city lost by the construction of the Suez Canal has been more than regained by the discovery of large deposits of gold and diamonds in the interior and the building of railroad lines. Among the industries are extensive machine shops, flouring mills, tanneries, woolen mills, and factories producing implements, hardware, and machinery. Cape Town was founded by the Dutch in 1652 and has been a possession of England since 1806. Population, 1904, 91,973.

**CAPE VERDE** (vērd), the most westerly cape on the west coast of Africa, between the Gambia and the Senegal rivers. The Portuguese discovered it in 1445, and it was so named from a grove of baobab trees, which gave the locality the appearance of a white coast.

**CAPE VERDE ISLANDS**, a group of fourteen islands belonging to Portugal, located about 320 miles west of Cape Verde, Western Africa. The islands have an area of 1,480 square miles. They are of volcanic origin and have at least one active volcano, located on the island of Fogo. The interior is elevated, while the coast is level and exceedingly fertile. The inhabitants consist largely of descendants from the Portuguese, whose language is official and is taught in the public schools. Among the leading products are indigo, tobacco, sugar, cotton, coffee, millet, chemicals, and tropical fruits. Rainfall is greatest from August to November, but droughts are not uncommon during the growing season. Among the domestic animals are goats, poultry, asses, and cattle. Roman Catholic is the state religion. The larger share of the trade is with Portugal. The governor is appointed by the King of Portugal and resides at Praya, the capital of the islands, which is located on Santiago, the largest of the group. Porto Grande, on São Vincente, is an important coaling station. The Cape Verde Islands were discovered by the Portuguese in 1450, and have since been under their control. Population, 1905, 147,665.

**CAPE WRATH**, a promontory at the northwestern extremity of Scotland, in Sutherlandshire. It consists of rocky cliffs, mostly of gneiss, which tower more than 500 feet above the sea. A lighthouse stands on the highest point and may be seen at a distance of twenty-five miles.

**CAPILLARIES** (kăp'îl-lâ-rÿz), the vessels of hairlike minuteness that form the connections between the extremities of the arteries and the beginning of the veins. The arteries form channels for the blood to pass from the

heart and become smaller continuously until they merge into the capillaries, tubes from  $\frac{1}{500}$  to  $\frac{1}{1,000}$  of an inch in diameter. The flow in these small vessels is about  $\frac{1}{80}$  of an inch per second in the systematic and  $\frac{1}{5}$  of an inch in the pulmonic circulation. The flow is constant, equable, and regular. They fit closely to the veins, which unite into larger and larger channels, as streamlets do to constitute a river, and carry the blood back to the heart. In the capillaries of the lungs, the blood receives oxygen and gives up carbonic acid. The capillary action can be easily seen in the foot of a frog by the use of the microscope.

**CAPILLARITY** (kăp-îl-lăr'î-tÿ), the branch of physics which treats of the properties of liquid surfaces. The tendency of the surfaces of all liquids is to contract, which is seen in the spherical form of falling drops and in the effort required to blow a soap bubble. When a tube of fine bore is lowered into a liquid, the fluid surrounding the walls of the tube rises above the level of the liquid. This is more noticeable in small than in large tubes, and can be observed very easily by placing small tubes or straws into water slightly colored with ink. The difference in the surface results from the difference between the cohesion of the liquid molecules for one another and their adhesion to the walls of the capillary tube. The outer surfaces of a liquid which wets a capillary tube rise, because the adhesion between the liquid and the tube draws or attracts it toward the walls of the tube. A liquid which does not wet the capillary tube is depressed at the outer surfaces, because the cohesion of the liquid draws it away from the walls of the tube. Water and mercury may be used in making experiments of this kind, since water wets the walls of a tube, hence the outside parts rise and the surface of the liquid is concave; and mercury does not wet the tube, hence the effect is reversed and the surface of the mercury is convex. Oil rises in the wick of a lamp through the capillarity of the spaces between the strands. In the same way plants absorb moisture from the air and the soil by their foliage and roots, and the sap rises in them through the capillarity of their tissues.

**CAPITAL** (kăp'î-tal), in economics, the portion of wealth which is employed for the further production of wealth. It is sometimes defined as that portion of stock which the owner expects to convert into revenue. Writers usually divide capital into two classes, known as *fixed* and *circulating* capital. Fixed capital is a kind that is used only once in the fulfillment of its purpose, such as machinery. In this form it represents a certain amount of



money invested, which will not be used a second time, since the machinery is supposed to be employed in the prosecution of a trade or business until it is worn out and must be replaced by new machinery. On the other hand, circulating capital consists of those forms of wealth which require renewing after having served a certain time for a specified purpose, such as a loan made for a definite time or an investment in land.

The nature of modern business enterprises differs very materially from those of society in the primitive state. Then it was thought that each individual should pursue a business and furnish practically all the capital, hence a laborer was skilled to the extent that he could complete almost the entire product without relying upon any one else. With the invention of modern machinery, capital has become invested very largely in fixed forms, and now the laborer is skilled more particularly to do certain parts of the work necessary to complete a commercial product. This *division of labor*, as it is called, has greatly revolutionized modern commerce by making labor more intelligent and skillful. However, it was long thought that every new machine invented would throw a certain per cent. of laborers out of employment, and thus deprive them of their means of support. This is shown in the invention of the harvester, which, with the aid of one man and two horses, does the work which formerly required four or five men. The invention of machinery to manufacture cotton is another illustration, and the inventors of these machines were treated violently by the laborers who considered them and their inventions highly detrimental. However, these and other inventions that might be mentioned, instead of having a harmful effect, have caused more laborers to be employed and at the same time have greatly improved the character of the product.

The *management* of capital may be rightly considered a theme of much importance. Modern business methods have greatly concentrated the management of large interests in the hands of a few, and the tendency has been for the larger institutions to absorb or displace the smaller ones. This may be seen clearly in the management of railroad business, both in Canada and the United States, where the smaller lines have been largely absorbed by the companies having control of trunk and transcontinental railways. The former management of smaller railways has given way to the management of systems, such, for instance, as the great systems of the New York Central lines, the Pennsylvania lines, and the lines of the

Canadian Pacific. In England many of the public utilities have come under the ownership of municipalities and of the government, and in America the tendency is manifestly toward municipal ownership of large properties, such as lighting plants and rapid transit systems, which are now operated generally by the capital of private individuals or corporations. It is quite apparent that the laboring class of people feel favorable to public ownership, at least to a very large extent, and that they look upon the private ownership of large utilities as a centralization of power in the hands of corporations that control them to the detriment of the industrial classes. See **Money**.

**CAPITAL PUNISHMENT**, in criminal jurisprudence, the infliction of the penalty of death upon conviction of a high crime. In early history it was the mode of punishment for felonies of all kinds, and all primitive people regarded it as the best remedy to induce observance of the law and for the prevention of crimes. A wider study of the causes of crime, including heredity and environment, has led to the conclusion that this mode of punishment is not the best means to overcome criminal conduct, although it is held by all governments that the severity of the punishment of crime should be based upon the nature of the crime committed. The Grecian scholars, Plato and Protagoras, favored the retention of capital punishment on the ground that it tends to deter men from committing the crime of murder, while others maintained positions diametrically opposed to this view.

Capital punishment was inflicted in early history for desecration of the Sabbath, cursing, idolatry, witchcraft, incest, and disobedience to parents, as well as murder. The Anglo-Saxons made such trivial offenses as robbing a rabbit warren, cutting down a tree or arbor, and offenses against the revenue acts capital crimes, but the theory of law was more severe than the practice. This is seen by the fact that the early laws contained 200 offenses punishable by inflicting this severe penalty, while it was inflicted upon persons guilty of committing only 25 of them. Sir James Mackintosh and others, about 1820, secured a repeal of the early English laws and confined the punishment by death to its present limits.

In Europe capital punishment is prescribed generally for persons guilty of murder, but it is rarely inflicted. The death penalty was abolished in Holland in 1870 and in Rumania and Portugal in 1864, while other countries have followed in the same course toward modifying the penalty for capital crimes. Many coun-



tries have laws whereby the form of punishment can be *commuted* to some other form; as, for instance, in Sweden only three persons were executed out of thirty-two sentenced to death in recent years. For the same length of time 484 persons were sentenced to death in Germany, but only one was executed; ninety-four in Denmark, only one executed; and 248 in Bavaria, only seven executed. This is the proportion usually maintained in the civilized countries.

In the United States, capital punishment is inflicted only in cases of murder, but in a few of the states it is extended to rape. In some of the states life imprisonment is the severest form of punishment, while in others this form may be substituted by the Governor in place of capital punishment. The form of execution is hanging in most countries, but in others beheading is the usual mode. The newer method adopted in New York, Ohio, and several of the states is that of electrocution. In the armies of the world capital punishment is usually inflicted by shooting or hanging for conviction as a spy or an aggravated form of desertion. Many societies have been organized and are now flourishing that have for their object the abolition of capital punishment, claiming that this form often induces crime, while life imprisonment and other severe forms akin to it are much more fruitful in securing obedience to law and regard for the life and property of others.

**CAPITALS**, the upper-case letters used in printing and writing. Each language has its peculiarities in the use of capital letters, and in some there is a difference of opinion upon the rules that should govern, hence individual scholars differ in their views as to where to employ them. In English the general rule is to begin all proper names, the first word of every sentence, the first word of each line of poetry, adjectives derived from proper names, and the names of deities with capital letters. The days of the week and of the month, the titles of books, the names of institutions, and the personal pronouns relating to God are capitalized. When an adjective directly precedes the name of a place it is usually capitalized, as Central Europe. Specific events, such as the French Revolution, are capitalized. However, there are differences of opinion for capitalization in English, hence the rules published are numerous and differ very materially. Every noun begins with a capital letter in the German, which was formerly the style used by English writers, and this system has many advantages over those now in vogue in many countries. Such a sys-

tem simplifies and leaves no question as to propriety in capitalization, the test being in determining the part of speech.

**CAPITOL** (kăp'ĭ-tŏl), the name applied to the main government building in which the legislative body of a State or Nation holds its sessions and the public business is transacted, located at the capital city. The name is from the Roman citadel known as the Capitol, which stood on Capitoline Hill, one of the seven hills of Rome. It was planned by Tarquinius and destroyed during the civil wars in the time of Sulla, but was rebuilt by the Senate on a larger plan. It contained an equestrian statue of Marcus Aurelius, the "Capitoline Venus," and "The Dying Gladiator."

In the United States, each State has a capitol building, of which the finest are at Albany, N. Y., and Austin, Tex. The corner stone for the national capitol was laid Sept. 18, 1793, at Washington, D. C., by George Washington. In 1800 the north wing was completed, and in 1808 the south wing, and both were greatly damaged by the British in 1814. In 1818 part of the foundation for the main building was laid, and the whole was completed in 1827. President Fillmore laid the corner stone for the south extension July 4, 1851. It was completed in 1857. The length of the entire building is 751 feet; breadth, 324 feet. It covers three and a half acres. The diameter of the dome is 136 feet and the height is 308 feet. The cost of the entire building was \$15,000,000.

**CAPITOLINE HILL** (kăp'ĭ-tŏ-lĭn), the name often applied to the Tarpeian Hill, one of the seven hills of ancient Rome. On it a temple or capitol was built to Jupiter. The first foundations were laid by Tarquinius Priscus about 600 B. C., but it was not completed until after the republic was established. In 83 B. C. it was destroyed by fire and was rebuilt by Sulla, but was again destroyed in the civil wars. Vespasian rebuilt it in 69 A. D., but it was again destroyed in the reign of Titus, and was rebuilt with great magnificence by Domitian in 80 A. D. Emperor Augustus donated 2,000 pounds of gold to decorate its roof, and the Roman consuls bestowed great fortunes on it. The interior was decorated with shields of solid silver and the thresholds were of brass. On the same hill were other buildings and a library. All parts of Capitoline Hill were decorated with statuary, and in the interior of the capitol were beautiful productions of sculpture and painting. In 387 B. C. the Capitoline games were introduced to commemorate the deliverance from the Gauls, and after a lapse of interest they were revived by Domitian in 86 A. D. The



modern structure is known as the Campidoglio, and was erected on the site of the capitol by Michael Angelo soon after 1536. It contains the palace of senators. In the hall of the illustrious men are busts of ninety-five famous Greeks and Romans, and in the hall of the emperors are sculptures of eighty-three emperors and empresses, while other interesting busts, statues, and pictures constitute a most wonderful collection of value and beauty.

**CAPPADOCIA** (kăp-pă-dō'shê-à), an ancient province of Asia Minor, most of which is now included in the Turkish province of Karaman. It was conquered by Cyrus and belonged to Persia. After the time of Alexander the Great, it became an independent kingdom and was ruled as such until 17 A. D., when Tiberius made it a province of Rome. Much is said of this section of Asia Minor in Christian literature, and it is recorded in the first epistle of Saint Peter that the Cappadocians were converted to Christianity.

**CAPRI** (kă'prê), a famous and beautiful island in the Mediterranean, near the entrance to the Bay of Naples. It is two miles wide and five miles long, rising to an elevation of 1,900 feet above the sea. The island is remarkable for its richness in fertile soil, beauty of scenery, historic interest, and ancient ruins. The last seven years of Emperor Tiberius were spent on this island amid riotous and voluptuous living. The present inhabitants engage in fruiting, trading, and the culture of vineyards and orchards. In the west end is the town of Anacapri and in the eastern part is Capri. A flight of 535 steps has been cut in the rocks to reach the former. Capri, the capital, has a population of 4,220 and the island, 6,252.

**CAPRICORN** (kăp'rî-kôrn), the tenth sign of the zodiac (q. v.), and the name of a southern constellation. The latter was represented on ancient monuments by the figure of a goat, or as having the fore part of a goat and the hind part of a fish. The ancients celebrated it as the harbinger of success. The two largest stars are of the third magnitude, hence it does not rank as a constellation of much brilliancy. The Tropic of Capricorn is the southern boundary of the Torrid Zone, at which the rays of the sun are vertical once a year, at noon, usually the 21st day of December.

**CAPSICUM** (kăp'sî-kûm), a genus of plants native to tropical America, from which four varieties of cayenne pepper are obtained. These plants belong to the nightshade family and are not related to those that yield the real pepper. About ninety species of capsicum have been studied. The leaves are simple and the fruit

is a berry with many seeds. The berry in all the species has an inflated appearance, the form being conical, round, or heart-shaped, and the seeds are flattened. A number are cultivated for the extremely pungent and stimulating fruit, which is used in medicine, in making sauces, and in preparing mixed pickles. Cayenne pepper is made from the fruit of several species, chiefly when the berries are ripe, when they have a scarlet or orange color. This product is made principally from *capsicum annuum*, known as chilli pepper, and is cultivated in the tropical and temperate climates of all the continents.

**CAPSTAN** (kăp'stăn), a strong, massive apparatus of wood shaped like a truncated cone, with holes for the reception of bars in the upper part, by means of which it may be revolved, and thus serve to raise or move a heavy weight by winding a rope around it. It is used for moving houses and on shipboard for weighing anchors. The smaller capstans are turned by hand, usually by two or three men, who work upon a lever which is inserted in holes at the tip or crown. Larger capstans are operated by horse, steam, or electric power.

**CAPSULE** (kăp'sûl), in botany, a seed vessel consisting of one or more cells, in which the seeds are stored, such as poppy heads. Some capsules break open and discharge their contents, while others fall off entire with the seed. The term is applied in medicine to a small hollow case of gelatin. It is used to inclose medicine so as to permit its being swallowed without coming in contact with the organ of taste. The gelatinous envelope melts when in the stomach, thus setting the medicine free to act.

**CAPTAIN** (kăp'tîn), in military, an officer in command of a company of infantry, a battery of artillery, or a troop of cavalry. In the United States navy a captain ranks next to a commodore, and his position corresponds to that of a colonel in the army. The term captain general is applied to the commander of the military forces of a province. In this sense the President of the United States is the captain general of all the military forces of the nation when in active service. In each State the supreme command of the State troops in times of peace is vested in the Governor, who is captain general of the military forces of the State.

**CAPUA** (kăp'û-à), a fortified city of Italy, twenty miles north of Naples, on the Volturno River. It has a cathedral and is the residence of an archbishop. Ancient Capua was about three miles southeast of the modern town, and was long as important as Rome and Carthage. The Romans considered it a favorite



place of resort on account of its agreeable climate and beautiful location. It is rich in ancient ruins, among which are those of an amphitheater with a capacity for seating 60,000 people. It was founded by the Etruscans in the year 800 B. C. who named it Vulturnum. Geneseric with a force of Vandals captured it in 456 A. D., and the Saracens finally destroyed it in 840. Capua became celebrated in literature as the scene of the play of "Romeo and Juliet." The modern town has a public library, a fine cathedral, and manufactures of earthenware and clothing. Population, 1906, 14,328.

**CAPUCHINS** (kăp-û-shēnz'), a religious congregation of the Franciscan order of monks, instituted by Matteo di Bassi in 1525. He desired to practice greater poverty than was required by the strict rule of the order of Saint Francis, and his congregation was validated by Clement VII. in 1526. The Capuchins were permitted to wear the habit and a beard, and their custom was to live in solitary places and as hermits. Their rules are very strict, requiring them to recite the canonical hours without singing, to spend an hour every morning in mental prayer and in silence, and to partake of the simplest kind of food. In climates and seasons of the year that permit the practice, they are enjoined to go barefooted. This class of monks is now most numerous in Austria, but they are represented in Canada and the United States. In the latter country they have provinces at Pittsburg, Pa., Leavenworth, Kan., Detroit, Mich., and at a number of other places. Bernardino Ochino, converted to Protestantism in 1542, and Theobald Mathew, the celebrated Irish advocate of total abstinence, are among the best known Capuchins.

**CAPYBARA** (kă-pē-bă'rá), a rodent animal of South America, allied to the guinea pig. It has the appearance of a hippopotamus on a



CAPYBARA.

small scale, but attains a length of only three feet. The legs are short, the head is large, and the hair is coarse and brown. It is tailless. It

feeds mainly on vegetation and lives near streams. The flesh is taken for food by the natives, who eat it either fresh or salted. This animal is well distributed throughout the warmer parts of the continent, but is most abundant in Brazil and the Guianas.

**CARACAL** (kăr'â-kăl), a kind of lynx found in Africa and the warmer portions of Asia. It is strong and fierce, about the size of a fox, and is deep brown in color.

**CARACAS** (kă-ră'kās), the metropolis and capital of Venezuela, located in a beautiful valley six miles from the Caribbean Sea. The site of the city is on the slope of Mount Avila, which attains a height of 8,640 feet, and the city is 3,020 feet above the tide level. It is connected by a railroad with its seaport, La Guayra, about eight miles distant. The plat of the city is regular, having streets at right angles, and many of its buildings are modern. Its altitude brings it within an equable temperature and healthful air. It is the seat of a school system for free attendance, and articulated with its courses are a number of professional colleges, technical schools, and the University of Caracas. The capitol building is a large and beautiful structure, and besides it there are federal buildings, the president's residence, several cathedrals, and the Basilica of Saint Ann. It is lighted by gas and electricity and has telephone and telegraph connection. Many of the streets are paved with stone and asphalt. Several public parks, gardens and promenades are maintained. The gardens and parks contain many rare and beautiful plants, and fine collections of wild animals. It has a growing import and export trade, the latter consisting chiefly of coffee, cacao, and tobacco. Caracas was founded in 1567. Population, 1906, 73,520.

**CARAT** (kăr'ăt), a weight equal to the twenty-fourth part of an ounce, or three and one-fifth grains Troy. Jewelers use the term to express the fineness of gold; the whole mass is represented by twenty-four parts, the number of parts taken expressing so many twenty-fourths. Pure gold is twenty-four carats; eighteen carats three-fourths gold; twelve carats, one-half gold, etc. Fine gold consists of two parts alloy and twenty-two of pure gold. The gold coinage of the United States is in these proportions. The double eagle weighs 516 grains, of which 464.4 grains are fine gold.

**CARAVEL**, or **Caravella**, a small vessel used in Southern Europe, fitted to carry from 25 to 150 tons. In Turkey the name is given to a ship of war, but in Portugal and Spain it has reference to a vessel with one or two sails, the



larger of which is on the foremast. Caravels were used extensively in 15th and 16th centuries, when they usually had a capacity for a burden of 300 tons. They were fitted with four masts, one of which was square-rigged and the others were lateen-rigged. Columbus sailed with three of these vessels in 1492, the Santa Maria, the Niña, and the Pinta, of which the first mentioned was the flagship.

**CARAVAN** (kär'ä-vän), the name applied to a company of travelers, merchants, or pilgrims passing through parts of Africa and Asia for purposes of safety and convenience. The Mohammedans form caravans annually to worship at Mecca; the most important caravans are assembled or organized at Cairo and Damascus. These often number from 30,000 to 50,000 pilgrims and move from fifteen to twenty-five miles a day. Much of the business of Northern Africa and Western Asia is carried on by caravans. The camel is used as a means of conveyance, owing to its strength and exceptional power of endurance in desert regions. Often 500 camels are used in a single caravan, the body moving in single file.

**CARAWAY** (kär'ä-wä), a plant native to Southern Europe and Western Asia, and culti-



CARAWAY.

vated extensively in all continents for its aromatic seed. It has a fleshy root, which resembles that of the parsnip, finely divided leaves, and umbels of whitish flowers. The stem is

from one to two feet high. The seeds are valued for their pleasant, aromatic flavor, and are used extensively by confectioners and bakers, and as a medicine to stimulate the digestive organs. The aromatic properties are derived from its volatile oil, known as *oil of caraway*, which is obtained by distilling. Caraway is grown in gardens for its seed in all the continents.

**CARBAZOTIC ACID** (kär-bä-zöt'ic), a substance of great value in dyeing wool and silks. It is obtained by combining carbolic acid with nitric or sulphuric acid.

**CARBOLIC ACID** (kär-böl'ik), an acid obtained by the distillation of coal tar. *Carbol*, *phenol*, and *phenic acid* are other names by which it is known. It resembles creosote, which is similarly obtained from wood, in that it possesses a pungent taste, strong odor, and other properties similar to it. Being an effective poison to low forms of animal life, it is valued as a disinfectant and to preserve meat, and is used as medicine internally and externally. As an external remedy it destroys germs admitted to wounds. To be effective as a germicide, it must be brought into contact with the germ to be destroyed. However, when applied to wounds, it forms a crust or coating sufficiently strong to destroy the germs that may come in contact when atmospheric air is admitted.

**CARBON** (kär'bön), an elementary non-metallic substance which is present in all organic compounds. It exists uncombined in three forms, as graphite, charcoal, and diamond. The diamond and graphite forms are crystalline and charcoal is amorphous. The diamond form is colorless or yellow, pink, blue, or green, and is transparent. It is the hardest substance known and the purest form of carbon. In the charcoal form it is mixed more or less with anthracite or bituminous coal and other substances. The pure charcoal is light, brittle, inodorous, and black in color. The graphite is gray-black with a metallic luster. It often separates in scales from molten iron, and is used for lead pencils and as carbons in electric lighting. Carbon consists more plentifully in compound form than all the other elements combined. It forms a number of compounds with hydrogen, called hydro-carbons, in which forms many properties, both chemical and physical, are possessed. It forms only two compounds with oxygen, although the two elements can be united without difficulty. Carbon is found as a regular constituent of both plants and animals.

**CARBONATES** (kär'bön-äts), the compounds in which carbonic acid is the base, such as carbonate of lime and some forms of lead



ore. The former, in its purest natural form, is the mineral calcareous spar. Carbonate of chalk is the principal ingredient in the marbles and limestone. Other carbonates are those of soda, potassa, and ammonia. They comprise a class of salts that are used extensively in the arts and in medicine, and are very numerous, although carbonic acid itself is feeble and can be expelled easily from nearly all the carbonates by red heat.

**CARBONDALE** (kâr'bôn-dâl), a city of Lackawanna County, Pennsylvania, on the Lackawanna River, sixteen miles northeast of Scranton. It possesses large iron foundries, flouring mills, and other manufactories. The coal mines near it yield about 900,000 tons annually. There are excellent railroad facilities, electric street railways, electric lights, paved streets, good schools, and other public institutions. Population, 1900 13,536.

**CARBONIC ACID** (kâr-bôn'ik), or **Carbon Dioxide**, a substance occurring free as a gas in the atmosphere, forming about  $\frac{1}{2500}$  of the air. It is made up of twelve parts by weight of carbon and thirty-two of oxygen. Carbonic acid is twenty-two times as heavy as hydrogen, has no distinct smell or color, and has the property of turning blue litmus slightly red. It acts as a narcotic poison when present in the air to the extent of four or five per cent., and is incapable of supporting combustion or animal life. It is brought into the air by the breathing of animals, the burning of fuel, the decomposition of animal and vegetable substances, and the fermentation of liquors, and evolves from fissures of the earth. In coal mines it constitutes *choke damp*.

As carbonic acid is a dense gas, heavier than air, it has a tendency to sink into vaults, wells, and low places, often rendering valleys and caves uninhabitable. It is pleasant to the taste and forms a small per cent. of aërated beverages, such as carbonated mineral waters, champagne, and beer. Though poisonous to the lungs, it is agreeable and pleasant when taken into the stomach. It is found in large quantities in all marbles and limestones, is evolved from the colored parts of the flowers of plants both during the day and night, and from the green of plants during the night. Plants absorb it from the atmosphere during the day, and it forms an important part in their nourishment. It constitutes the largest ingredient in the food of vegetables.

The carbonic acid evolved from the fissures of the Upas valley in Java is very dense and rises to a height of about eighteen feet above the surface. The valley is nearly a mile in

circumference and entirely devoid of animal or plant life. Birds attempting to fly across it drop dead, while a dog is killed by its influence in about fifteen seconds. Carbonic acid, when present in large quantities, extinguishes a lighted lamp or burning of any kind. The condition of the air in mines is tested by lowering a lighted lamp. Carelessness in entering mines without testing the air has caused the loss of many lives, as carbonic gas, if breathed freely, causes death by asphyxia. The presence of large quantities in poorly ventilated rooms, given off by the breathing of many persons, is the source of headache and depression, and causes the loss of health if long continued. Its presence in the air may be recognized by exposing a vessel containing lime water, as it causes a white film of carbonate of chalk or lime to form on the surface of the liquid, if present in large quantities.

**CARBONIC OXIDE** (öks'id), a colorless gas containing one equivalent less of oxygen than carbonic acid, being a combination of about forty-three per cent. of carbon and fifty-seven per cent. of oxygen. It is generated in close furnaces as a product of imperfect combustion, mixed with carbonic acid and other gases. It is without smell and taste, burns with a blue flame, and is more poisonous than carbonic acid. When breathed as it issues from furnaces in factories, it sometimes causes asphyxia to the workmen.

**CARBONIFEROUS AGE** (kâr-bôn-îf'ēr-üs), the period of time preceded by the Devonian age, and classed in the latter part of the Palaeozoic era. It is so named from the mineral coal and other carbonaceous matter found in the deposits, which include many fossils of plants and animals. Among the remains and traces of plants are chiefly ferns, rushes, conifers, and lepidodendrons. These plants differed greatly from those of the present time, and all of the species seem to have been very large. The mosses grew thickly matted and the ferns resembled trees with stems twenty feet in height. Among the animal life were the corals and crinoids, the gastropods, the cephalopods, crustaceans, scorpions, dragon flies, spiders, fishes, and numerous large reptiles. It is reasonably certain that more than 2,000 species of plants and almost that number of animals existed.

The carboniferous system lies between the Devonian and Permian systems of the Palaeozoic period. It is estimated that this system includes about 400,000 square miles of productive coal fields, but the area is undoubtedly much larger. These coal measures are widely



distributed in all the continents, but the larger portion of commercial coal deposits are made up of bituminous and lignite coal, with fields of anthracite in the United States, Canada, and other regions, though the area of these fields is not extensive. Associated with the coal seams are deposits of fire clay, iron ores, limestone, potter's clay, and stone valuable in building. In some localities salt is obtained from the lower strata. See **Geology**.

**CARBORUNDUM** (kär-bō-rūn'dūm), a manufactured material made by combining carbon and silicon, two of the hardest known elements. In making this product, coke is crushed and ground to a fine powder and mixed in proper proportions with common glass sand. Salt and sawdust of determined quantities are added to this mixture for mechanical purposes. The mixture of coke, sand, sawdust, and salt is then placed in an electric furnace, and for thirty-six continuous hours an electric current of 1,000 horse power of energy is passed through the furnace, subjecting the mixture to a heat of approximately 7,000° Fahr. When the furnace is cool, the mixture is found converted into large masses of beautiful colored crystals of exceedingly brilliant luster. After the carborundum crystals have been removed from the furnace, they are crushed to separate the mass of crystals apart, then thoroughly washed, dried, and screened to separate the different sizes.

Carborundum is the hardest artificially made product, and in degree of hardness is exceeded only by the diamond. It is used extensively as an abrasive. For dentistry alone there are 205 separate and distinct devices in the form of wheels, points, and others that employ carborundum. This material enters into minute forms scarcely large enough to be picked up by the finger, and on the other hand the same material is used in wheels weighing 1,000 pounds. The largest factory for manufacturing this product in America is at Niagara Falls, where it is prepared for use in instruments and machinery, and for lining furnaces as a protection against great heat.

**CARBUNCLE** (kär'būn-k'l), a painful inflammation of the connective tissue beneath the skin, most frequently on the back. It resembles a boil, but is much larger and more painful, and its origin seems to be constitutional. In the beginning it is characterized by swelling and a severe burning pain, frequently accompanied by chills and fever, and in its later stages small blisters open and discharge a thin pus. Both surgical and medical treatment is sometimes required. The name *carbuncle* is

applied to a variety of garnet obtained in Southern Asia and many sections of North America. It has a deep red color and is used in jewelry.

**CARDENAS** (kär'dā-nās), a seaport on the northern coast of Cuba, in the province of Matanzas, 103 miles east of Havana. It is one of the principal seaports of the island, has good railroad connections, and exports large quantities of fruits, tobacco, coffee, molasses, and sugar. Since the Spanish War of 1898 it has grown steadily in commercial importance. The manufactures include cigars, sugar, clothing, and utensils. It has several schools and convents, electric lights, and a system of waterworks. In 1898 it was the scene of an engagement between the United States blockading vessels and the Spanish batteries, in which Worth Bagley was killed, the first American to lose his life. Population, 1899, 21,940.

**CARDIFF** (kär'dīf), a village of Onondaga County, New York, eleven miles north of Syracuse. It is situated in the center of a fine country. The village is notable for the pretended discovery of the Cardiff Giant, a statue carved from Iowa gypsum, made in Chicago, and buried at Cardiff. It was exhibited as a petrified giant at various times.

**CARDIFF**, an important seaport of Glamorgan County, Wales, at the mouth of the Taff River, on the estuary of the Severn. It has extensive docks and large exports of minerals; mostly iron and coal. The manufactures include machinery, clothing, implements, steamboats, and ironware. It formerly contained a castle of great strength, in which Henry I. imprisoned Duke Robert for twenty-six years. The city has modern facilities, a number of colleges and higher schools, many costly churches, and several libraries and public parks. Rapid transit connections are maintained with several suburban districts. Cromwell captured Cardiff in 1648, after a bombardment that lasted three days. Its modern growth dates from 1839, when the first great dock was opened. Population, 1907, 187,620.

**CARDINAL** (kär'dī-nal), the highest dignitary in the Roman Catholic Church under the Pope. The cardinals are classified in three divisions, which include the orders of cardinal bishops, cardinal priests, and cardinal deacons, the total numbering seventy, in allusion to the seventy disciples sent out by Christ. They are chosen by the Pope, the cardinal bishops numbering six; cardinal priests, fifty; and cardinal deacons, fourteen, who constitute the sacred college in which the election of the Pope is vested. The Roman pontiffs, before the reign



of Nicholas II., were elected by the whole clergy of the city of Rome and by the prominent laity, and at one time even by the body of citizens. However, Nicholas II. transferred the election of the pontiffs to the cardinals, with the assent of the other parties, and Alexander III. in 1179 limited the election to the cardinals, a two-thirds vote being necessary to constitute the election. This method still prevails in the election of pontiffs. Among the list of privileges enjoyed by the cardinals is the precedence over bishops, archbishops, primates, and patriarchs. They have exclusive right to the titles "Eminence" and "The Most Eminent," and rank with royal princes.

**CARDINAL FLOWER**, the name of several species of the *lobelias*, native to the swampy places in temperate climates, and cultivated extensively as garden flowers. The stem is tall and simple and has alternate leaves, and the flowers are of a variety of colors, ranging from white to deep red. They are cultivated as ornamental plants in many flower gardens of Canada and the United States.

**CARDINAL VIRTUES**, the moral virtues which are regarded as the basis of all right action, so named from *Cardo*, a hinge, denoting the fundamental point on which all things turn. These virtues are four in number, embracing justice, prudence, temperance, and fortitude. Socrates and other ancient writers divided the virtues in this way, but modern ethics looks upon personal acts as virtues only so far as they respect and are respected by social relations.

**CARDS**, a kind of cards printed on pasteboard, having pictures and symbols, and used in playing a number of games. The *deck* or *pack*, as a set is called, consists of fifty-two cards, of four classes or suites, known as *clubs*, *diamonds*, *hearts*, and *spades*. The suites are distinguished by colors, the clubs and spades being black and the diamonds and hearts red, and the individual cards are known by the spots and faces. Thirteen cards make up each of the four suites, each of which includes spot cards from one to ten and three face cards, known as *king*, *queen*, and *jack* or *knave*. Among the games played are *cassino*, *cribbage*, *draw poker*, *euchre*, *solitaire*, *whist*, etc. Though used more extensively in playing games of chance than any other cards, they are proscribed by many Christian and other societies, chiefly because the games in which they are used either take up much time or are popular among those who play for money or other valuable considerations.

**CARIB** (kär'ib), a tribe of Indians who for-

merly inhabited the northern coast of South America, from the Orinoco to the Amazon. They came in contact with the Spanish explorers in many islands of the West Indies. It is thought that they expelled the Arawakan tribe from the Lesser Antilles. These Indians practiced cannibalism and were warlike when first discovered, and the Spaniards subjected them as slaves. At present the descendants, mixed largely with the Negroes, are known as Black Caribs and number several thousand. They inhabit the coast of Central and South America.

**CARIBBEAN SEA** (kär-ib-bē'an), the largest inlet of the Western Hemisphere, extending inland from the Atlantic Ocean. It is bounded on the south by Venezuela and Colombia, on the west by Central America, and on the north by Yucatan and the Greater Antilles. It is connected by Yucatan Channel with the Gulf of Mexico, whose waters unite with those of the inflowing currents to form the Gulf Stream. Among the principal arms are the Mosquito Gulf and the Gulf of Honduras, on the west, and the gulfs of Darien, Paria, and Venezuela, on the south. The length from east to west is 1,700 miles, and the extreme depth, south of Cuba, is 16,000 feet.

**CARIBOU** (kär'ī-bōō), the American woodland deer, employed by the natives to draw their sledges. Formerly it ranged south as far as Ohio and Colorado, but it is now confined chiefly to Canada. It has large hoofs, prominent antlers, and long hairs about the neck and feet. See **Deer**.

**CARICATURE** (kär'ī-kà-tūr), a picture or drawing of a person in which certain points are so exaggerated as to give the whole a ludicrous effect. The art of caricaturing dates from the early Egyptians, and was employed more or less in all times. At present it forms a distinct feature of comic journals, such as *Puck* and *Judge*, in the United States; *Fliegende Blätter*, in Germany; *Charivari*, in France; and *Punch*, in England. Among the leading caricaturists are Nast, Opper, and McCutcheon, in the United States; Wilhelm Scholz, in Germany; Wilhelm Busch, in Austria; Honoré Daumier, in France; and George Cruikshank and John Doyle, in England.

**CARLISLE** (kär-lil'), a city of England, capital of Cumberland County, fifty miles west of Newcastle. It is located at the confluence of the Eden and Caldew rivers and several important railroads, and has communication with Liverpool by steamboats. Among the chief buildings is a cathedral founded by William Rufus. A castle, in which Mary, Queen of Scots, was confined after the Battle of Langside,



founded in 1092, stands near the city and is now used as a barrack. The manufactures include cotton and woolen textiles, clothing, and ironware. It has a large trade in produce and manufactures. Carlisle dates from an early time in the history of England and was destroyed by the Danes in 900. Population, 1907, 46,580.

**CARLISLE**, county seat of Cumberland County, Pennsylvania, about eighteen miles west of Harrisburg, on the Cumberland Valley and the Gettysburg and Harrisburg railroads. It is platted on a regular plan and has waterworks, electric lights, and other municipal facilities. The manufactures include railroad cars, ironware, carpets, and machinery. It is the seat of Dickinson College and the Carlisle Indian School, founded by the government in 1879. This college is supported by the government for the education of Indian pupils, and has been attended by three thousand students, of whom several hundred have been graduated. The pupils publish a number of periodicals, make their own uniforms, and many of them rise to high educational attainments. Near the city is Mount Holly Springs, a popular summer resort. Carlisle was settled in 1751. At the time of the Civil War, in 1863, it was bombarded by the Confederates. Population, 1900, 9,626.

**CARLOVINGIAN** (kär-lō-vīn'jī-an), the name of a historical royal family which furnished a number of sovereigns for Germany, France, and Italy in the 8th, 9th, and 10th centuries. The family origin dates back to the early part of the 7th century, but derived its name from Charles Martel. The latter reigned in France from 715 to 741. He was succeeded by his son Pepin, who reigned from 741 till 768, and he was succeeded in the government by Charlemagne and Carloman, who reigned conjointly from 768 to 771. In 771 Charlemagne became sole king, was crowned emperor by the people of the western world in 800, and was succeeded by his son Louis le Debonnaire in 814. The latter divided his empire among his sons and in 840 Charles the Bold became King of France. He was succeeded by a number of weak princes in 877, and the dynasty came to its end with Louis V. in 987. The most important division of the empire of Charlemagne consisted of Germany, France, and Italy, beginning in 887. A branch of the family ruled in Germany until the rise of the houses of Franconia and Saxony, and in Italy until the rise of Otho the Great, when the country became united to the German empire.

**CARLSBAD** (kärls'bät), or **Karlsbad**, meaning Charles's Bath, a city in Bohemia,

seventy miles northwest of Prague, on the Tepl River. It is so named because its mineral springs were first utilized by Charles IV. (1316-78), Emperor of Germany, for their healing qualities. It is the most aristocratic place and health resort in Europe. Visitors crowd it from June to September, the visiting delegations often numbering 25,000. It has cold and thermal springs, the latter reaching a temperature of from 80° to 165° Fahr. The city has ample accommodations for guests, such as parks and hotels and is in every way fitted for the entertainment and accommodation of guests. In the market place is a beautiful statue of Charles IV. The manufactures include carpets, needles, scissors, knives, woodwork, and articles of glass, which are sold largely to visitors. Among the municipal utilities are gas and electric lighting, a public library, and steam and electric railways. Population, 1906, 15,375.

**CARLSRUHE** (kär's'rōō-e), or **Karlsruhe**, meaning Charles's Rest, a city in Germany, capital of the grand duchy of Baden, thirty-eight miles northwest of Stuttgart. It was founded in 1715 by Markgraf Charles William, whose remains are interred below a statue in the market place. The city is built on a beautiful plan, and has several fine edifices, including castles and palaces. The court library contains 100,000 volumes and the public library is somewhat larger. Its museums have rare collections of antiquity and natural history. The city possesses fine botanical gardens, a large market place, several public squares, and a number of monuments. It has manufactures of railroad cars, carriages, jewelry, locomotives, carpets, textiles and chemical products. The streets are paved with stone and asphalt and traversed by lines of electric railways. Population, 1905, 111,249.

**CARMEL** (kär'měl), the name of a range of hills in Palestine, extending from the Mediterranean to the plain of Esdraelon. The length of the range is about twenty-six miles, extending from the plain of Dothan in a northwesterly direction, and the highest altitude is 1,810 feet. Mount Carmel, an eminence near the sea, is about 1,500 feet high and is the seat of a monastery, the monks being called Carmelites. These mountains were a favorite retreat of the prophets Elijah and Elisha, and here were enacted many noted scenes in Bible history.

**CARMELITES** (kär'měl-its), a monastic order of the Roman Catholic Church, known officially as the Order of Our Lady of Mount Carmel. Those who belong to the organization claim that it was instituted by Elijah,



the prophet, but it dates from 1156, when Count Bertrand, one of the crusaders, came from Calabria and established the monastery on Mount Carmel, in Palestine. The Saracens compelled them to wear striped dresses, but later they changed to a habit of brown with a white cloak and scapular, from which they came to be known as white friars. The Carmelite nuns date from 1452, and both they and the friars were reorganized by Saint Theresa in the 16th century, when they became known as barefooted Carmelites. At present they are found in all the countries where the Catholic Church has a considerable membership. They are austere in their habits of life.

**CARMINE** (kär'mīn), a pigment of a brilliant scarlet color, obtained from cochineal. Several processes are employed in obtaining this product, one of which is as follows: Put one pound of cochineal in three gallons of water, after fifteen minutes add one ounce of cream of tartar, heat gently for ten minutes, add half an ounce of alum, boil about three minutes, and draw the liquid into clean glass pans, in which the carmine will settle at the bottom, when the water will be drawn off and the product dried. Carmine is used as rouge for imitating the soft blush upon the cheeks, and in coloring confectionery and artificial flowers. Carmine lake, a product obtained from the residues of cochineal in manufacturing carmine, is used in printing and painting.

**CARNATION** (kär-nā'shūn), the name of the double-flowering variety of the clove pink. The highly cultivated carnation is noted for its beautiful colors and sweet scent. It is propagated by layers or cuttings of shoots in the summer season. The plants are taken up late in the fall and set in the greenhouse, where they bloom nearly the entire winter. Under cultivation the carnation has assumed a large variety of tints and forms. It is grown very extensively for the market.

**CARNEGIE** (kär-nēg'ī), a borough of Allegheny County, Pennsylvania, six miles southwest of Pittsburg, on the Pittsburg, Cincinnati, Chicago and Saint Louis and other railroads. It occupies a fine site on Chartier's Creek and has a large jobbing trade. The manufactures include iron and steel products, machinery, and implements. Its name was changed from Mansfield Valley to Carnegie in 1894. Natural gas, coal, and oil abound in the vicinity. Population, 1900, 7,330; in 1910, 10,009.

**CARNEGIE INSTITUTION**, an educational institution founded at Washington, D. C., by Andrew Carnegie, and incorporated Jan. 4, 1902. Its object is to promote higher study

and original research in any department of science, art, or literature, for which purpose it is designed to cooperate with learned societies, colleges, technical schools, governments, and universities. The founder donated \$10,000,000 to establish this institution, which is designed on a plan similar to that of the Smithsonian Institution. In 1907 he made an additional gift of \$2,000,000.

A board of trustees and ex-officio members of such a board were named for the Carnegie Institution by its founder. The ex-officio members are: The President of the United States, the president of the Senate, the speaker of the House of Representatives, the secretary of the Smithsonian Institution, and the president of the National Academy of Sciences. The trustees named originally were: John S. Billings, New York; Grover Cleveland, New Jersey; William H. Frew, Pennsylvania; Lyman J. Gage, Illinois; Daniel C. Gilman, Maryland; John Hay, District of Columbia; Abram S. Hewitt, New York; Henry L. Higginson, Massachusetts; Henry Hitchcock, Missouri; Charles L. Hutchinson, Illinois; William Lindsay, Kentucky; Seth Low, New York; Wayne MacVeagh, Pennsylvania; D. O. Mills, New York; S. Weir Mitchell, Pennsylvania; William W. Morrow, California; Elihu Root, New York; John C. Spooner, Wisconsin; Andrew D. White, New York; Edward D. White, Louisiana; Charles D. Walcott, District of Columbia; and Carroll D. Wright, District of Columbia. Jan. 29, 1902, the institution was duly organized, when Daniel C. Gilman was chosen chairman of the board of trustees and John S. Billings was named as secretary.

The object and administration of the Carnegie Institution are best set forth in the deed of gift, which contains the following:

First—To promote original research, paying great attention thereto as one of the most important of all departments.

Second—To discover the exceptional man in every department of study whenever and wherever found, inside or outside of schools, and enable him to make the work for which he seems specially designed his life work.

Third—To increase facilities for higher education.

Fourth—To increase the efficiency of universities and other institutions of learning throughout the country, by utilizing and adding to their existing facilities and aiding teachers in the various institutions for experimental and other work in these institutions as far as advisable.

Fifth—To enable such students as may find Washington the best point for their special



studies to enjoy the advantages of the museums, libraries, laboratories, observatory, meteorological, piscicultural, and forestry schools and kindred institutions of the several departments of the government.

Sixth—To insure the prompt publication and distribution of the results of scientific investigation, a field considered highly important.

**CARNELIAN** (kär-něl'yan), or **Cornelian**, a mineral of the chalcedony variety. It is found in various colors, usually reddish, but sometimes yellow, brown, or white. This mineral is widely distributed, especially in the region of Lake Superior, but the finest specimens are brought from India, where it is obtained chiefly in the vicinity of Cambay. It is used largely for ornaments and beautiful seals are engraved on it.

**CARNIVAL** (kär'nī-val), the festival week before the beginning of Lent. It is celebrated in Roman Catholic countries with much freedom and mirth, especially at Naples and Rome. In some of the American cities it is celebrated under the name of *Mardi Gras*. The cities of New Orleans and Mobile are especially enthusiastic in its observance.

**CARNIVORA** (kär-nīv'ō-rà), the name applied to animals which have teeth fitted for the mastication of animal matter and prey upon other animals. They possess short jaws, large jaw muscles, and teeth especially fitted for cutting and mincing flesh. The body is slender, thus giving advantage in securing prey, while the jaws differ greatly from the long jaws of herbivorous animals like the horse and ox, which require time to grind their less nutritious food. The stomach is simple and the alimentary canal is short, and the latter has only about three times the length of the body, while in herb-eating animals the alimentary canal is often from ten to thirty times the length of the body. The most important carnivorous animals include the lion, tiger, tapir, wolf, bear, leopard, skunk, coati, panther, puma, jaguar, raccoon, and walrus.

The carnivorous animals are well distributed in all the continents except Australia, where they are limited to the flesh-eating marsupials. They vary in size from the small and slender ermine to the large polar bear, which may weigh 2,000 pounds. The species native to tropical countries are the most numerous and carry on a constant warfare against man as well as the lower animals. The dog and the cat, though among the fiercest of this class, have been domesticated as pets.

**CARNIVOROUS PLANTS**, a class of plants which feed or subsist on small animals, especially insects. Many species are included in

this group and most of them occur in swamps where nitrogenous matter is scant, hence the advantage of feeding upon animal life. The Venus's flytrap, common to North Carolina, is a notable example. It has leaves divided into halves which close instantly, much like a trap, when minute hairs upon their surface are touched, and the entrapped insect is held until the digestible parts are assimilated, when the leaves open again. The pitcher plant (q. v.) is another notable example, and its numerous species are more or less widely distributed. It has hollow leaves in which water, made up partly of a secretion of the plant itself, comprises the trap, while a honeylike exudation lures the insects, and small hairs strike downward when touched and cause the insect to fall into the basin. The butterwort of Canada and the northern parts of the United States belongs to the carnivorous plant. Other familiar species are the sundews, and such plants as the petunia and tomato, whose leaves are frequently covered with insects, from which the plant is supposed to derive some nourishment.

**CAROB** (kär'ōb), or **Locust**, a tree native to the countries adjacent to the Mediterranean Sea. In size and appearance it resembles the apple tree, but is evergreen, with oval leaflets, and bears hornlike pods filled with a mealy pulp of agreeable taste and odor. The pulp is valuable as stock food, and is used to some extent as human food by the poorer classes. Carobs are often called *Saint John's bread* from the tradition that they are the locusts eaten by John the Baptist while he was in the wilderness. It is probable that they are the husks alluded to by Christ in the parable of the prodigal son. The tree is exceedingly productive, often yielding from 700 to 900 pounds in a season. The wood is useful in tanning, while the roots contain medical properties. It is not allied to the American locust. The Moors and Arabs cultivate it extensively. It is gaining a foothold in India, where it serves a useful purpose as a food article.

**CAROLINE ISLANDS**, a group of islands in the Pacific Ocean, lying north of New Guinea and east of the Philippines. The area is 570 square miles, and, including the Pelew group, 860 square miles. The archipelago consists of thirty-six groups of islands, the principal ones being the Pelew, Yap, Ponape, and a number of other island groups. About 525 islands are included in the archipelago. Of this number about 200 are in the Pelew group, of which Babel-Thaob is the largest, containing an area about as large as all the other groups



put together. Commercially, the most important of the entire group is Ponape, containing an area of 134 square miles. Most of the surface is fertile. The products include fruits, cereals, and coconuts, while excellent pasturage for horses and cattle abounds. Several of the islands are volcanic and rich in minerals, including quartz and limestone. However, the larger number are of coral formation. The natives belong to the Polynesian group, while the Europeans consist mostly of Germans, who control the trade and manufactures. Agriculture, stock raising, mining, and commerce are the chief occupations. The forests yield timber for cabinet work and various fruits used in making varnish.

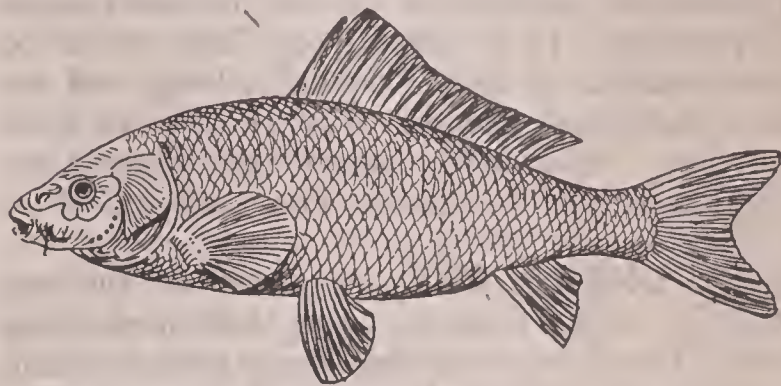
The Caroline Islands were discovered by the Portuguese in 1527 and were annexed to Spain in 1686. A dispute arose over the commercial relations between Germany and Spain in 1885, which was adjusted by the Pope under a joint agreement of the two nations; by which Spain retained control and Germany secured special trade advantages. The American representatives at the Paris convention, following the Spanish-American War, vainly endeavored to induce Spain to cede them to the United States. In 1899 Germany bought the islands from Spain for about \$4,000,000. They are now a German possession, with a local governor appointed by the emperor. Religious liberties are conceded to all inhabitants. Ponapé is the seat of government in the Eastern Carolines and Yap, in the Western Carolines. Population, 1907, 55,466.

**CAROLINGIANS** (kär-ô-lîn'jê-änz), the second dynasty of Frankish kings, so named from Charles Martel. This dynasty succeeded the Merovingians in 751, when Pepin the Short became king. He was a son of Charles Martel, who was mayor of the palace in the Frankish kingdom, and was succeeded by his sons, Carloman and Charlemagne, but the latter soon became sole ruler, in 771, and was succeeded by his son, Louis the Pious. The latter divided his empire into departments, each of which was presided over by one of his sons, and after his death, in 840, the great empire was divided. Charles the Bold, son of Louis the Pious, became king of the portion of the territory corresponding to modern France and is the founder of the French dynasty. He died in 877 and was succeeded by a number of princes until in 987, when Hugh Capet, founder of the Capetian dynasty, became King of France.

**CAROTID ARTERIES** (kâ-rôt'id), the name of two great arteries that serve to convey the blood from the aorta to the head and brain.

The common carotids are two arteries, one on each side of the neck. Each divides into an external and internal branch. The internal carotid supplies the eye and brain with blood, while the external carotid supplies the neck, face, and upper parts of the head.

**CARP** (kärp), a fish native to the fresh-water lakes and streams of Central Europe and corresponding latitudes in Asia. Owing to its



COMMON CARP.

value as an article of food, it has been extensively naturalized in many countries, and is cultivated in many parts of Canada and the United States. It has been transferred more extensively than any other fish, except, perhaps, the gold fish, and can subsist out of water longer than any other. Under careful feeding it attains a weight of three pounds when six years old, and often reaches a weight of eighteen pounds at maturity, while in Europe it has been known to weigh forty pounds. The fins are dark brown, and the body is yellowish beneath and olive brown above. Its food consists chiefly of aquatic plants, but it is fond of insects and worms. The carp is not a favorite game fish, as it is not a free biter, and is quite cunning in evading a net. Among the species are the *German*, *leather*, *golden*, and *crucian* carp. The leather carp has no scales.

**CARPATHIAN MOUNTAINS** (kär-pä'thī-an), a mountain range of Central Europe, extending a distance of about 875 miles from Pressburg on the Danube to Alt Orsova on the Rumanian frontier. They form two great masses, one in Hungary and one in Transylvania, the group lying almost entirely within Austria and Rumania. The culminating peak, Gerlsdorferspitze, has an altitude of 8,737 feet above sea level. These highlands consist of various chains and groups, including the Carpathians proper, the Little Carpathians, and the Transylvanian Alps. They are timbered to a height of nearly 5,000 feet, the lower portions with valuable walnut groves, and the higher with beech, cherry, and pine. The groups within Hungary are exceedingly rich in various minerals, especially limestone and iron. Many valleys



which produce fruits and cereals lie in different portions, while some parts are rocky, barren, and exceedingly precipitous. The only glacier within the region is on the northern declivity of Eisthal Peak.

**CARPEL** (kär'pěl), in botany, the name of the leaf forming the pistil, or one of the several parts of a compound pistil. See **Flower**.

**CARPENTARIA** (kär-pěn-târ'ĩ-à), **Gulf of**, an extensive indentation of the northern coast of Australia. It extends from Cape York to Cape Arnhem, is about 500 miles long, and incloses numerous islands. The shores are generally low. It was so named from Peter Carpenter, a Dutch navigator, who explored it in 1627.

**CARPENTER BEE**, an insect of the bee family, so called from its great skill in working wood. The insects of this class include some of the true bees, and most of them inhabit countries that have a warm climate. Several species are common to America and Europe, some of which are as large as the bumblebee. These insects cut a longitudinal hole or tunnel, about a foot long and a third of an inch wide, usually in dry trees, and in these they lay their eggs and store honey.

**CARPENTRY**, the art or calling of framing timber for architectural and other purposes. The term is properly applied to framing heavy work, such as sills, flooring, roofs, and partitions. The art of doing the ornamental work is called *joining*, but commonly the workman in either line is called a carpenter. The tools of a carpenter include saws, planes, gouges, mortise chisels, squares, bevels, augers, brad awls, and many others. Carpentry has been greatly changed by the introduction of labor-saving machinery. Much of the material for building is now bought in a prepared form at planing mills and at blind, sash, and other factories. Doors, stair railings, windows, ornamental trimmings, and many other parts are secured in complete form, instead of being made by hand as formerly. This is the natural result of employing improved machinery in cutting timber, which has likewise caused a saving in the cost of transportation to long distances from the sawmills located in forests or at points reached by rafting logs in streams. Formerly the carpenter cut the shingles with a hatchet from the block, now mills cut them by the thousands, or the wooden forms have been displaced by stone, slate, or metallic products. Paper is now used to a large extent in walls and asbestos is employed for deadening sound, while steel and iron are displacing the wooden and brick frames of former times. The general diversity of orna-

mentation has caused the invention of a large variety of machines, which have simplified the work in some lines, but, on the other hand, require greater skill in others.

**CARPET** (kär'pět), the name of a kind of felted or woven fabric, generally made of wool, used as a covering for floors and chambers, or for spreading on staircases and on the ground. The use of rugs was common in ancient Babylon, Egypt, China, and India. Carpet making has been an important industry in Persia, Turkey, India, and many portions of Eurasia for centuries, and many laborers are engaged at present in its production. The use of carpets was introduced into Western Europe at the time of the Crusades, but, even in the time of Queen Elizabeth, the floors of palaces and residences were strewn with rushes. The practice of decorating walls with tapestry and cloth is much older than the carpeting of floors. For several centuries, particularly in the time of Thomas Wolsey, the walls were covered with tapestry while the floors were bare. The manufacture of carpets was introduced in Germany and France about 1606, and in England by the French in 1750. Wool is the principal article used in the manufacture, though hemp and vegetable matting are employed extensively.

Among the different grades of carpet are the varieties known as *Brussels*, *Venetian*, *Dutch*, *Wilton*, *Axminster*, *Chinese*, and *tapestry*. Axminster carpet is on the style of the Turkish, in one piece, the patterns consisting mostly of curved and angular strips, containing tufts of colored worsted designs and decorations in various colors. Brussels carpet was first made at Brussels, Belgium, but is now manufactured extensively in all countries. It is woven on a loom carrying a shuttle which raises portions of colored yarn to the surface, and the linen basis is concealed by the worsted, which is drawn through the reticulation and looped over wires, which are afterward withdrawn, thus giving the surface a ribbed appearance. The machinery used in manufacturing Brussels carpet is very complex. Wilton carpet is made similarly to the Brussels, but, instead of being drawn out, the loops are liberated by passing a sharp knife into the grooves, thus producing a velvet pile surface instead of looped threads.

Felt carpet is made by printing colors on felt. Hemp carpet is used in the more inferior buildings and stairways. Many offices and chambers are now furnished with a carpet made of matting in which a vegetable growth from the South Seas is utilized, while others are decorated with a class of oilcloth. Philadelphia is one of the most extensive carpet producing cities in the



world. The largest output of carpets in the United States is in the east central states, while the finest rugs are made in Western Asia. As a whole, the United States takes the first rank in the production of carpets; Canada, second; Germany, third; and France, fourth.

**CARPETBAGGERS** (-bäg-gērz), the name applied to a class of northern people who settled in the Southern States after the close of the Civil War with the view of controlling the political affairs in that section of the United States. It was first used in reference to the northern politicians who had an ambition to become members of Congress, hence these men removed to the Southern States. They were called carpetbaggers from the circumstance that many of them brought only their wearing apparel in baggage. The term is now applied to all of the northern adventurers who sought political influence during the reconstruction period, from 1865 until 1876. At that time many of the leading white citizens were not permitted to vote, and the county, district, and State politics were controlled by carpetbaggers, who were assisted by the Negroes. This régime, known as *carpetbag government*, was extravagant and plunged many of the states into debt.

**CARPET BEETLE**, a small bug or moth which infests houses and preys upon carpets and other cotton and woolen fabrics. It was not known in America until 1872, when it was first noticed in New York and in Southern Canada, and since it has become widely distributed. The adult is about one-seventh of an inch long, has scales of red and black, and is marked with white spots. The larvae are hairy grubs and attack the edges of carpets, especially at the seams and where furniture is placed, while the adults feed on the pollen of flowers and other parts of plants. Naphtha balls, fumes of carbon bisulphide, and kerosene are protection against these pests in their early stages.

**CARRARA** (kä-rä'ra), a city of Italy, in the province of Massa e Carrara, sixty miles southwest of Modena. It is located on the Avenza River, three miles from the Mediterranean, and is surrounded by hills famed for their white marble. The chief buildings include the churches of the Madonna and of Saint Andrea, and in the city are fine statues of Rossi, Mazzini, and Garibaldi. It has a fine museum and an academy of sculpture founded by Napoleon. The Carrara quarries have been worked since an early period in Roman history, and at present there are more than 600 quarries in the vicinity of the city. Most of the product is transported via Avenza, a small port on the

Mediterranean, but many sculptors come here to save expense in transporting the marble. Population, 1906, 21,560.

**CARRIAGE** (kär'rij), a name generally applied to all structures employed to transport merchandise and passengers. In the United States the name refers particularly to wheeled vehicles for carrying persons to distinguish them from those used for transporting goods. It is especially applied to an elegant conveyance, partly or wholly enclosed, with seats for two or more persons and drawn by one or more horses. The term is loosely applied to such vehicles as top buggies, broughams, and phaetons. In Great Britain the term is applied to railway cars and often preceded by the name designating the class, as first-class or second-class carriage.

The most ancient conveniences for transportation were, no doubt, by riding animals, as camels, elephants, and horses. We learn that Pharaoh gave Joseph second place in Egypt and "he made him ride in the second chariot which he had," and later wagons were sent to convey Jacob and his family to Egypt. Chariots were generally used by rulers and warlike leaders in Egypt, while in Rome they were employed for general use. The Roman carriages were richly ornamented, some drawn by two and others by four horses. In the Olympic games of Greece the chariot was a necessary supply. The condition of the roads had a material modification on early vehicles. The celebrated Appian Way, constructed in Rome in 331 B. C., and many other thoroughfares, were especially fitted for the use of chariots. Covered carriages came into use in the 16th century, at first among the nobles, but later were generally adopted as conveyances by all classes of citizens. Their use was greatly opposed by the owners of boats and the carriers of sedan chairs. In some cases the sovereigns were induced to forbid their employment by the citizens and their wives, of which the ordinance of Philip the Fair, in 1294, is a notable instance. In 1550 there were only three carriages in Paris, the noblemen and citizens riding mostly on horseback. They came into general use in Germany as early as 1613. Hackney coaches were introduced in London in 1625.

The early vehicles were extremely rude, particularly the heavy wagons used for transports. Many had rude axles with wooden wheels cut from large logs, and in this respect were similar to those now rarely used in Mexico. At the beginning of the 18th century the body of carriages was suspended by leather straps. In 1804 an Englishman, Obadiah Elliott, invented the oval springs which are in common use at



present. The general forms of carriages now used in Western Europe are similar to those seen in Canada and the United States, but many have been modified or improved. The *buckboard*, *sulky*, *rockaway*, and *buggy* are distinctly American vehicles. The *jinrikisha* is a two-wheeled cart pulled by a man, and is commonly used in Japan and Eastern Asia. Among the newer means of conveyance are the bicycle and automobile, which are extensively used in many countries. See **Automobile**, **Bicycle**, etc.

**CARRIER** (kă'rĭ-ēr), a person or company that undertakes to carry or makes a business of carrying persons or goods for a consideration. Two classes of carriers are recognized—*private carriers* and *common carriers*. Private carriers are persons who undertake to transport the goods of others who may choose to employ them, yet they do not enter into the employ of the public generally. A private carrier incurs no responsibility beyond that of ordinary diligence. Common carriers are persons or companies who engage to carry goods for the general public in consideration of a suitable compensation. They are required to provide safe and suitable conveyance, and are not exempt from responsibility, even if interfered with by ice, snow, fire, or other natural causes. They are responsible for all losses, except from the act of an enemy in times of war or the default of shippers.

In many cases the responsibility of common carriers is limited or modified by special contract, but under the general law they cannot free themselves wholly nor escape the duty of reasonable diligence. The common carrier is responsible for the acts of all his agents, must deliver commodities in as good condition as received, may refuse to accept goods not properly prepared for shipment, and may demand transportation charges in advance. In cases where charges are payable at the end of the route, the goods may be held until payment is made, and, if entirely neglected, the goods may be sold to cover a part or all of the transportation charges and storage. In making shipments the sender need not disclose the contents of his package unless requested to do so by the carrier. If the sender misrepresents the value or character of the goods, the carrier is not liable in case they are stolen. Railroad, hack, steamboat, and street railway companies are common carriers.

**CARRIER PIGEON**, a name applied to a species of pigeon used for conveying letters from any place to their home, now generally called *homing pigeon*. The common carrier pigeon is a large bird with naked skin at the

base of the beak and long wings, and has a circle of naked skin around the eyes. It is thought that the Chinese were the first to make use of pigeons in this way, but the oldest instance on record is that of the 16th century B. C., when Joshua invaded Palestine and employed this mode of communication between the camps on different sides of the Jordan. The Greek lyric poet Anacreon mentioned the use of carrier pigeons in the year 500 B. C. Pliny the Elder called attention to the value of homing pigeons in several sieges conducted by the Roman army. In the siege of Paris by the German army, in 1870-71, fully 150,000 official messages were carried into the city by means of pigeons. Various uses of trained carrier pigeons constitute a national game in Belgium and Holland, and they are kept for pleasure and military purposes in many European countries.



CARRIER PIGEON.

A pigeon flies about thirty miles an hour under favorable circumstances, and is successfully used for distances from 200 to 500 miles, though there are cases on record in which they have been used for more than 1,000 miles. The homing faculty or instinct enables them to find their way home from surprising distances, and upon this virtue depends the value of these birds. Pigeons are trained for service by taking them a short distance from home and setting them free, gradually increasing the distance from time to time. By successive experiments the tendency to seek their former place of habitation is gradually developed, until finally they can be depended on to return from long distances. One of the best records ever made was by an American homing pigeon, which flew 1,040 miles without stopping. In the East, where the custom is general, the birds' feet are washed in vinegar to induce them not to alight in quest



of water and to keep them cool. The message sent is microscopic. It is rolled in a goose quill, which is tied to a wing feather or a leg, though long-hand writing is frequently used for short distances.

**CARROT** (kär'rüt), a plant cultivated for its root, belonging to the parsley family. It is a biennial plant. In the wild state the root is white, while the domesticated carrot is of a yellow or reddish color. The root differs somewhat in the numerous species, but is generally long and tapering and matures on the approach of cool weather. The seed is sown in beds early in the spring, usually in rows about one foot apart, and the plants are afterward thinned. Carrots are used chiefly in soups and stews, especially in America, and in many European countries they are cultivated as feed for cows. They yield at the rate of 500 to 1,200 bushels per acre, and produce an excellent quality of butter with a bright color. The carrot is used in Canada and the United States for adulterating coffee, and in America and Europe more or less extensively as an article of food.

**CARSON CITY**, the capital of Nevada, county seat of Ormsby County, thirty miles south of Reno, on the Virginia and Truckee Railroad. It is located near the base of the Sierra Nevada Mountains, in a district which is rich in gold and silver deposits, about twelve miles from Lake Tahoe. The chief buildings include the capitol, the county courthouse, the United States mint, and the Federal building. It has extensive railroad shops, lumbering interests, and grain elevators. The city was founded in 1858 and became the capital of Nevada in 1861. It was incorporated in 1875. Population, 1900, 2,100; in 1910, 2,466.

**CARSON RIVER**, a stream in Nevada, rises in the Sierra Nevada Mountains, and after a course of about 150 miles flows into Carson Lake. Its general direction is toward the northeast, passing a short distance south of Carson City, and a branch of it in the lower course flows into Carson Sink. Carson Lake has no visible outlet. The water from this stream is used in the Truckee-Carson irrigation system. See **Irrigation**.

**CART**, a vehicle with two wheels, usually without a top, and fitted to be drawn by one horse. Heavy carts have no springs and are employed in hauling heavy freight or rocks, while vehicles of light construction are used in driving. The latter are supplied with springs and frequently with a top or canopy. The one-horse cart is employed extensively in Europe for draying, usually in the form of a dump cart, from which the load may be removed by

tilting the body of the vehicle. A dogcart is constructed so the frame may be adjusted to balance the load, and a trotting sulky is used in horse racing. The gig is a two-wheeled cart with a single seat. In the calash, used more or less in Canada, the driver has a low seat in the front. Carts with wheels made of cuts from logs are used extensively in Central America and the West Indies.

**CARTAGENA** (kär-tä-jě'nà), or **Carthage**, a city of Colombia, on the Caribbean Sea, capital of the state of Bolivar. It is located on a peninsula and has a fine harbor, but the low coast makes it unhealthful to Europeans. The chief buildings include those of the government, a college, a cathedral, a seminary, and several churches. Among the manufactures are candles, clothing, and chocolate. It has a large export trade in tobacco, cattle, coffee, rubber, and precious stones, and imports merchandise and machinery. The city was founded in 1533 and was captured by Spain in the revolution of 1815. Population, 1906, 19,380.

**CARTAGENA**, a seaport in Spain, on the Mediterranean Sea, about twenty-eight miles southeast of Murcia. It is an important naval and military station, and its harbor is one of the safest and largest on the Spanish seacoast. It has manufactures of glass, cordage, wine, and machinery, and exports of iron ore, lead, esparto grass, and fruits. The chief features are the arsenal, the Presidio, the Hospital Militar, a Gothic cathedral, several hospitals, and a number of schools. It has steam and electric railways, waterworks, stone pavements, and systems of gas and electric lighting. Cartagena was founded by Hasdrubal about 243 B. C. and was named New Carthage. In 210 B. C. it was conquered by Scipio Africanus and made an important Roman city. The Goths ruined it, but in the time of Philip II. its importance was revived. Population, 1905, 106,150.

**CARTAGO** (kär-tä'gõ), a town of Costa Rica, capital of a province of the same name, fourteen miles southeast of San José. It has railroad connections with the principal cities of Central America and a brisk trade in coffee and fruit. An earthquake destroyed many of its buildings in the latter part of the 19th century and civil wars caused it to decline. Population, 1906, 5,502.

**CARTHAGE** (kär'thâj), a city in Missouri, county seat of Jasper County, on Spring River, fifty-eight miles west of Springfield. It is on the Saint Louis and San Francisco, the Missouri Pacific, and other railroads, and is surrounded by a coal, lead, zinc, and cobalt producing region. The chief buildings include the



county courthouse, the public library, and Carthage College. It has manufactures of plows, windmills, furniture, artificial ice, clothing, and machinery. Among the municipal improvements are sewerage, waterworks, pavements, and gas and electric lighting. On July 5, 1861, it was the scene of a battle between the Union army under General Sigel with 1,500 and the Confederates under General Price and Governor Jackson with 3,500 men. The battle resulted in a retreat of Sigel's army. Carthage was settled in 1833 and was incorporated in 1873. Population, 1910, 9,483.

**CARTHAGE** (kär'thīj), the most celebrated Phoenician colony, founded by Queen Dido about 880 B. C., who came thither with a body of aristocrats, fleeing from the democratic party of Tyre. It was located in Africa, occupying a portion of the region now included in Tunis. Queen Dido fled from Tyre after the murder of her husband. She built up a colony around which great commercial interests centered, and the city of Carthage rose to vast importance among the ancient cities in Northern Africa. The population of the city before the time of its destruction was about 700,000. It was built on a peninsula about three miles wide, across which was constructed a triple wall with lofty towers. Every side of the city was defended by a wall. The Punic traders brought immense wealth, thus resulting in the construction of massive buildings and in lavishing them with magnificent adornments. A double harbor served for merchants' ships and for the navy. The admiral's palace occupied a lofty island in the center of the inner harbor. At the time of its greatest prosperity Carthage occupied a site twenty-three miles in circumference, with a population probably greater than that of ancient Rome. Its navy was the largest in the world; at the time Regulus made his famous attack on Carthage it consisted of 350 vessels and 150,000 men.

The Carthaginians conquered Sardinia in the 6th century B. C. and entered upon a war for the possession of Sicily. They founded colonies on the western coast of Africa, contended for the possession of the Strait of Gibraltar, and invaded Spain and Gaul. The history of this powerful nation is divided into three epochs for convenience in study. The first extends from its foundation to 410 B. C., and includes the rise and development of national power. The second extends from 410 to 265 B. C., and embraces the period of wars with Greece and Sicily. The third epoch embraces the period from 265 to 146 B. C., and includes the wars with Rome, ending with its fall and destruction. In the

first period colonization was widely extended and treaties were made with other powers. Among the most famous were those concluded with Rome in 509 B. C., in 348, and in 306. Its people were noted for their interests in commercial enterprises and the early wars were but the natural result of an extending commerce and colonization. The first Punic War extended over twenty-three years, from 264 to 241. It was a period of contention for the occupation of Sicily and resulted in the expulsion of the Carthaginians from the island. What Carthage lost in Sicily was more than regained, by the conquest of Spain under the skillful military achievements of General Hamilcar and his son-in-law, Hasdrubal.

After the death of these two distinguished generals, Hannibal, the son of Hamilcar, took charge of the army and rose to eminence, establishing for himself a place among the most noted generals of the world. He organized the forces of Carthage in Spain and entered upon the second Punic War in the year 218 B. C., when he crossed the Alps with a powerful army and proceeded into Italy. His successes astounded the world, routing the best soldiers of Rome and gaining victories at Lake Trasimeno, Trebbia, and Cannae. For seventeen years he harassed Rome and brought it to the verge of ruin. After the Battle of Cannae, he sent a bushel of gold rings to Carthage, the ornaments of Roman knights. One-fifth of the Roman populace able to bear arms had fallen within eighteen months, while Capua, the second city of importance, joined Hannibal. In the hour of peril the Roman spirit rose and Hannibal's victories began to ebb. He was recalled to defend his own city, where he was defeated by Scipio in the Battle of Zama in 202 B. C.

Peace was concluded between the two nations, but the power of Carthage was broken, never again to rise to its former height. Although the nation began to recover its importance in commerce, a party at Rome was bent upon its destruction. The third Punic War began in 150 and ended in 146 B. C., in which Rome was the aggressor. The Carthaginians surrendered their arms, but when bidden to leave the city to be razed they were driven to desperation. They melted their gold and silver vases and their metallic statues to forge them into new weapons. The long hair of the women was made into bowstrings, and all available material was used to contest every inch of the city against the Romans. The younger Scipio led the siege and after a desperate struggle captured Carthage. Though the city had flourished



more than 700 years, it was utterly razed to the ground. The territory was turned into a Roman province and became one of the chief possessions of the Roman Empire. The Vandal kings of Africa made it their capital in the 5th century A. D. and at the end of the 7th century it was destroyed by the Arabs.

Very little is known of the laws, life, and customs of the people of Carthage. Both its constitution and history are obscure in many respects. It is known that no ancient people rivaled it in colonization and competition for trade. There is no fragment of a Punic orator, historian, philosopher, or poet to make known the events that characterized this wonderful people. Carthage is better understood from its wars than from the achievements in education, art, and industry. It is known that the Carthaginians descended from Phoenician ancestors and, like them, worshiped Moloch and Baal, to whom human sacrifices were offered. The sun was the highest natural manifestation of this deity, but they also worshiped the Tyrian Hercules and a variety of heroes, heroines, and spirits, such as the goddess of the elements and the genius of death. The language was similar to that spoken by the Asiatic Phoenicians, from whom they were descendants.

**CARTHUSIANS** (kär-thū'zhanz), a monastic order of the Catholic Church, founded by Saint Bruno of Cologne in 1084. It was so named from La Chartreuse, France, where the first hermitages were built. The order was approved by the Pope in 1170, and the name was corrupted into Charter Houses in England, where the first monasteries of this order were built in 1180. The rules of living are very austere, and the members are divided into monks and lay brothers. They abstain from eating flesh, are required to perform manual labor, wear coarse clothing, and take a vow of continual silence. The wine known as *chartreuse* was originated by them and from its manufacture they derive some revenue. Formerly this order had a large membership in Central Europe, but their austerity caused them to decline, and at present there is only one monastery in England, the one located near Brighton.

**CARTILAGE** (kär'tī-lāj), or **Gristle**, an elastic substance or texture occurring in vertebrate animals. There are two forms, the *temporary* and the *permanent*. The former is present in place of bone in very early life and later changes to bone by ossification; the permanent cartilage retains its cartilaginous character. Temporary cartilage is found at the ends of bones, where they enter into the formation of joints. The permanent cartilage consists of

the *articular* and the *membraniform*. The former is found at the joints and the latter in the walls of cavities, as the nose, external ear, and larynx.

**CARTOON** (kär-tōon'), a term now generally applied to pictorial sketches published in newspapers and magazines. They are intended to convey a vivid or exaggerated view of some important event or notable character. The term is applied in painting to designs drawn on paper, intended for models in transferring the figures to the fresh plaster of a wall. The most celebrated cartoons were painted by Raphael for the tapestries of the Vatican. Originally there were twenty-five of these famous paintings, but only seven are now extant. They are in the South Kensington Museum, London, and include representations of "The Death of Ananias," "Paul Preaching at Athens," and "The Miraculous Draught of Fishes."

**CARTRIDGE** (kär'trij), a case of metal, flannel, paper, or parchment containing an exact charge of powder and bullet, and fitting the bore of a gun. A *blank cartridge* contains only the powder. A cartridge filled with dynamite or other explosive is used in blasting. In breech-loading guns the cartridge case is metallic, or contains a metallic rim. A percussion cap is in the center base, or on the inner rim. Solid brass cartridges can be reloaded and used an indefinite number of times.

**CARVING** (kärv'ing), a kind of sculpture, usually done by cutting on ivory or wood. This art was practiced by the Assyrians and Babylonians, who carved in ivory and associated with it the practice of engraving in gems. Ivory was used largely for carving among the Grecians, especially in making the statues of the gods, in which the solid material was overlaid with plates of ivory. The art of wood carving came into extensive use during the early Christian period, and it was long a popular form of decorating the churches of Central Europe, especially in Germany. Among the famous carvers may be mentioned Albert Dürer, Hans Bruggemann, and Hans Schwartz of Augsburg. The churches in which famous carvings are well preserved include those of Nuremberg, Altenberg, and Erfurt. The carvings in some of the Lutheran churches are very elaborate, including scenes in the lives of Christ and the saints.

**CASCADE MOUNTAINS** (käs-kād'), a range of western highlands, forming the northern extension of the Sierra Nevada of California, and trending through Oregon, Washington, and British Columbia. Their direction



is nearly north and south, and the distance from the Pacific coast averages about one hundred miles. The Cascades are of volcanic origin, though they are more recent than the Rocky Mountains. They are covered with fine forests of valuable timber. The lava cast up by volcanic action through the fissures and craters is deposited over an area of about 200,000 square miles, and in many places it forms a coat fully 2,000 feet thick. The surface is formed largely of decomposing lava, but it is very fertile and whitish in color, and furnishes good soil for grazing and agriculture. There are productive deposits of coal, copper, nickel, and platinum, and small quantities of silver and gold. West of these mountains, in the State of Oregon, is the fertile valley of the Willamette, and in Washington is a corresponding valley drained by the Chehalis and Cowlitz rivers. Among the most noted peaks are Pitt, elevation 9,820 feet; Jefferson, 10,200 feet; Hood, 11,225 feet; Baker, 10,700 feet; Saint Helen's, 12,000 feet; and Rainier (Tacoma), 14,450 feet.

**CASCADE TUNNEL**, an excavation through the Cascade Mountains, in Montana, constructed by the Great Northern Railway Company. It is sixteen feet wide, twenty-two feet high, and 13,413 feet long, about two and one-half miles. The excavations were difficult on account of much water and large boulders being in its course. It is lined almost exclusively with solid work of concrete, and comprises one of the notable engineering works of America.

**CASCARILLA** (kās-kā-rī'lā), the bark of a small tree or shrub native to the West Indies and the Bahama Islands. It has a spicy, bitter taste, and is used in medicine as a tonic to aid digestion. *Cascarillin* is an essential oil obtained from the bark, which also yields a resinous product used in medicine.

**CASCO BAY** (kās'kō), an inlet of the coast of Maine, between Cape Small Point and Cape Elizabeth. The shore is about twenty miles long, and at the western extremity is the city of Portland. Within the bay are about 300 small islands, most of which are fertile and are occupied by fishermen and summer residents.

**CASE**, in grammar, that form or use of a noun or pronoun by which its relation to other words in a sentence is denoted. Formerly the English language possessed inflections to indicate five different cases. At present the language contains only three cases, the *nominative*, *possessive*, and *objective*, though some writers include the *absolute*. The possessive form of nouns is the only case that is marked by inflections. In French, Spanish, Portuguese, and

Italian the nouns have no inflections. The *nominative*, *dative*, *genitive*, and *accusative* are the cases in German grammar, while the Sanskrit has eight cases.

**CASEIN** (kā'sē-īn), the principal nitrogenous portion of milk. It is soluble in alkali, coagulates by animal membranes, and dries in a yellow mass. Casein is the principal constituent of cheese. Vegetable casein or *legumin* is a similar substance occurring in peas, beans, and the seeds of several other vegetables. Casein consists essentially of 0.8 parts of sulphur; 7.1 of hydrogen; 15.7 of nitrogen; 22.5 of oxygen; and 53.9 of carbon.

**CASHEW** (kā-shōō'), a tree native to the West Indies, related to the sumach and poison ivy. It is about sixteen feet high, has evergreen leaves, and bears kidney-shaped fruit, the cashew nuts of commerce. These nuts yield a sweet oil resembling olive oil, which is used to flavor wine and other liquids. The nuts are borne upon fleshy stalks, sometimes called the cashew apple, and these stalks are free from acidity. They are edible and have a pleasant, acid flavor.

**CASHMERE** (kāsh-mēr'), or Kashmir, an extensive principality in the northwestern part of Hindustan, governed by a Sikh ruler, but politically subject to British India, of which it forms a part. The districts included in it are Baltistan, Jammu, Ladakh, Cashmere, and a number of other minor divisions. It has an area of 80,500 square miles. The district including Cashmere proper is inclosed by the Hindu-Kush and Himalaya mountains and is drained by the Jhelum River. It is celebrated in history and literature for its excellent climate and beautiful scenery. The mountains surrounding it attain a height of 7,000 to 12,000 feet, among which are many fertile valleys, and the lower regions are covered with beautiful and valuable forests. The soil produces cereals and fruits, while the mountains yield iron, plumbago, sulphur, limestone, and cobalt. In many places both thermal and mineral springs abound. The wolf, ibex, bear, leopard, and chamois are among the animals inhabiting the district.

The inhabitants belong chiefly to the Mohammedan religion, but include a considerable number of Brahmans. They engage largely in agriculture and the manufacture of ironware, baskets, furniture, and cashmere shawls. These shawls are made of the down common to the animals of the region, which surpasses in fineness and length the merino wool, and is obtained from the wild sheep, yak, and cashmere goat. The manufacture of a shawl of the best



grade requires several weeks. This work is done mostly by women and girls. A number of different dialects are spoken. The people are strongly developed physically and are among the most intelligent and progressive of the Hindu races. Srinagar, or Cashmere, is the capital and largest town and the summer residence of the Maharajah. Population, 1906, 2,928,620.

**CASHMERE GOAT**, a kind of goat native to Asia, valuable for its long, silky hair. The best grade of this animal is obtained in Tibet and Cashmere, and it has been acclimated and is reared in all of the continents. It has nutritious flesh and gives rich milk, but is grown chiefly for its fleece. The hair is longer than that of the Angora goat, about eighteen inches in length, and a single goat does not yield more than seven or eight ounces of the down, beyond which extend the long hairs. It requires the fleeces of about ten goats to manufacture a shawl a yard and a half square. The male of the cashmere goat has large horns.

**CASH REGISTER**, a mechanical device used in stores and shops to record the cash received for goods sold. It is in general use in retail stores and in some of the larger shops and bazaars. This machine consists of a metallic box, supplied with a keyboard similar to that of a typewriter, each key being attached to a bar which registers the amount of the purchase and exhibits a tablet, showing the amount of the sale both to the customer and to the salesman. Amounts larger than those that can be shown by the machine are registered by pressing two or more keys in succession. A roll of paper within the machine is moved continuously by a system of wheels, and at the close of the day the various amounts recorded can be added to determine the total sales made at the store or in a certain department. The salesmen place the cash received in a drawer, and the total must agree with the sum of all the sales as recorded on the roll of paper, which is secured by a lock and key.

**CASPIAN SEA** (käs'pī-an), an inland sea or lake in Eurasia, the largest in the world, having a breadth of 200 miles and a length from north to south of about 700 miles, with an estimated surface of 170,000 square miles. It is located on the boundary between Europe and Asia. On the eastern coast are a number of large bays. The western coast is more or less modified by the Caucasus Mountains; the southern, by the Elburz Mountains, and the northern and eastern, by the Kirghiz Steppe. A portion of the land north of the Caspian is below sea level, while the surface of the sea itself is

97 feet below the Black Sea and 250 feet below the surface of the Aral Sea. It is thought that the three lakes were once a common sea, which is demonstrated, apparently, by the fact that the water is still diminishing, and appears formerly to have covered a large portion of the adjacent steppes.

The Caspian Sea has no visible outlet to the sea. Its water is salty, though not as salty as that of the ocean. Among the rivers that flow into it are the Ural, the Terek, the Emba, and the Volga, the last mentioned being the largest river in Europe. Through the middle of the sea is a submarine ridge formed by a continuation of the Caucasus Mountains, which divides it into north and south basins. The greatest depth of the northern basin is 2,525 feet and of the southern, 3,250 feet, though both contain shallows that render navigation dangerous. It has salmon, sturgeon, and other valuable fisheries. It is the seat of a vast commerce. The most important ports on its coast are Astrakhan, Baku, Petrovsk, Derbend, and Krasnovodsk. A large number of railroads extend from it in all directions, and it is connected with many navigable rivers and canals. Among the important canals are those connecting the headwaters of the Volga with the Schlina and Tvertza rivers, by which the Baltic Sea is united with the Caspian. Russia has a number of fortifications on its coast and maintains a strong fleet and steamship lines for trading purposes. The sea is not affected by ebb or flood tides.

**CASSEL** (käs'sel), or **Kassel**, a city of Germany, capital of Hesse-Nassau, ninety miles northeast of Frankfort-on-the-Main. It is pleasantly situated on both sides of the Fulda River, has important railway and electric line connections, and is the seat of extensive manufactures of ironware, locomotives, machinery, and scientific instruments. The public institutions include two gymnasia, several high schools, and a number of hospitals and charitable institutions. It has a large trade in merchandise and manufactured products. The city operates and owns the gas works, a slaughterhouse, and an electric-light plant. A short distance west of the city is the Palace of Wilhelmshöhe, erected in the 18th century, in which Napoleon III. was imprisoned at the close of the Franco-Prussian War.

Königsstrasse is the principal street, which is beautifully paved, and near the center is the famous Königsplatz. Friedrichsplatz, one of the largest squares in Germany, is in the center of a large number of famous buildings, including the Electoral Palace and the Museum Frid-



ericanum. The latter contains the provincial library of 170,000 volumes, of which the Grimm brothers were librarians from 1814 to 1830. In this library is the valuable poetic production known as *Hildebrandslied*, dating from the 9th century. The art gallery, constructed of red sandstone, is one of the finest buildings in the city, and contains a collection of paintings gathered by Langrave William VIII. The city was anciently known as Chassala. In the Seven Years' War it was captured by the French, and became the capital of the kingdom of Westphalia in 1807. It was occupied by the Prussian troops in 1866 and made a part of the kingdom of Prussia. Its modern prosperity is due largely to its material development in manufacturing and wholesaling. Population, 1905, 120,467.

**CASSIA** (kăsh'ă), a genus of plants of the pea family, including herbs, shrubs, and trees. Several species are known for their leaves, which, when dried, constitute the drug called *senna*. These plants are native to Africa and Asia, but an American species quite similar has the cathartic properties of *senna* in a mild form. The *cassia fistula*, a tree native to Egypt and India, yields the purging cassia, which contains considerable sugar and is used in making laxative conserves. The familiar *cassia bark*, or *cassia wood*, is derived from a tree of the laurel family, and is sold in the market as a cheap grade of cinnamon. It is obtained in large quantities from China. The fragrant bark mentioned in the Bible is supposed to be the cassia bark.

**CASSIMERE** (kăs'si-mēr), a word derived from the cashmere manufactured in the Himalayas from the fine wool of the cashmere goat. It is applied to a dress fabric made of soft, fine wool. Cashmere is made into shawls, but the cassimere of European and American manufacture is used largely for men's wear.

**CASSINO** (kăs-sē'nō), a game played with a full pack of cards, by two or more persons. Each of the players receives four cards, dealt in succession, and four are laid on the center of the table with the face turned up. To secure a full understanding of the game, it is necessary to consult the rules. In one variation of *cassino*, the jack, queen, and king are treated as pit cards, that is as if they had eleven, twelve, and thirteen spots. The game consists of scoring the highest number of points, usually twenty-one, hence several deals are required for one game. The points that count one each are: each ace, the two of spades, the greatest number of spades held by an individual player, and a *sweep* (which signifies that a player can

take all the cards from the table except in the last hand); the ten of diamonds counts two; and the greatest number of cards held by an individual player counts three, making a total of twelve points to each deal. The two-spot of spades is known as *Little Cassino* and the ten-spot of diamonds is called *Big Cassino*.

**CASSIQUIARI** (kăs-sē-kē-ä'rē), a river of southern Venezuela, which unites the Orinoco with the Rio Negro. At the point where it issues from the Orinoco it is 300 yards wide, and it gradually increases in breadth until it reaches the Rio Negro, where it has a width of 600 yards. This remarkable river connects the Amazon River with the Orinoco and furnishes a passage for vessels between the two great river systems.

**CASSOWARY** (kăs'sō-wā-rÿ), a bird allied to the ostrich and the emu. It differs from the ostrich in having shorter wings, a bony crest,



CASSOWARY.

and wattles on the naked neck. It is native to New Guinea, the Moluccas, and many other Asiatic islands. The cassowary is distinguished from the emu by various characteristics, and possesses points of similarity with the moa and other extinct birds. Its wings are unfitted for flight, owing to their shortness, while its legs are powerful and well designed for swiftness. The feathers resemble pendant hair, the color is brownish-black, and the neck is naked, with the upper parts of a bluish color. The eggs are laid on the sand, where they are hatched by the sun. The flesh is juiceless, tough, and black. It is rarely eaten, except by the natives. Its food consists of leaves, seeds, and fruits.

**CAST**, an impression made by pouring a duc-



tile substance like plaster of Paris into a mold. The substance hardens on cooling and when taken out retains the form of the mold. Casts are of value in studying art, especially since the works of great masters cannot be seen by all. Many of the finest figures of antique art have been cast. These casts constitute the larger part of many museums.

**CASTALIA** (kās-tā'li-à), a fountain famous in the history of ancient Greece. It is located at the foot of Mount Parnassus, near the temple of Apollo, sacred to Apollo and the muses. The Pythia used to bathe in its waters before delivering the oracles of the gods. It was regarded as a source of inspiration for the poets and was so named from Castalia, the daughter of Achelous. It is now called the fountain of Saint John.

**CASTE** (kást), the artificial division of society on the basis of wealth, heredity, and other conditions. The caste system reaches its culmination in India, where society is divided into many classes. The principal castes include the *Brahmans*, *Kshatruyas*, *Vaisyas*, and *Sudras*, besides the *Pariahs*, or *outcasts*, who are regarded as of no caste. These castes are again divided into subcastes, the object being to make position or employment hereditary. See **India**, **Buddhism**, **Brahmanism**, etc.

**CASTELLAMARE** (kās-těl-là-mä'rà), a city and seaport of Italy, in the province of Naples, sixteen miles southeast of Naples. It is important as a railway and commercial center, and the surrounding country is noted for its beautiful springs and healthful climate. A fine cathedral, a royal palace, a military hospital, and several convents are among the chief buildings. The manufactures include clothing, machinery, and silk and cotton textiles. It has considerable trade, both export and import, and its fisheries are important. The city was anciently known as Stabiae. It was captured by Sulla in the Social War, and was destroyed by lava from Pompeii in 79 A. D. The castle was erected by Frederick II. in the 13th century. Population, 1906, 33,250.

**CASTELLAMARE DEL GOLFO** (-děl gòl'fò), a seaport of Sicily, on the Gulf of Castellamare, forty-five miles west of Palermo. It is situated near the mouth of the San Bartolomeo River. It occupies the site of the ancient Segesta. The commerce consists chiefly in grain, oil, fruit, wine, and fish. It is the seat of several fine schools and has a cathedral. Population, 1906, 20,175.

**CASTILE** (kās-těl'), a region extending southward from the Bay of Biscay, and forming the center of the Spanish monarchy. It is

divided into Old Castile and New Castile, both from the standpoint of geography and politics. Old Castile forms an elevated plateau from 2,500 to 3,000 feet high, surrounded on all sides by mountains, watersheds, and other natural demarkations. It has an area of 25,810 square miles, is divided into several provinces, and has a population of 1,785,325. New Castile is similarly inclosed by elevations. It has an area of 44,720 square miles and is divided into five provinces. Population, 1,876,350.

**CASTING**, the art of forming metal in a mold. It is thought that the art of shaping metal by means of hammer and chisel is much older than that of casting. However, casting is of great antiquity, which is evidenced by a number of historical accounts, among them the incidents connected with the golden calf and the brass vessels cast for Solomon's temple. John Thomas in 1709 introduced into Scotland an effective method of casting iron and carried out the art successfully, but kept it a secret for many years. It is now one of the principal industries.

**CAST IRON**, the crudest form of iron, obtained from the blast furnace by running melted metal into molds. The cast bars are from three to four feet long and from three to four inches wide. The molds are long, narrow channels. After the metal has solidified, the bars are taken out and placed in a storage room. Iron cast in this form is called pig.

**CASTLE** (kās'l), a fortified building used as a residence and as a place of defense, usually belonging to a nobleman or a prince. Castles were especially numerous in feudal times.

Many ruins of these buildings are preserved in Europe, especially in Austria, England, France, and Germany. They were built chiefly of stone so as to make them proof against fire and the attacks of enemies. The entrance was defended by a *barbican*, which was often large and strong, and the *portcullis* or *iron grating* was hung by chains and weights. The larger castles had many rooms and compartments, the stronger of which was known as the *donjon* or *dungeon*. It was the last resort in case of great danger.

**CASTLE GARDEN**, the name originally given to a fort built on an island off New York. New York harbor was fortified after the War of 1812, which rendered Fort Clinton, the name applied to it, unnecessary. In 1822 it was deeded to the State and later leased and made into a pleasure garden. P. T. Barnum had control of it during the first appearance of Jenny Lind in America. It was used by the State board of immigration as an immigrant sta-



tion until 1891. At that time the Government took charge of immigrants and transferred the station to Ellis Island, since which time Castle Garden has been transformed into an aquarium.

**CASTOR AND POLLUX** (kās'tōr ānd pōl'lūks), the chief stars of the constellation known as Gemini, the Twins. The former is of the first magnitude and the latter of the second. Longitude is reckoned from the latter, as outlined in the *Nautical Almanac*, a publication issued by the Government. In the mythology of Greece the two were noted as the twin deities, sons of Zeus. Immortality was assigned to Pollux, but Castor was regarded as mortal, while both were famous as the patron deities of the mariner. They accompanied Jason on the Argonautic expedition. When a storm had arisen on the voyage, Orpheus played on his wonderful lyre and prayed to the gods that the tempest might be stilled, when starlike flames shone over the heads of the twin brothers. When Castor was slain, Pollux could not be reconciled until Jupiter gave him immortality with his brother. In order to fill the mission assigned to both, they passed alternately one day under the earth and the next on the Elysian Fields. The soldiers of antiquity not only believed them guardians of navigation, but thought they were mounted on snow-white steeds, clad in rare armor, and that they took part in many battles of the Greeks and Romans.

**CASTOR OIL PLANT**, a plant native to the East Indies, but now generally distributed



CASTOR OIL PLANT.

throughout the tropical and temperate zones. Its seeds are of light ash color, oval in shape, and about the size of a small bean. The castor

oil sold in the markets is obtained from the seed of this plant by crushing and pressing. It is used largely in medicine as a purgative, and is a remedy for dysentery and irritation of the stomach. Castor oil is valuable as a lubricating oil in the higher classes of machinery. Most of the castor oil consumed in America is imported. The plant is grown extensively in gardens and parks for ornamental purposes.

**CAT**, the name applied to a genus of quadrupeds, including the domestic cat, the wild cat, and other animals, such as the jaguar, puma, tiger, leopard, and cougar. The domestic cat is well known and has been a favorite animal for many years. It is thought that the cat was kept as a domestic animal in ancient Egypt, and that the country adjacent to the Nile is its nativity. The wild cat has been found more or less distributed in Eurasia, but is not thought to be the origin of the domestic kind, for the reason that the latter has no tendency to return to the type of a wild cat, even after being isolated from settlements for some time. Besides, there are no evidences that the wild kind has ever been domesticated, and cats now found in a wild state still retain the identical features of those met with many centuries ago. In 938 the cat became a general favorite in Europe, and, on account of its rarity, laws were passed in several countries punishing those who stole or killed the animal.

The habits of the cat are quite well known and need very little description. Its ability as a hunter, both during the day and night, renders it valuable, while its characteristic mewing, purring; and cruelty in fighting are well understood. It is quite certain that a cat forms no real affection for mankind. Its attachment is rather to place and condition, where it may receive food and shelter. Its delight in tormenting a mouse before killing it has been mentioned as a trait of sympathy, but it is known that birds are generally inflicted with a fatal wound upon being captured, which is evidence that fear of escape causes the immediate death of the one, and the delight in torment of the other. The desire to return home is a peculiar characteristic, since it has the ability to find its way back at great distances, even when carried in an inclosure, but this trait is more distinctly marked in the older of the family.

The food of cats consists largely of meat and small quadrupeds, but in the absence of these it subsists on starchy food and even vegetables. Its cunning disposition is often manifest by an inclination to lay traps for mice and birds. Several incidents are on record where



cats shelled grains of corn from the cob and placed them a short distance from the entrance to the hiding places of mice, in order that they might decoy their prey when coming for the morsels of food. There are several accounts of cats scattering crumbs in the winter time to attract birds that they might fall upon them. The peculiar construction of their eyes enables them to see quite as well in the dusk of the evening as in the daytime, which renders them



WILD CAT.

peculiarly fitted to entrap the prey at the time when small quadrupeds are in the habit of coming out of their places of hiding for food. Nature seems not to have intended them to enter the water, as the absence of oily substances in the hair causes them to shun wet and moist places.

The skins of cats are valuable for rugs and sleigh robes. Electrical machines have been rendered more serviceable by the use of rub-



ANGORA CAT.

bers made of cats' skins. In former times illy informed people were superstitious regarding the conduct of cats. In Egypt they were held in reverence, and were honored by devotion and the construction of temples. Many people still prophesy visitors when a cat washes its face, or a death in the family when a catcall is heard from the top of a house. The foolish notion that cats have nine lives has led to the death of many of these very useful and agreeable animals. Among the various kinds of cats kept

for domestic purposes are the *tailless cat* of the Isle of Man, the *Angora cat* of Asia Minor, the *Persian*, and the *blue* or *Carthusian*. The *Chinese cat* has long, silky ears that hang downward, the *tortoise-shell* variety is quite elegant and delicate in form, and the *Maltese* is a bluish-gray and a general favorite for store and house use. The Arabians are among the greatest lovers of cats and keep them as pets. Cats are more or less widely distributed and are either kept as pets or as a protection against pests.

**CATACOMBS** (kät'ä-kömz), the underground cavities used for the burial of the dead. This peculiar mode of caring for dead bodies was practiced by people of great antiquity. While the existence of vast catacombs has long been known, they were apparently forgotten by the great mass of writers until Father Bosio spent thirty years in exploring them. A descriptive account of his investigations was first published in 1632. Attention was again attracted to them by the celebrated work of De' Rossi in 1864-67. Among the celebrated catacombs are those of Egypt, Syria, Persia, Asia Minor, Palermo, and Syracuse. Many catacombs are of wonderful extent and still in a good state of preservation. In many of them are frescoes and paintings still as fresh and beautiful as if recently touched by the brush of the artist. At Milo a hill is fairly honeycombed with vaulted labyrinths in which thousands of bodies are stored. In the catacombs of Peru, South America, many remarkable relics have been found dating long prior to the Christian era. In Paris are similar burying places, but these have been used mainly as charnal houses for criminals and victims of pestilence and insurrections.

The most important catacombs are located near Rome, especially in the vicinity of the Appian Way. These crypts are believed to have been the places of worship of the early Christians at the time when the new worship was forbidden and the followers of Christ were generally persecuted. The earliest of these belong to the year 111 A. D., and the newest date from the time immediately previous to the period when Constantine began his reign. In these subterranean burial places are about 6,000,000 tombs. They are constructed in the form of galleries five feet wide and eight feet high, from which branches lead in all directions. Galleries lie above galleries, forming several stories and constituting a perfect honeycomb of rooms and departments. A vast number of them contain slabs on which Christian inscriptions and symbols are found, among them such



as an anchor, a palm branch, or a dove. It is quite certain that these tombs were constructed by the Christians, principally by those possessing riches, and that they remained for some time under the control of the church. Later they passed to the ownership of church communities, but with the beginning of Constantine's reign they ceased to be used for burying purposes. The Goths and Lombards ravished divers of these tombs in the 6th and 8th centuries, and later the popes removed the remains of many saints and martyrs to the churches for burial.

**CATALEPSY** (kăt-ă-lěp'sŷ), a disorder generally connected with hysteria, in which the person afflicted falls into a state of real or apparent unconsciousness. Those afflicted remain in a rigid, fixed state from several minutes to several hours or even days, and very suddenly recover consciousness as if aroused from a deep sleep. It mostly affects people who are hysterical, and as a rule is followed by no bad consequences. Cases have not been infrequent in which persons affected by this disease were buried alive.

**CATALPA** (kă-tăl'pa), a class of trees found in the southern part of the United States, where they are native. The genus includes four or five species. They have large leaves, beautiful trumpet-shaped flowers, and long pods with winged seeds. The wood is soft and light, and its durability makes it valuable for railroad sleepers, furniture, and construction purposes. Several species common to the West Indies attain a height of forty feet and yield timber known as the French oak, while the bark is a source of tannin. The Asiatic species are much smaller and quite unimportant.

**CATAMARAN** (kăt-ă-mă-răn'), the name given to a kind of vessel or boat made of three logs lashed together. The center log is much the largest and serves as a keel, while the others correspond to the sides of a boat. This class of boats is either rigged with a sail or propelled wholly by paddles. The length is from twenty to twenty-five feet. They are used by the Hindus of Madras, the Ceylon Islanders, and on the coast of South America. In the monsoons and stormy seasons the catamaran is much safer than a boat of ordinary construction.

**CATANIA** (kă-tă'ně-ă), a seaport city of Sicily, on the northeastern coast, near Mount Aetna, thirty miles northwest of Syracuse. It is the capital of the province of Catania. Being surrounded by a fertile plain, it is frequently mentioned as the granary of Sicily. In

1693 it was visited by earthquakes which occurred at the time of an eruption of the great volcano, but it has since endured successive damages of this kind, and is the finest and most prosperous city on the island. It has a safe and commodious harbor, an excellent cathedral, and numerous public buildings. Among the most noted are the Church of San Nicolo, the Benedictine Convent, the town hall, and the university founded in 1445. The manufactures include linen goods, articles of wood, clothing, wine, machinery, and silk. It has stone and macadam pavements, waterworks, gas and electric lighting, and steam and electric railway service. The public library contains 92,500 books. It has several fine schools, a museum, and attractive gardens and parks. The city was founded as early as the 8th century B. C. by the Greeks, and attained its highest prosperity in the 5th century B. C. It was desolated by Dionysius, but later became the seat of a Roman colony, which caused it to attain its former commercial importance. The Goths inflicted severe damage, but it again rose to become the principal city of the island under the Byzantine Empire. Population, 1906, 149,295.

**CATAPLASM** (kăt'ă-plăz'm), a preparation applied to diseased or painful parts for soothing or stimulating the skin. The most common preparations of this kind have linseed meal as a basis, or are made up of yeast or mustard, in which form they are applied as a poultice.

**CATAPULT** (kăt'ă-pŭlt), an ancient military engine invented by Dionysius, tyrant of Syracuse, in 399 B. C. It was used for throwing darts, arrows, or stones with great force. Its construction was of wood. The framework supported a bow, which was bent by a windlass and the cord was released by a spring, thus causing the missile to be propelled with considerable force.

**CATARACT** (kăt'ă-răkt). See **Waterfall**.

**CATARACT**, an affection of the eye, in which opaque matter more or less penetrates the crystalline lens, causing vision to be either wholly or partially obstructed. A loss of the natural color of the pupil marks its earliest approach, and, when developed, the pupil has a milk-white color. There are two kinds of cataracts, the hard and the soft. Elderly people are affected most commonly with the hard cataract, while the soft cataract occurs at any age, but is most frequent among children. Children born with this condition, which often occurs, are said to be affected by *congenital cataract*. The form that results from a wound of the lens is called *traumatic*. The disease is



quite painless and is treated by surgical operations, in which the diseased lens is removed from its location opposite the transparent cornea.

**CATARRH** (kă-tăr'), a discharge or running which occurs under certain circumstances from the various outlets of the body. It is due to a number of causes, such as overheating, sudden checking of perspiration, constipation, or breathing foul air. In the eyes and nose it is usually called a cold in the head, in the back of the mouth and throat it is known as post-nasal catarrh, and in the windpipe and bronchial tubes it is designated laryngeal and bronchial catarrh. The form of catarrh that affects the stomach and alimentary canal is known as gastric and intestinal catarrh, while that affecting the bladder is called vesical catarrh.

**CATAWBA** (kă-tă'βά), a river of North Carolina, rises in McDowell County and courses 250 miles, entering South Carolina, after which it is known as the Wateree River. The name has been given to a wine made from the Catawba grapes, discovered near the river in 1801. It is now produced in large quantities in Ohio and other states, and is one of the wines most largely consumed.

**CATAWBA**, an Indian tribe formerly occupying large parts of North and South Carolina. The Catawbas were generally friendly to the settlers, and served with them in the Revolution and against the hostile tribes of Indians. Pontiac and Peter Harris, the latter a Revolutionary soldier, were of Catawba descent. When in their greatest strength, the tribe numbered 1,500 warriors. It is now reduced to a small number and most of these Indians are mixed with whites.

**CATBIRD** (kăt'bērd), an American bird belonging to the same group as the mocking bird, and commonly found in thickets and shrubberies. Its name was derived from the peculiar mewlike cry which it makes when disturbed. The nest is built of twigs, leaves, weeds, and grass, and its greenish-blue eggs usually number from four to six. Its food consists chiefly of worms, insects, berries, and fruit. The color is dark-gray or blackish, with bluish-gray beneath, and the head and tail brownish-black. It is more slender than the robin and measures about nine inches in length. In the autumn it passes to the extreme south of the United States, Mexico, and Central America, and in the spring moves northward, where it builds its nest and rears its young.

**CATECHISM** (kăt'ĕ-kiz'm), an elementary book in which the principles of any art or science are explained by means of questions and answers, but the term is applied especially

to texts treating of the principles of religion. The first Christian catechisms were those written by Kero of Saint Gall and Otfried of Weisenburg, and others issued in the 8th or 9th centuries. In 1520 Martin Luther published a short catechism for Protestant students, and larger and smaller ones were issued by him in 1529. These still continue to be used in the Lutheran churches. In 1536 the Geneva Catechism was issued, and in 1549 the catechism of the Church of England appeared. The latter originally contained only the baptismal vow, the ten commandments, the creed, and the Lord's Prayer with explanations. Later larger editions were published, the complete form appearing in 1612. The catechism of the orthodox Greek Church was published in 1542, and that of the Roman Catholic was issued in 1566 under the direction of the Council of Trent. The general assembly of divines at Westminster agreed upon the catechism of the Church of Scotland in 1648. Catechisms have since been published by other sects, some of which are of great literary merit. They constitute the principal text-books in teaching religious principles in parochial schools and academies.

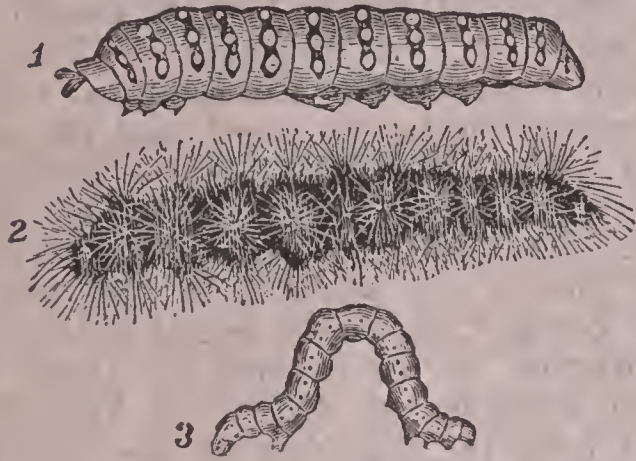
**CATEGORY** (kăt'ĕ-gō-rŷ), in logic, a predicament understood to be an attempt at a comprehensive classification of all that exists, for the purpose of logical affirmation, proof, or disproof. The entire universe may be classified in various ways—as into things celestial and terrestrial; as matter and spirit, as minerals, plants, animals, etc. The original classification made by Aristotle proceeds on the very general properties or attributes that most extensively pervade all existing things, although in unequal degrees. He made ten categories, viz., *substance, quantity, quality, relation, action, passion, time, place, situation, and habit*. These have not been admitted by many logicians. Plato admits only five, the Stoics four, and Descartes suggests seven, while J. S. Mill says, "It is like a division of animals into man, quadrupeds, horses, asses, and ponies." He gives as the result of his own analysis the following enumeration: 1. Feelings, or states of consciousness. 2. Minds, which experience those feelings. 3. Bodies, or external objects. 4. Successions and coexistences, the likenesses and unlikenesses between feelings and states of consciousness.

**CATENARY CURVE** (kăt'ĕ-nā-rŷ), a curve formed by a chain or rope of uniform density hanging freely from any two points. The forms are of two kinds, the *common* and the *uncommon*. The former is constituted by a chain equally thick in all its points; the latter,



by a thread unequally thick. The catenary curve was first observed by Galileo, who proposed it as the proper figure for an arch of equilibrium. It is now adopted in suspension bridges, and is of interest as bearing on the theory of arches and domes.

**CATERPILLAR** (kăt'ēr-pīl-lēr), the larva or larval state of lepidopterous insects, from which they finally turn into butterflies, moths,



CATERPILLAR—1 SMOOTH, 2 HAIRY, 3 SPANNER.

or hawk moths. They are hatched by the warmth of the sun from the eggs laid by the butterfly. The points of difference in caterpillars are as great as those found in the perfect insects into which they change. The body, usually soft and formed like a cylinder, is generally divided by rings into thirteen segments, with nine small openings for respiration on each side of the head. Most caterpillars have a rounded head composed of a horny substance. It is much harder than the rest of the body and contains about six shining points at each side, which are regarded as eyes, and two very short antennae. In size they vary from very small to quite large, the usual size being about an inch in length. The body of some is covered with hairs, and others have a smooth skin. Many live in large societies in nets spun in the small branches of trees, while others roll leaves for houses or burrow in the ground. The food consists of seeds, roots, fruits, flowers, or leaves, this depending upon the class to which they belong. Most caterpillars that grow into butterflies have sixteen legs, and those that develop into moths have from ten to sixteen. In many caterpillars the legs are distributed along the entire body, while in loopers, spanners, or measuring worms they are on the ends of the body. The latter class move from place to place by drawing themselves into arches or loops.

When hatched from the egg, the caterpillar grows very fast, owing largely to its remarkable ability to devour food, which sometimes equals more than twice the weight of the body

in a day. For this reason the insect becomes very harmful to tender plants, shrubs, and trees. It turns into the pupa or chrysalis state before becoming a butterfly or moth. In this state it is pointed and has little warts over its surface, but some species have a smooth and oval surface. When about ready to turn into the chrysalis state, it ceases to eat and hangs from the under side of a twig or leaf by means of its legs or threads of silk spun by itself. While in this state it is at perfect rest and takes no food. After eight or ten days it passes into the butterfly or moth state, but during damp and cool weather it requires from two to three weeks to make this change. Shortly after passing from the chrysalis state it is seen with its wings hanging downward, but they soon grow to their proper proportion, the body becomes hardened, and the butterfly is seen flitting about gathering food from various articles of subsistence.

The habits of caterpillars are quite various, some moving about during the daytime, while others work at night taking in their food. It is estimated that the food consumed by a caterpillar before passing into the developed state weighs many thousand times as much as the first weight of the larva. Among the enemies of the caterpillars are birds and poultry. In some localities birds are valuable in destroying caterpillars and protecting orchards from their ravages. Butterflies and moths are not as great a pest as caterpillars for the reason that they move from place to place, while caterpillars remain fixed to one place, thus entirely consuming the foliage and vegetation as they move onward. From 200 to 800 eggs are laid by a single butterfly or moth, and when these come into the caterpillar state they fully cover large branches of trees, sap them of their juices, and often cause them to wither and die. Some forms of caterpillars are carnivorous, and live on the carrion of insects and small quadrupeds.

**CATFISH** (kăt'fīsh), a fish found in the lakes and streams of all the continents. The



CATFISH.

family includes a large number of species. In the catfish of North America the skin is wholly naked, most species have barbels about the mouth, and the color is dark or dark-blue. All have a large head and are armed with barbs



or spines, with which they are able to inflict a painful wound. Among the familiar species are the *channel cat*, the *bullhead*, and the *stone cat*. Those found in the smaller streams are usually from six to ten inches long, while a number of species common to lakes grow to a length of several feet. The catfish of the Mississippi attains a weight of over one hundred pounds. It prefers to frequent muddy bottoms rather than clear streams. The flesh is prized for its flavor and nutritious qualities.

**CATGUT** (kăt'güt), a cord used as the strings in musical instruments, such as the violin, harp and guitar. It is employed as whipcord, in the bows of archers, and in the cords used by clockmakers. Catgut is made chiefly from the intestines of the sheep, and sometimes from those of the mule and horse, but not from the intestines of a cat. It is prepared by a tedious process, which consist chiefly of cleansing the intestines from fatty matters, after which they are steeped in water and carefully scraped with a blunt knife, then treated with a solution of alkali, and assorted into their respective sizes by drawing them through a perforated brass thimble. At this stage the catgut is subjected to the fumes of burning sulphur in order to prevent offensive odors or putrefaction. The so-called Roman strings, manufactured in Italy, are considered the strongest and best on the market. Surgeons use a superior grade of catgut for tying wounds, and whipcord is made by twisting catgut similar to a one-corded rope.

**CATHEDRAL** (kâ-thē'dral), the principal church of a province or diocese. It is distinguished from others by its *cathedra* or throne, and by having a more elaborate and larger style of architecture. The largest and most noted cathedral is Saint Peter's at Rome, founded in 1450. Others of much renown include the fine Italian-Gothic style at Florence, begun in 1294; the one at Milan, 1386; at Cologne, 1248; those at Amiens and Rheims; and the Notre Dame Cathedral, Paris; the last mentioned was begun in 1163. Many of the noted cathedrals of Europe are in the Gothic style, and in connection with them are side chapels, chapter houses, crypts, and cloisters. The Byzantine, Romanesque, and Renaissance styles of architecture are well represented in the cathedrals of continental Europe. Among the leading cathedrals of North America are the Notre Dame, in Montreal; the Roman Catholic Cathedral of Saint Patrick's, in New York City, and the Protestant Episcopal Cathedral of Saint John the Divine, in New York City.

**CATHETOMETER** (kâth-ê-tôm'ê-tēr), an

instrument employed to measure accurately small differences of height, especially two columns of fluid. It consists of a perpendicular metallic standard, to which is attached a telescopic leveling apparatus so it may be moved up or down. In order to sight the objects or surfaces, the telescope is raised or lowered, and the differences in height are thus seen on the graduated standard.

**CATHODE RAY** (kâth'ōd), a kind of ray generated at the cathode in a vacuum tube by the electrical discharge. The poles of the battery are called *electrodes*. The one which receives the electric current, or the negative pole, is called *cathode*, and the other, which overflows with electricity, or the positive pole, is known as the *anode*. When a cylindrical tube from which the air has been exhausted is attached to the poles of an electrical machine, the cathode rays fill the vacuum with a green light. An apparatus of this kind is employed in producing Röntgen rays.

**CATHOLIC CHURCH** (kâth'ō-lik), a term signifying universal church. It cannot be applied to any particular sect or party, as Greek, Anglican, Roman, Lutheran, or Presbyterian, since any one of these forms merely a portion of the universal church. The term is employed to distinguish the Christian from the Jewish; the former applies to the world and the latter is confined to a particular nation. About the year 160 A. D. the term *Catholic Church* began to be applied in this universal sense to distinguish the followers of Christ from Gnostics and all others not holding to Christianity. The term is now applied in the catechisms, the books of faith, of the Christian churches generally, but the Roman Catholic and Greek Catholic are the only ones that have retained the name and made it apply to their organizations. See **Greek Catholic**, **Roman Catholic**.

**CATHOLIC EMANCIPATION**, in England, the term used in reference to the repeal of certain laws affecting the civil rights of Roman Catholics. The law prohibited Catholics from purchasing land and performing the rites of their church until 1780, when many of these laws were repealed. The Duke of Wellington, in 1829, moved the repeal of all anti-Catholic laws, and after much discussion they were generally discontinued. However, there are still some restrictions upon Catholics, chief among which is that a seat in the House of Commons cannot be held by a Catholic priest.

**CATHOLIC UNIVERSITY OF AMERICA**, an institution of higher learning established at Washington, D. C., under authority of Leo XIII., who granted its apostolic constitution



in 1887. It was opened for instruction in 1889. The chief officers, who consist of the chancellor, the rector, and the treasurer, are chosen by the board of trustees, which is made up from the laity, clergy, and episcopate. Cardinal Gibbons, the first chancellor, continues to hold that office. The primary purpose is to facilitate original research by graduates of Catholic seminaries and colleges. It maintains faculties of law, philosophy, theology, and technology, and instruction is given by about 35 professors. The library has 40,000 volumes and the value of property is \$1,350,000. The attendance is reported at 250.

**CATHOLIC YOUNG MEN'S NATIONAL UNION**, an organization of young men belonging to the Roman Catholic Church. It is a federation of the diocesan unions and was organized in 1875. A council approved it at a session held in Baltimore, and since then it has grown in favor and membership in the United States and Canada. The purpose is to bring young men into the church, establish and maintain reading rooms, and promote the organization of libraries. It has a membership of about 65,000.

**CAT ISLAND**, one of the Bahama Islands, about 200 miles northeast of Nuevitas in Cuba. It is about 45 miles long, from two to eight miles wide, and is largely of coral formation. It is supposed that Columbus visited this island in 1492.

**CATLETTSBURG** (kăt'lets-bûrg), a city in Kentucky, county seat of Boyd County, at the confluence of the Big Sandy and Ohio rivers, on the Chesapeake and Ohio Railroad. It has electric lights, waterworks, and a brisk trade in lumber and merchandise. The manufactures include flour, machinery, and lumber products. Among the chief buildings are a county courthouse and several fine churches and schools. Population, 1900, 3,061.

**CATNIP** (kăt'nîp), or **Catmint**, a perennial plant of the mint family, common in the fields of Europe and North America. It was so named for the fondness with which cats eat the leaves. The plant has an erect stem from two to three feet in height and heart-shaped leaves, and bears a dense whorl of whitish flowers. The leaves are soft and downy beneath. They are aromatic and somewhat bitter to the taste and have a slightly disagreeable odor. The leaves are used in medicine as a tonic.

**CAT'S-EYE**, a mineral classed with the precious stones, found in Brazil and Ceylon. It is so named from its peculiar internal radiation called *chatoyant*, which somewhat resembles a cat's eye. It is commonly of a greenish-gray col-

or, though sometimes red, brown, or yellow. A variety known as *tiger-eye* is obtained in the vicinity of the Orange River in South Africa. It is an altered crocidolite and is not of much value.

**CATSKILL** (kăts'kîl), county seat of Greene County, New York, on the Hudson River, thirty-five miles below Albany. It occupies a fine site at the mouth of Catskill Creek, on the West Shore Railroad, and is the starting point of the Catskill Mountain Railroad. The chief buildings are a courthouse, an academy, a public library, and an opera house. Among the manufactures are paper, woolen goods, and stone products. It is an important station for pleasure parties visiting the Catskill Mountains and is connected by ferry with the New York Central Railway on the east side of the river. The vicinity was settled by the Dutch in 1680. Population, 1900, 5,484; in 1910, 5,296.

**CATSKILL MOUNTAINS**, a group of mountains in New York, belonging to the Appalachian system, situated west of the Hudson River and south of the Mohawk. Washington Irving made the Dunderberg, one of the Catskills, the scene of his famous "Rip Van Winkle." The area covered by the group is about 5,000 square miles. The highest peaks are Roundtop, 3,810 feet; Slide Mountain, 4,250; and Hunter Mountain, 4,025. The scenery is very fine and attracts many visitors in the summer season. Forests of oak ash, beech, pine, and maple cover a large part of the region.

**CATTEGAT** (kăt'tê-găt), or **Kattegat**, a gulf extending between Sweden and Denmark. It is an extension of the Skager-Rak from the North Sea. Its length is 150 miles and the greatest breadth is 90 miles. The shores of Sweden are rocky and steep, but the Danish shores are low. There are sand banks more or less dangerous to navigation. Among its principal islands are Samsö, Läsö, and Anholt.

**CATTLE** (kăt't'l), the name formerly applied to all large domestic animals, such as oxen, cows, horses, swine, and sheep, but now limited to cows, oxen, and steers. The name applied to this class of animals in British countries is neat cattle. Cattle were unknown in America prior to the discovery of the continent by Columbus. They are mentioned in the ancient records of Hindu and Hebrew peoples, and are shown extensively on Egyptian monuments constructed more than 2,000 years before the Christian era. Remains of cattle have been found in the Swiss lake dwellings along with stone implements. The wealth of primitive man consisted largely of cattle, since they furnished the necessary meat and milk for subsistence, answered as beasts of burden, and were suitable





HERD OF HEREFORD CATTLE.

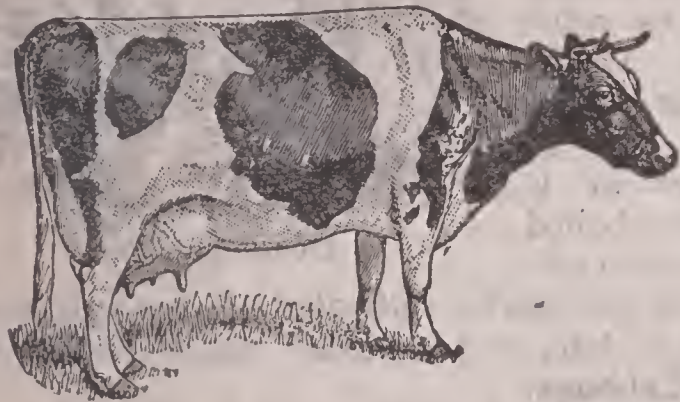






for plowing the soil and threshing the grain. The Hindus still hold several species sacred. The Romans punished the mistreatment of this animal by inflicting severe penalties, while the Germanic and Latin tribes of early Europe used them as a chief support.

Cattle were first brought to America by the Spaniards in 1525, about six years after the



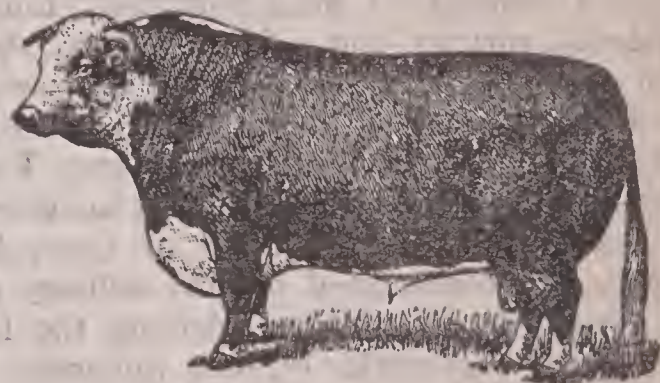
HOLSTEIN COW.

discovery of Mexico by Cortez. From Mexico they spread into California, Central America, and later over the whole of South America. Most Spanish grades of cattle are marked by rough characteristics and a tendency to merge into a wild state. The wild cattle of South America are descendants of those brought from Spain. The Dutch brought the first cattle to the northern colonies in 1625. Others introduced them into Virginia from the West Indian Islands, while the Swedes brought a number to Delaware in 1627; the Danes, to New Hampshire; and the English, to Maryland. Most of the teaming, plowing, and prairie breaking in early times was done by oxen, horses being introduced later on account of their greater speed.

The grades of cattle now generally reared in Canada and the United States are greatly diversified, owing to the fact that importations have been made from various parts of Europe, but also because different sections of the country demand a diversity. The chief uses of cattle are to supply milk and yield beef, although in many localities there is still a demand for oxen as beasts of burden. It may be said that the *Galloways* constitute a grade distinctly fitted for beef production, while the *Jersey*, *Guernsey*, and *Ayrshire* breeds are reared principally for their abundant yield of rich milk. The *Durham*, *Holstein*, and *Hereford* grades are reared most extensively through the central portion of the United States and in the corn belt region, for the reason that they yield a choice quantity of milk and at the same time are among the finest for beef. In general Texas cattle are coarser and rougher, owing to their descent from Span-

ish ancestors, but they are being rapidly improved by skillful breeding and care. Other well-known breeds of cattle are the *Polled Aberdeen*, *Devon*, *Angus*, *Suffolk*, *Red Polls*, *Norfolk*, and the highly valuable Dutch breeds, among them the *Dutch Belted*.

Beef is obtained from the adult animal including both the male and female, and veal is secured from the calves. The hides of cattle are of value in making leather, while the bones are used for fertilizing; the blood, for buttons and fertilizing; and horns, for cutlery and other purposes. The production of milk, cheese, butter, and beef constitutes one of the most important industries in America, engaging much labor and capital. Several grades, among them the *Galloways*, are *hornless*, but feeders of cattle have for many years practiced *dehorning*, a process whereby the horns are removed by means of a saw, or the germs of the horns are clipped out of the head of the calf when it is a few days old. Dehorning has proven valuable in that it makes the cattle more docile, and consequently more productive in milk and beef. The State of Iowa has led in the production of milk and butter, while Texas ranks first in the number of beef cattle produced annually in the United States. About half the cattle reared in Canada are in the Province of Ontario. In



HEREFORD BULL.

the western grazing districts cattle are largely grass-fed, while in the corn belt region the richest corn beef is produced.

**CAUCA** (kou'kà), a river of Colombia, South America, the largest tributary of the Magdalena. It rises in the Andes and flows northward through Cauca, Antioquia, and Bolivar, and has a length of about seven hundred miles. The lower course is navigable, but numerous waterfalls obstruct navigation in the province of Cauca.

**CAUCASIAN** (ka-kā'shan), the name first applied by the German writer Johann F. Blumenbach (1752-1840) to the fair race, because of its greater intelligence and physical perfec-



tion, and because he regarded it the original race. It is classed into three branches: the Hamitic, the Semitic, and the Japhetic. The Hamitic races formerly inhabited the Arabian Peninsula, Palestine, and the valley of the Nile. The Semitic races include the inhabitants of Arabia, Abyssinia, the northern part of Africa, and the Jews. This race included the great peoples of antiquity—the Assyrians, Babylonians, Moabites, Edomites, Phoenicians, Ammonites, and Ishmaelites. The Japhetic races include the Aryan. They are classed as follows: The Germanic, including Germans, Dutch, English, Flemish, Danes, Swedes, and Norwegians; the Celts, comprising the Welsh, Irish, Scots, and Bretons of France; the ancient Greeks; the Romanic, including the French, Italian, Spaniards, and Portuguese; the Slavonic, comprising the Russians, Croats, Poles, and Czechs; the Iranians, including the Afghans, Persians, and Baluchis; the Hindus.

**CAUCASUS** (kə'kə-sūs), a mountain range in the region between the Caspian and Black seas, stretching northwest and southeast, and forming part of the boundary between Asia and Europe. The width is about 150 miles and the length is 750 miles. A number of the peaks are highly elevated, including Kasbek, altitude 16,546 feet; Koshtantau, 17,120 feet; Dikhtau, 16,925 feet; and Elbruz, 18,570 feet. The region contains a number of mud volcanoes, mineral and thermal springs, and a few glaciers. At its eastern extremity, near the Caspian Sea, are the productive oil fields of Baku. The inhabitants include Russians, Tartars, Armenians, Turks, Persians, and Georgians. The Russian government has established a number of forts, built railroads, and constructed several military passages across the mountains. Among the leading products are cattle, cereals, minerals, and timber. Tiflis is the central railway city.

**CAUCUS** (kə'kūs), a term derived before the American Revolution from meetings held by calkers of ships in so-called calkhouses of Boston, for the purpose of resisting the British and eventually controlling the city. The term *calk-hus* was applied in ridicule by British sympathizers. John Adams first used the word *caucus* in his diary in 1763. It is now applied to meetings held by political parties or legislative assemblies in which plans for future action are discussed. In some states caucuses are regulated by law to prevent designing persons from obtaining undue advantages, in which case the voting is by ballot and the meetings are called *primaries*. The caucus has recently been introduced into Great Britain.

**CAULIFLOWER** (kə'li-flou-ēr), a species

of cabbage cultivated extensively by the Greeks and Romans. The flowers constitute a flattened head and are the edible part. It requires a richer soil and is not so hardy as cabbage, but is cultivated in a similar manner. It is pickled or is eaten boiled with sauce.



CAULIFLOWER.

Among the species cultivated are *broccoli*, which matures late, and *snowball* and *dwarf erfurt*. See **Cabbage**.

**CAUSTIC** (kə'st'ik), a substance that destroys the tissues of the animal parts to which it is applied. It is used to remove morbid growths, as warts, cancerous deposits, and excessive granulations, and to improve the character of ulcerated surfaces. Caustics serve a good purpose in opening abscesses and in destroying poisonous bites of rabid animals and serpents.

**CAVALIER** (käv-à-lēr'), a term used to designate a horseman. The courtiers, in the struggle between Charles I. and his Parliament in 1641, were nicknamed *Cavaliers*, and the friends of the Parliament were called *Roundheads*. Later the Cavaliers came to be called Tories and the Roundheads were known as Whigs.

**CAVALRY** (käv'al-rÿ), the division of a military force which serves on horseback. In time of peace cavalrymen serve as a mounted police and form a nucleus for organization in case of war. Their drilling is thorough, fitting them to maneuver both on horseback and as foot soldiers. This part of the army is serviceable for speedy and decisive movements to protect the center or the wings of a department, and is utilized as closely to the infantry as possible. During the time of war, the cavalry is employed chiefly to cover a retreat, for intercepting an enemy, for procuring intelligence, and as an aid in foraging. Formerly the cavalry was armed with lances and sabers, but now the arms consist principally of rifles and revolvers. See **Army**.

**CAVE DWELLERS**, a prehistoric race that lived in caves and caverns. Very little is known of this peculiar race of people, and the only information obtainable is from the remains left in the places of their habitation. New Mexico,



Arizona, Mexico, and Utah have supplied the best evidences of cave dwellers. Their remains indicate that they knew nothing of agriculture, metals, and pottery, and that they kept none of the domestic animals. Their manufactures and modes of life were very simple and primitive. See **Cliff Dwellers**.

**CAVES**, the general designation for subterranean caverns under the crust of the earth. They occur most frequently in limestone regions and were produced by the upheaval of strata, by the erosion of water, or by both causes combined. Some have been greatly enlarged by the action of the water, which carried away sand and gravel, thus eroding the bottoms and sides. Great caves occur in many regions where limestone rocks abound, notably in America, Australia, and Eurasia. Among the most remarkable in America is the Mammoth Cave in Kentucky, which is celebrated for its great size and subterranean streams. It includes more than fifty miles of subterranean passages and is rich in the remains of various extinct animals. The waters are inhabited by fish and other forms of life devoid of eyes. A cave about fifty miles from Los Angeles, Cal., in the Santa Susanna Mountains, is studded with stalactites and stalagmites and has several large halls covering an acre or more. Wyandotte Cave, in Crawford County, Indiana, bears evidence of having been an underground river in prehistoric times. The length, including its various passages, is about twenty-five miles, and in it are some remarkable chambers and gulches.

The Fingal's Cave, on the Island of Staffa, has a roof and many walls formed of basaltic columns. The cave in Franconia, Germany, is another remarkable formation. Many of the caves contain animal remains. Those of South Africa have relics of animals now found only in Asia, and those in Southern Europe contain bones of the hyena, which animal is now common only to Africa. Thus, the different caves bear evidence that many animals formerly numerous are now extinct, and that the existing animals are distributed differently than at former times. Geologists have been able to add valuable information to the study of geological and historical biology by the study of animal fossils found in caves.

**CAVITE** (kā-vē'tā), a city in the Philippines, on the island of Luzón, about ten miles southwest of Manila. It is the capital of the province of Cavite and is strongly fortified. It has several fine churches and schools, good dockyards, and a well equipped arsenal. The manufactures include soap, cigars, sugar, oil, and alcoholic beverages. It was the scene of a

battle in the war with Spain. Population, 1907, 4,680.

**CAVY** (kā'vŷ), a small rodent mammal native to South America, allied to the capybara and the agouti. Several species have been described. The cavies are hunted for their flesh and are now nearly extinct in the plains of Argentina. They are active, feed chiefly at night, and spend the day in deep burrows. Some students consider a species of the cavy the ancestor of the guinea-pig.

**CAWNPORE** (kān-pōr'), a city of the Northwest Provinces of India, on the Ganges River, forty miles southwest of Lucknow. It passed under British influence in 1801, and has since ranked as one of the strongly fortified cities. A mutiny broke out in 1857, under the leadership of Nana Sahib, during which nearly all of the Europeans, numbering about 1,000, were massacred. The city is now the seat of government of a province of the same name. It has an important railroad and river commerce. The railroads penetrate from it into the mining and agricultural districts, while telephone and telegraph lines connect it with many important points. The river is 500 yards wide in the dry season, and attains a width of over a mile in the rainy times. Among the manufactures are cotton, woolen, and silk products, tobacco, furniture, machinery, and leather. The city has several large government, religious, and educational buildings. It is improved by parks, electric lights, rapid transit, and waterworks. Population, 1906, 198,690.

**CAYENNE** (kā-ĕn'), capital of French Guiana, located on an island of the same name, at the mouth of the Cayenne River. It has a shallow harbor, which has been improved by dredging. The chief buildings include a college, several hospitals, a number of churches, and the structures erected by the government. Direct steamer communication is maintained with France. The city was founded in 1604 and has been a possession of France since 1675. Population, 1906, 13,500.

**CAYUGA LAKE** (kā-yōō'gā), a beautiful lake located between Seneca and Cayuga counties, in the central part of New York. It is from one to three miles wide and thirty-eight miles long, the greatest depth being 500 feet. The surface is 387 feet above the level of the sea. Its outlet is the Seneca River, which flows into Lake Ontario. The lake is rich in fish. On its shores are numerous cities and pleasure resorts, including Aurora, Cayuga, and Ithaca.

**CAYUGA INDIANS** (kā-yū'gā), a tribe of North American Indians, formerly located near Cayuga Lake, New York. The tribe formed



an alliance with the Five Nations, known as the Iroquois, in the 16th century, and which, in 1712, became known as the Six Nations. After the Revolutionary War, it greatly decreased in numbers. At the present time there are about 1,500 members of this tribe, who reside in Ontario, Canada, near the Grand River, but a few are located in Oklahoma and Wisconsin.

**CEBÚ** (thâ-vōō'), an island of the Philippines, located between Mindanao and Luzón, containing an area of 4,210 square miles. The productions include sugar and tobacco, while the manufactures consist of abaca, cigars, oil, and sisal goods. It is the seat of the oldest Spanish settlement of the Philippines. Cebú is the capital and principal city. It has a fine cathedral, a seminary, and a well-organized school system. There is a considerable foreign trade. In 1906 the island had a population of 575,630, and the city of Cebú, 15,475.

**CEDAR** (sē'dēr), the name applied to various cone-bearing trees of the evergreen kind. They are distributed widely and thrive in swamps, valleys, and arid mountain elevations. Among the most famous species is the *cedar of Lebanon*, of which the Bible speaks in these words: "His boughs were multiplied, and his branches became long." Solomon's temple was constructed largely of a species of the cedar of Lebanon. Cedar timber has been useful in all historic times for manufacturing and other purposes. The wood yields an oil useful in preserving books against moths and for embalming. Some species grow to a height of eighty feet and the largest specimens measure sixty-five feet in circumference. The age cannot be estimated by concentric rings as in many trees, since the older owe their vitality to portions of the bark. Botanists think they frequently attain an age of 800 years, while some are estimated at 2,000 years. They thrive at a height of 6,500 feet above the sea.

The *deoder cedar*, a native of India, is classed by botanists as a species of the cedar of Lebanon. It grows abundantly in the Himalayas, and attains a circumference of thirty-five feet and a height of more than 150 feet. Its leaves and cones are larger than those borne by the cedar of Lebanon, and it yields fine material for building and resinous oils. The *atlas cedar* is widely distributed in North Africa. In America and the West Indies the *red cedar* is a common tree. This species is found in the swamps of many sections, as well as on the arid, rocky cliffs of the continental highlands. It is cultivated extensively for ornamental purposes in parks and gardens, and serves as a valuable protection on the Great Plains for barn and

house yards against winds and storms. The wood is used extensively for lead pencils, furniture, and boxes in which clothes are protected against moths. In swamps it is of a slender growth, on arid hills it is low and branchy, while in valleys, particularly in California, it attains an immense size. The *arbor vitae*, or *white cedar*, is a common tree in many parts of Canada and the United States. Cigar boxes are made of *Spanish cedar*. However, this species and the American red cedar are not true cedars, though they are coniferous trees.

**CEDAR CREEK**, a stream in northern Virginia, rises in the North Mountains, and flows into the Shenandoah River. It was the scene of a battle fought on Oct. 19, 1862, between the Union army under General Sheridan and the Confederates under General Early. Sheridan had been called to Washington and left General Wright in command, and while he was away the Confederates made an attack, utterly routing the eighth corps. Wright immediately reformed his lines, making a change of front and a retrograde movement, thus losing heavily during the formation. Just at that time Sheridan, who had heard of the battle at Winchester, appeared upon the scene with his horse covered with foam and inspired his men with such confidence that the enemy was driven back and put to flight with great slaughter. The Union losses were estimated at 5,600, while the Confederates lost about 3,150. The famous ride of Sheridan from Winchester to Cedar Creek was made the basis of Thomas Buchanan Read's famous poem, "Sheridan's Ride."

**CEDAR FALLS**, a city of Iowa, in Black Hawk County, one hundred miles west of Dubuque, on the Illinois Central, the Great Western, the Rock Island, and other railroads. It is nicely situated on the Cedar River and has connection by an electric railway with Waterloo, which is six miles east. The surrounding country is fertile. It has a brisk trade in produce and merchandise. Among the manufactures are clothing, flour, machinery, and canned goods. It has a public library and is the seat of a State normal school, one of the largest in the United States. The first settlement was made on its site in 1845 and it was incorporated in 1853. Its importance as a city is due to its location on the Cedar River and its excellent public institutions. Population, 1905, 5,329.

**CEDAR LAKE**, a lake of Canada, in the district of Keewatin, about twenty-five miles north of the province of Manitoba. It receives the drainage from the Saskatchewan River and the discharge is carried by the same river into Lake Winnipeg. It is about thirty miles long,



from ten to twenty-five miles wide, and has an area of 315 square miles. Forests of poplar, pine, balsam, and tamarack abound in the vicinity.

**CEDAR MOUNTAIN**, an elevation situated near the Rappahannock River, in Culpepper County, Virginia. It was the scene of a battle on Aug. 9, 1862, between the Federal forces under General Banks and the Confederates under General Jackson. The Union army was greatly outnumbered and was defeated with a loss of 400 prisoners and 1,400 killed and wounded, besides a loss of stores and a large quantity of ammunition. The confederate loss was 1,314.

**CEDAR RAPIDS**, a city of Iowa, in Linn County, seventy-eight miles southwest of Dubuque. It occupies a fine site on both sides of the Cedar River, on the Chicago and Northwestern, the Illinois Central, the Chicago, Milwaukee and Saint Paul, and other railroads. Intercommunication is by a system of electric railways, which have lines to Marion and other cities. The chief buildings include Coe College (a Presbyterian institution), the high school, the post office, the public library, and the Masonic Temple. The city has extensive railroad shops, pork-packing establishments, and flouring mills, and manufactures of oatmeal, carriages, machinery, and agricultural implements. It has a large jobbing trade. The streets are substantially paved and improved by waterworks, sewerage, and electric and gas lights. The first settlement was made in 1845 and it was incorporated in 1856. Population, 1910, 32,811.

**CEDAR RAPIDS**, or **The Cedars**, a village on the north bank of the Saint Lawrence River, in Soulanges County, Quebec. It is located at the Cedar Rapids of that river, which is avoided in navigation by the Soulanges Canal. This point was the scene of a military contest in 1776, when the British and a number of Indians under Captain Foster captured four hundred Americans in their retreat from Quebec. Arnold went out from Montreal with a force to attack the captors, but consented to a compromise for an exchange, fearing that the Indians under Brant would massacre the prisoners.

**CEDAR RIVER**, a river of Iowa, rises in southeastern Minnesota. It has a southeastern course of about four hundred miles, and joins the Iowa River about twenty-five miles above its junction with the Mississippi. Its course is through a fertile region and along its banks are belts of hard wood timber.

**CEILING** (sē'ling), the upper surface of a room, opposite the floor, usually finished with plaster work; but sometimes with ceiling lumber.

In large structures, such as churches and government buildings, the ceiling is often decorated with fine frescoes and other paintings.

**CELEBES** (sē'l'e-bēz), one of the largest islands of the Indian archipelago, located east of Borneo, having an area of 71,470 square miles. The equator crosses the northern part. On the southern shore is the Bay of Boni and on the eastern, the two great bays of Tomini and Tolo. It was visited by the Portuguese in 1512 and claimed by them. The Dutch took possession of the southern peninsula as early as 1660 and later expelled the Portuguese, and in 1683 acquired possession of the entire island. It is now one of the important Dutch possessions, and is governed by them under a general system for the administration of the colonies. The soil is exceedingly productive, though there are several active volcanoes and earthquakes are not uncommon. The highest peak is Bonthain, height 9,690 feet.

The leading products are coffee, bananas, tobacco, sago, sugar cane, maize, indigo, and tropical fruits. Cattle, buffaloes, horses, goats, and sheep are reared profitably. It has rich deposits of coal, iron, salt, and gold. The manufactures include principally weaving and spinning. The island is noted for its large variety of beautiful birds, including the cuckoo, parrot, and bird of paradise, besides many species of bees, butterflies, and other insects. Among the principal towns are Port Rotterdam, Menado, and Macassar. The last mentioned is the capital and has a population of 21,300. Most of the natives belong to the Malay race. Mohammedanism is the chief religion. Population, 1906, 2,120,640.

**CELERY** (sē'ēr-y), the name of a plant of the parsley family. In the native state it is acrid and poisonous, being rank and coarse, but under cultivation it has become a wholesome vegetable. It is cultivated extensively for salads and raw consumption. The principal species grown for the market are those that have red or white stalks, which include a number of sub-varieties. They include those known as the *Paris Golden*, *Giant Pascal*, *Boston Market*, and *White Plume*. The stalks are bleached by placing soil about the plants after they are developed. It is useful in the preparation of medicine for nervous disorders and yields an agreeable flavoring. *Celeriac* is a root form of celery and does not require bleaching. Celery thrives best in a well-drained, but deep, rich soil. See illustration on following page.

**CELESTIAL SPHERE** (sē-lēs'chal), a term generally applied to the heavens. The word *celestial* has reference to objects surpass-



ing in excellence anything earthly, and which partake of a divine or angelic nature. China is often called the Celestial Empire, because its rulers claim authority from heaven and assume



CELERY.

the title of "Son of Heaven." John Bunyan speaks of heaven in his "Pilgrim's Progress" as the celestial city. Heavenly bodies are often spoken of as celestial bodies.

**CELESTINE** (sĕl'ĕs-tĭn), the name of five Roman popes who ruled in the period included between 422 and 1294. See **Pope**.

**CELIBACY** (sĕ-lib'ă-sÿ), the state of being unmarried, but having especial reference to voluntary abstinence from marriage. Celibacy is followed by several orders of religious denominations, particularly among the Christians by the clergy of the Roman Catholic Church. The custom is of great antiquity and was observed anciently by the priests of Egypt and the priestesses of Greece and Rome. It is now held essential by the Buddhist priests, who are universally pledged to it. There has been more or less contention on the importance of celibacy since the early centuries of Christianity and successive movements were made to abolish it entirely, even some of the leading adherents of Roman Catholicism holding it unnecessary. In the early part of the 19th century several European countries favored abolishing it by compulsory legislation, but with little effect.

**CELLS**, the minute microscopic cavities in animals which are composed of cell-walls and contain cell contents. A single cell is usually a closed sac, the membrane of which it is constructed being generally nitrogenous formation. Within the sac is a fluid or semifluid *protoplasm* in which *globules*, *molecules*, *gran-*

*ules*, or other very minute cells are suspended. The larger cells inclose still other *nucleus cells* containing *nucleolus*. Within and surrounding the nucleus is an albuminous substance vital in principle and which is thought to contain the seat of life. In plants, cells are composed of solid, soft, and fluid layers. They are largely grouped and united, and, in this relation, form a cell tissue. In size they are very small, ranging from 0.004 to 0.002 of an inch in diameter. The cells of the yeast plant are about 0.00032 of an inch in diameter, but the bacteria are still smaller. Most cells are made up of three parts: a firm outer skin, a soft albuminous matter, and an inner cavity filled with a watery fluid called *cell sap*.

The term *cells* is applied to the compartments of a honeycomb and to the inclosed walls of an ancient temple. In physics, the term has reference to a single jar, bath, or division of a compound usually containing a couple of zinc or copper plates united to each other, or to their opposites, by a wire.

**CELLULAR TISSUE** (sĕl'ŭ-lĕr), in physiology, the fibro-cellular connectives or areolar tissues which fill interstices between the organs in man and the vertebrate animals. In botany, the term is applied to a tissue composed of a number of separate cells or minute bags holding together. When first formed they are egg-shaped or globular, but afterward become flattened by pressure. See **Connective Tissue**.

**CELLULOID** (sĕl'ŭ-loid), a compound resembling ivory in appearance, which can be turned, molded, and manufactured into various products, such as were formerly made of bone and ivory. Its manufacture was first introduced at Birmingham, England, in 1856, but it is now manufactured extensively in America. The process consists of immersing paper in nitric and sulphuric acids, by which it is converted into *nitrocellulose*. After being washed and bleached, a quantity of camphor is added and the mass is passed through a roller mill. At 176° Fahr. it readily softens and can be made into the most delicate forms, and it again hardens after becoming cold. The chief use of celluloid is for the manufacture of napkin rings, piano keys, billiard balls, handles for knives, forks, and umbrellas, backs of brushes, collars, cuffs, buttons, shirt fronts, dolls, and a large variety of other useful products. It can be colored easily, but is inflammable, unless blended with some chemical having an opposite property.

**CELLULOSE** (sĕl'ŭ-lōs), a substance which constitutes the basis of vegetable tissues. It is allied to sugar and starch, and is changed into



starch by the action of caustic potash, sulphuric acid, or heat. The cell walls of plants consist almost entirely of cellulose during the early stages of development, but it is replaced in part by coloring matter, resins, and other substances as the plant grows. The pith of the Chinese rice-paper plant consists almost wholly of cellulose. Animal tissues do not contain this substance, with the possible exception of the integument of insects, but it is important as a food for animals. It is manufactured and used in making vegetable parchment, collodion, and gun cotton.

**CELTS** (sěłts), an ancient Indo-European or Aryan race which formerly inhabited a large part of Italy, Spain, Gaul, and Britain. The descendants of this race still occupy Wales, Ireland, the Highlands of Scotland, and part of northern France. After spreading over large portions of Europe, they appear to have been driven westward by the Teutons, Slavs, and succeeding waves of migratory peoples. They were mentioned by Herodotus as occupying the valley of the Ebro River, with the Iberians, in Spain. They were called Galli by the Romans, and appear to have reached their greatest power in the 2d and 3d centuries B. C. In Asia Minor they settled a region known as Galatia. They eventually divided into two branches and spoke dialects widely different from each other, known as the Gaelic and the Cymric. The Highlanders of Scotland, the Manx, and the Celtic Irish represent the Gaelic; while the inhabitants of Cornwall and Brittany and the Welsh represent the Cymric, or the other dialect. The sun was the object of worship among the Celtic people in former times. They supported a literary order known as the Bards.

**CEMENT** (sě-měnt'), the name applied to any matter having elements capable of holding two bodies in close cohesion. In building the name is applied to the mortars consisting of white lead, glue, plaster of Paris, putty, and hydraulic limes containing silica. The cements used in building are known chiefly as *Portland* and *Roman*. Portland cement was patented in 1824 and is so called from its resemblance to Portland stone. It was first manufactured by calcining a proper portion of chalk with clayed mud, and this mass was reduced to a fine powder after being dried. Roman cement is the name applied to hydraulic mortars made by calcining limestone and mixing it with sand in various proportions. It can be prepared from any limestone containing from fifteen to twenty per cent. of clay. The calcining is effected by burning the stone to ashes. *Hydraulic cement* is a mortar used in building piers and walls

under or exposed to water. One of the best grades is made of ground Portland stone in the proportion of six to twelve parts mixed with thirty-five parts of sand and three parts of litharge. The cement of ordinary use is made by burning together clay or shale and limestone, but it is not as good as the manufactured product for the reason that limestone contains unequal proportions of iron, silica, and alumina, which in the process of manufacture can be made uniform. Age increases the strength of good cement. See **Concrete**.

**CEMETERY** (sěm'ě-těř-ỹ), a word derived from the Greek, meaning a sleeping place, and applied to burial grounds and other places for the deposit of the dead. The modern cemeteries have taken the place of the burial grounds that were formerly maintained around churches, and came into use in Western Europe as a consequence of the fine burial grounds established by the Turks in the vicinity of Constantinople and other cities. The Turkish burial grounds are famous for their dense forests of cypresses, which are planted by the Mohammedans after burial on the grave of the dead and the grave is never reopened.

In Italy the cemetery is known as the *Campo Santo* (holy field) and is generally an inclosed place. The most famous burying ground is at Pistoia, near the cathedral and leaning tower, and was founded by Archbishop Ubaldo in the 12th century. Other noted cemeteries of Europe are the Père Lachaise, in Paris; the Kensal Green, near London; and Capuchin Cemetery, near Palermo. Most of the cemeteries in Canada and the United States are located at convenient distances from the center of cities, or, in country districts, in the center of communities. The lots are usually deeded in fee simple, but are sometimes leased for a term of years. The laws govern the care and protection of cemeteries. They are usually cared for by a board of directors appointed by the department of health in cities, or by societies, and quite often are under the ownership of municipal corporations.

The government of the United States owns eighty-three national cemeteries, which are cared for by the United States. In them are buried officers and soldiers who died during the war or while in active service, and those who died after being mustered out and left without ample means to provide a suitable burial. The eighty-three national cemeteries are located in different portions of the Union, but are mostly near the battlefields of the Civil War, or at army posts of the United States. They are under the charge of the quartermaster's department. The num-



ber of soldiers interred aggregates 335,453. Among the most celebrated are those at Nashville, Tenn., containing 16,558 graves; Vicksburg, Miss., 16,656; Fredericksburg, Va., 15,285; and Andersonville, Ga., 13,705. The national cemeteries and those located near cities are beautified by monuments, avenues of trees, and splendid walks. The most beautiful cemeteries in the United States are Laurel Hill, Philadelphia; Greenwood, Brooklyn; Spring Grove, Cincinnati; and Mount Auburn, Boston.

**CENIS** (sē-ně'), **Mount**, a mountain of the Alps, located between Piedmont and Savoy, altitude 11,456 feet. It is celebrated for the road constructed, for military purposes, over the pass from the Isère valley in France to Susa in Italy in 1803-10. It is penetrated by an immense railway tunnel, which was completed in 1872 at a cost of \$15,000,000. It was constructed by the French and Italian governments and the Northern Railway Company of Italy.

**CENOZOIC** (sē-nō-zō'ik), or **Tertiary**, a division of geologic time, extending from the Mesozoic to the Quaternary Period. It embraces the rock systems of the Pliocene, Miocene, Oligocene, Eocene, and Cretaceous periods. See **Geology**.

**CENSER** (sēn'sēr), a vase or other sacred vessel used by the Hebrews for burning perfume and wafting incense. The censer used by the Roman Catholic Church in mass, vespers, etc., is called *thurible*. It is swung in the air by means of chains for the purpose of diffusing the incense in all directions.

**CENSOR** (sēn'sōr), the title of two Roman magistrates, established by Servius Tullius, but not held by special appointives until 443 B. C. Patricians filled the office until 351 B. C., when a change of the law provided for the election of one plebeian, and in 131 B. C. both censors were plebeians. The term of office originally was five years, but it was soon limited to eighteen months. Among the duties of the office were included taking the census and the assessments, caring for public buildings, supervising the morals of the nation, administering the finances, inflicting disgrace upon those who were negligent or unworthy, and regulating the private life of citizens. The censors ranked in honor second only to that of dictator. The term is now applied to an examiner of books before publication, and to any person who holds the position of a critic.

**CENSUS** (sēn'sūs), an official numbering of the people, together with the collection of other statistics regarding the population, industries, and productions of any district or country. The Israelites were counted by Moses in 1490 B. C.

and by David in 1017 B. C. A general census system was established by Servius at Rome, under which an enumeration was taken every five years. Greece and other ancient countries maintained census systems. In the Roman government severe penalties were inflicted in cases where citizens gave in false returns, or refused to make statements, this being necessary because taxation depended upon the census. The first modern European nation to establish a census system was Sweden, where a reliable enumeration was made in 1749. France, Venice, and Florence established census systems before Sweden, but they were not counted reliable. The census of the United States, Switzerland, England, Sweden, Norway, Belgium, Holland, Portugal, and other nations is taken every ten years. In Germany a census is taken every five years; it may be said that the German system dates from Frederick William I. of Prussia. The first census in the United States was authorized by an act of Congress in 1787 and was taken in 1790. Congress also authorized a decennial census; thus one was taken in 1800, 1810, 1820, and every tenth year; the last taken was in 1900. On record they are known consecutively, the last being the twelfth. The census of Canada is taken every tenth year, in the years ending in 1, as 1901, 1911, 1921, etc.

Congress has general control of the census, and may fix the rules and regulations from time to time. Previously it was under the supervision of the Department of the Interior, which was organized in 1849. Congress placed the eleventh census and succeeding censuses under the immediate direction of the superintendent of the census, who was made the head of the census office. Each State is under a supervisor, under whose direction the enumerators canvass their respective subdistricts in the month of June. The enumerators must visit personally all families and dwelling houses within their respective districts, and ask such questions of the family regarding the age and intelligence as are required by act of Congress. The matters regarding which inquiry is made include age, sex, color, and ability to read and write, as well as facts relating to commerce, agriculture, manufactures, resources of the country, productions, and many other matters of interest regarding the population and products. It is made incumbent upon persons to answer the questions asked them, and a penalty of \$30 is placed upon those refusing to answer, with imprisonment until the penalty is paid. The penalty applies to each refusal to answer. The office of the superintendent of the census is



virtually perpetual, since it requires ten years to publish all the information regarding the population, productions, general conditions, and other matters of general interest regarding which information is taken by the enumerators.

**CENT**, from the Latin *centum*, a copper coin of the United States, which has the value of ten mills, or the hundredth part of a dollar. The same value is represented by the cent used in Canada, and approximately the same by the *centime* in France, the *centesimo* in Peru and Italy, and the *centavo* in Chile and other countries.

**CENTAUR** (sĕn'tar), a name first applied to a savage race of people inhabiting the forests and mountains of Thessaly, but later incorporated in the myths of Greece. They are mentioned by Homer as gigantic savages covered with hair, while the poet Pindar refers to them as half man and half horse. It is thought that the myth arose from the appearance of men on horseback in battle against people unacquainted with the uses of the horse, as was the case when the Spaniards invaded Mexico, the Mexicans thinking that the horse and man constituted one animal, as the Grecian centaur. The name is also given to a constellation in the Southern Hemisphere located below the Southern Cross. It contains two stars of the first magnitude and five of the second.

**CENTENNIAL EXPOSITION** (sĕn-tĕn'-nĭ-al), an international exposition of arts, commerce, manufactures, and products of the soil and mines held in 1876 at Philadelphia, Pa. It was designed to celebrate the 100th anniversary of the Declaration of Independence of the United States, and was open to visitors from May 10 to Nov. 10. The grounds on which this first international exposition of America was held included 236 acres, which was a part of Fairmount Park, and about two hundred buildings were erected. The largest attendance on a single day was on Sept. 28, which was Pennsylvania Day, when 274,919 persons entered the grounds. A total of 9,910,996 admissions were recorded during the season, of which 8,004,274 were paid. The leading nations of the world made exhibits of their products and the several states of the United States were represented, hence the exposition furnished facilities for studying the growth and development of industries as well as the quality of products in almost every art and enterprise. In this respect the exposition was profitable, furnishing means to compare and criticise, and as a result much benefit has come to trade and in manufacturing. See **Exposition**.

**CENTER OF GRAVITY** (grāv'ĭ-tĭ), that

point of a body about which all its parts can be balanced. The attraction of gravity on any body tends to draw its particles toward one point, though the direction of these forces are not parallel. However, since the radius of the earth is very large in comparison with the size of any object which is weighed, the diversions of the directions of these forces from parallel lines is practically not measurable. The point at which all the parallel forces that make up the weight of a body meet is the center of gravity, and is sometimes called its *center of mass* or its *center of inertia*. A ring and other circular bodies have their center of gravity on the outside. The center of gravity of bodies that are of homogeneous or uniform specific gravity may be found by geometrical rules.

**CENTERVILLE**, a city in Iowa, county seat of Appanoose County, seventy-three miles southeast of Des Moines, on the Iowa Central, the Chicago, Rock Island and Pacific, and the Keokuk and Western railroads. It is surrounded by a rich farming and coal producing region, and has a large trade in farm produce. The chief buildings include the county courthouse, the public library, and the high school. It has manufactures of flour, brick, and machinery. The municipal improvements include electric lighting and waterworks. The first settlement was made in 1847 and it was incorporated in 1848. Population, 1905, 5,967.

**CENTIGRADE** (sĕn'tĭ-grād), a thermometer graded by Anders Celsius (1701-44), a Swedish astronomer. The scale is divided into one hundred parts, named *grades* or *degrees*, of which the *zero* is fixed at the freezing-point of water and the 100 point at the temperature at which water boils. In the Fahrenheit scale the freezing point is 32° and the boiling point is 212°, hence the proportion of one degree of Fahrenheit to one of the centigrade is as 5 is to 9. That is, the range of the centigrade between freezing and boiling is 100°, while in the Fahrenheit is 180°; hence, to reduce degrees expressed in the centigrade scale to the Fahrenheit, it is necessary to multiply by 5 and divide the product by 9.

**CENTIPEDE** (sĕn'tĭ-pĕd), an articulated animal having many feet and a body made up of numerous similar segments or rings. It is popularly believed that centipedes have a hundred feet, but this is not accurate. These worms are commonly placed in opposition to the millipede, an animal reputed to have a thousand feet, but the number of its feet is likewise very various. The most prominent distinction between the two is that the centipede has only one pair of legs from every ring of the body, while the



millipede has two pairs, except the anterior five or six rings, where there are none. The joints of the centipede are not less than fourteen and the feet consist of from fifteen to thirty pairs, and sometimes even more. They are found largely under stones and decaying wood by day, but come out at night to gather food, their eyes being better adapted to twilight than to the brightness of the day. They are distributed more or less over the entire earth, but are most numerous in the warm countries. Some species in the tropical regions have a length of twenty

plains to a height of 12,875 feet above sea level, thus explaining the possibility of cultivating a large variety of products with much success. The slow development of the past two centuries is explained by the unstable government, which is frequently disturbed by political insurrections. Within recent years railroads have developed with some degree of certainty, and the different political divisions have made advances along the line of internal improvement. The productions include lumber, tobacco, corn, sugar, cacao, dye woods, mahogany, coffee, minerals, and fruits.

Coffee culture is especially profitable, and the production of tropical fruits takes a high rank. The minerals include gold, silver, copper, lead, iron, and quicksilver. Cattle raising is developing, especially in Honduras, while horses and sheep can be grown with much profit. Commerce is in a healthful state of growth with the great trade centers of the world, and is developing locally, especially in the districts where canals are building and in the regions traversed by railway lines.



CENTRAL AMERICA.

inches. Many species common to warm countries have a poisonous bite.

**CENTRAL AFRICA.** See *British Central Africa*.

**CENTRAL AMERICA**, a portion of North America, occupying the region between Mexico and South America, comprising an area of 210,900 square miles. It is yet sparsely populated, but contains a soil so rich, mineral wealth so extensive, and a climate so agreeable and healthful that a population of 25,000,000 could be supported easily. The surface rises from low coast

The governments of Central America are exclusively republics, except the small country of British Honduras, and include Guatemala, Honduras, Salvador, Panama, Nicaragua, and Costa Rica. The principal rivers are Molagua, Belize, Bluefields, San Juan, and Usumacinta. Among the chief lakes are Dulce, Managua, Petén, and Nicaragua. North of Central America is the Bay of Honduras, east of it the Caribbean Sea and Mosquito Gulf; and its western and southern shores are washed by the Pacific Ocean. In 1525 Dom Pedro de Alvarado, one





# CENTRAL AMERICA

Scale of Miles

0 50 100 200 300

— Railroads —  
 — Submarine Telegraph Lines. —  
 ● Capitals.

Size of type indicates Relative importance of places

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of the companions of Cortez, conquered the country for Spain. It was maintained as a single state under Spanish dominion until 1821, when its independence was secured by revolution. In 1839 a general revolution broke out, and terminated with a treaty under which five countries absolutely independent of each other were formed. In 1895 it was proposed to unite all the countries into the Greater Republic of Central America, which terminated in the adoption of a constitution in 1898 modeled after the Constitution of the United States. The president was to be inaugurated March 15, 1899, but a revolution broke out, and the very excellent plan was frustrated. Panama was a part of the republic of Colombia until 1903, when its people became angered by the government obstructing the project to build the Panama Canal, hence it seceded and assumed independence. The total population of the entire Central America is estimated at 3,585,000. For further information see articles treating of the several countries of Central America.

**CENTRAL FALLS**, a city of Providence County, Rhode Island, on the Blackstone River, six miles above Providence. It is on the New York, New Haven and Hartford Railroad. Among the chief buildings are the public library and the high school. The manufactures include cotton and woolen goods, machinery, leather, haircloth, thread, and copper ware. It has stone and asphalt pavements, waterworks, gas and electric lighting and electric street railways. Formerly it was a part of the town of Lincoln, but was incorporated separately in 1895. Population, 1905, 19,446; in 1910, 22,754.

**CENTRALIA** (sĕn-trā'li-à), a city in Marion County, Illinois, sixty miles east of Saint Louis, on the Southern, the Illinois Central, and other railroads. It is surrounded by productive coal regions and an agricultural country. Among the chief buildings are the Carnegie library, the city hall, the high school, and a number of churches. The manufactures include flour, implements, cigars, machinery, and earthenware. Electric lights, waterworks and a sewerage system are among the municipal improvements. It was settled in 1853 and incorporated in 1859. It is the center of a growing jobbing trade. Population, 1900, 6,721.

**CENTRALIZATION** (sĕn-tral-ĭ-zā'shŭn), the act of bringing to the center, or centralizing. The term has come to be applied largely in economics to the tendency of wealth to centralize in the hands of millionaires, and in civics to the administration of government from the central power, instead of through local management. *Localization* and *centralization* stand opposed to

each other. One represents the theory that large powers can be safely trusted to the people, while the other, centralization, represents the opposite, that large powers should be vested in those governing through the functions of high office.

**CENTRAL PARK**, a great central park of New York City, one of the most beautiful in the world, platted in 1858. Its site was once a marshy and rocky locality, which prevented the platting of city lots and the construction of buildings. It consists of 843 acres, with an additional 24 acres on the northwest. The plan of converting this tract of land into a great park was an excellent one. It resulted in transforming the rocky slopes into grassy plats and the marshes into crystal lakes, around which grow the most beautiful trees of the temperate climates. In the very heart of the city, one-half mile wide, this beautiful improvement stretches a distance of two and one-half miles. Among its attractive features are its lakes, monuments, obelisk, cave, menagerie, and labyrinth. In it are located two great reservoirs of the Croton water system, the American Museum of Natural History, and the Metropolitan Museum of Art. Central Park as a whole, considered in the light of the surrounding edifices, internal wealth, and vast improvements, affords visitors and the public a most excellent resort for pleasure and recuperation.

**CENTRIFUGAL** (sĕn-trĭf'ŭ-gal) and **CENTRIPETAL** (sĕn-trĭp'ĕ-tal), terms used in botany to designate inflorescence of two different kinds. The former term is applied when the development of flowers proceeds from the apex toward the base of the axis, and the latter, when it extends from the base to the apex. The elder and valerian are examples of the former and the daisy and hemlock of the latter. For application in physics see **Force**.

**CENTURY** (sĕn'tŭ-rĭ), the term applied in modern usage to a period of one hundred years. It was derived from the practice of the Roman tribes, who voted in companies of one hundred men each at elections.

**CENTURY PLANT**, a popular name of the agave or American aloe. It is native to Central America and Mexico. The name arose from the wrong impression that a century of leaf formation and food storage elapsed before the appearance of a flower stalk. It is a plant of beautiful appearance, and develops a cluster of very thick and spiny leaves, from the midst of which, after a number of years, a flowering stalk rapidly rises to a height of from twenty to thirty feet, and bears a large cluster of greenish flowers. After flowering, it dies down to the



ground and new plants grow up from the roots. See **Agave**.

**CEPHALONIA** (sěf-à-lō'ně-à), or **Kephallenia**, an island of the Ionian group, belonging to Greece, of which country it forms a nomarchy. The area is 302 square miles. It has a very irregular coast line and possesses a number of elevated peaks. The surface is largely mountainous. Its rainfall is somewhat deficient, and it is subject to frequent but slight earthquakes. The principal cities include Lixuri, population 6,500, and Argostoli, 9,500. Among the chief exports are textiles, cheese, oil, cereals, wine, and fruits. In former times the island belonged successively to the Athenians, Romans, Byzantines, and Venetians, and was long held by the Turks. In 1797 it came into possession of the French, who were expelled by the Russians, and they in turn by the British. In 1864 it was ceded to Greece. Population, 1906, 84,148.

**CEPHALOPODA** (sěf-à-lōp'ō-dā), a class of mollusks which have their organs of locomotion arranged in groups about the head. These organs are called feet and arms, either of which name may be properly given, since they serve both as means of locomotion and for securing a hold upon objects. The mouth, situated in the center of the circle of feelers, is furnished with a pair of horny jaws, the tongue is rough and prickly, and the eyes and organs of hearing are well developed. They breathe through gills and most species have something resembling shells, though only the nautilus and argonaut are entirely covered with them. Their arms are supplied with suckers, by which they fasten themselves to and overcome animals much larger and better protected than themselves. The cephalopoda include the cuttlefish, nautilus, octopus, argonaut, and squid. The cuttlefish is entirely unprotected by a shell, but defends itself by throwing out from a bag a dark colored fluid, which is gathered by seamen and forms the valuable pigment known as *sepia*. Many extinct species of cephalopoda are found in fossiliferous rocks.

**CERAM** (sě-rām'), or **Zeram**, an island lying west of New Guinea and belonging to the Moluccas. The area is 6,910 square miles. Much of the surface is hilly, but vegetation is luxuriant. It has extensive productions of cabinet wood, sugar, palms, tobacco, rice, and tropical fruits. The inhabitants consist largely of Malays, and the government is administered by Holland. Population, 1907, 208,460.

**CERAMIC ART** (sě-rām'ik), the department of decorative and plastic art which comprises objects made of baked clay, as cups, urns, vases, statuettes, and all others included in the

variety of porcelain and earthenwares. The Centennial Exposition (q. v.) in 1876 and the tariff law of 1883 operated to increase the American product. Besides the production of pottery proper, the art has been extended to include the manufacture of inlaid floor tiles, panels in relief, and facings. These products are usually decorated by mosaic, arabesque, or damask-finished effects. The enameling and glazing of the best products are held as trade secrets by manufacturers and are known to only a few.

**CEREBELLUM** (sěr-ě-běl'lŭm), the rounded part of the brain, situated above the medulla oblongata and under the cerebrum. It assists the brain to direct precise motion, as movements on which the body is balanced. It is composed of white matter in the interior and gray matter on the surface. The white matter is arranged in a branching manner, hence is sometimes called *Arbor Vitae*, or *tree of life*. In shape the cerebellum is oblong and flattened. It is largest from side to side and is divided into two hemispheres. Three pairs of rounded cords connect it with the rest of the brain.

**CEREBRATION, Unconscious** (sěr-ě-brā'-shŭn), an activity of the brain unaccompanied by mental activity. Many writers on psychology have advanced the theory that all the conscious mental processes are accompanied by molecular changes in the cerebrum, and that similar changes may take place without consciousness on the part of the individual, until the complete mental result is presented. According to this theory the brain works automatically, but unconsciously, which results in suddenly remembering or understanding a previously unknown matter, as a name or incident. Another example of it is an involuntary kick when the foot is tickled. It is best defined as an involuntary response of the motor nerve to an excitement of the sensory nerve.

**CEREBRUM** (sěr'ě-brŭm), the higher and front portion of the brain. It is the seat of thought and consciousness, receives all sensations, and sends all voluntary impulses and those that produce motion. Like the cerebellum, it is divided into two hemispheres, and these are again divided into an anterior, middle, and posterior lobe. See **Brain**.

**CEREUS** (sěr'rě-ŭs), the name of many species of cactus, about 100, which include several noted for their beautiful flowers. The *night-blooming cereus*, native to South America and the West Indies, is remarkable for its sweet-scented flowers, which open in the evening and fade before morning. During the time it blooms the flower perfumes the air a considerable distance with a sweet scent. The *giant cactus*,



native to the arid regions of Arizona and Mexico, is treelike and grows to a height of fifty feet, and at the top of each branch is a cluster of flowers. The natives gather its fruit for food. Another species, the *old man cereus*, is so called from the hairlike growth which appears at the top about the time the flowers open.

**CERIUM** (sē'rī-ŭm), a metallic element discovered in 1803 by Berzelius, and so named from the planetoid Ceres. It is a chocolate-brown, ductile, and malleable metal, has a specific gravity of about 6.2, and forms the two series of salts known as *ceric* and *cerous*. Cerium is not found native, but occurs with other minerals in Sweden, North Carolina, and other places, usually as the silicate of cerite and samarskite.

**CERRO GORDO** (sēr'rô gôr'dô), a pass in the mountains of Mexico, on the road from Vera Cruz to the City of Mexico. It was the scene of a battle on April 18, 1847, between Gen. Scott, with 8,500 men, and Santa Anna, with 13,000. The Mexican general had retreated from Vera Cruz and took a strong position in the pass, which was assaulted by Gen. Scott, who lost only 431 killed and wounded, while the Mexican army lost 3,000 prisoners, more than 1,000 slain and wounded, about 4,300 stand of arms, and 43 pieces of artillery. Gen. Scott moved to Jalapa the next day and occupied it.

**CERTIFICATE** (sēr-tif'ĩ-kât), a written document certifying to the qualification, conduct, or other advantageous facts more official than a recommendation. In the United States it is commonly understood to be a formal statement made by a public servant in the execution of his duty, as the certificates issued to school teachers and those written by courts, postmasters, and collectors of taxes.

**CERUSE** (sē'rŭs), a name given to white lead, or the carbonate of protoxide of lead. It is prepared by subjecting lead to a treatment of carbonic acid, and by the action of the vapor of vinegar on the slabs of lead, by which the metal is converted into a carbonate. It is used as a cosmetic and is mixed with oil for use in painting.

**CETACEA** (sê-tă'shê-à), an order of marine animals, having no hind feet and including species that surpass in size all others now living. Their form is like that of fishes, with the exception that the tail is horizontal, thus enabling them to rise rapidly to the surface of the water for respiration in the air, which is necessary, as they breathe with lungs. They are true mammals, since they suckle their young, and are warm-blooded. They are commonly divided into cetacea herbivora and cetacea ordinaria; the former division includes the dugongs, lamantins,

and stellerida, and the latter, the dolphins, whales, narwhals, porpoises, and cachalots. Remains of these animals are found in the deposits of the Eocene period and extend from that epoch to the present time.

**CETTE** (sět), a city of France, in the department of Hérault, twenty miles southwest of Montpellier. It is situated on the Mediterranean Sea, is well fortified, and has an important domestic and foreign trade. A deep canal connects the harbor with the lagoon of Thau, which is near the city, and through it transportation facilities are furnished by the Rhone and other streams. It is a railroad center and has electric railway facilities. Among the chief manufactures are chemicals, perfume, machinery, sailing vessels, and canned fish and oysters. The city has a number of fine buildings, including numerous schools and churches, and is supplied with modern utilities, such as paving and electric lights. It was founded in 1666. Population, 1906, 33,243.

**CEUTA** (sŭ'tà), a Spanish town on the northern coast of Africa, located on a small promontory in Morocco, eighteen miles south of Gibraltar. It is well built and strongly fortified. The chief buildings include those of the government and a cathedral, and it belongs officially to the province of Cadiz. Ceuta was founded by the Romans and was annexed to Spain in 1580, since which time it has served mainly as a penal settlement. Population, 1906, 14,350.

**CÉVENNES** (să vĕn'), a range of mountains in the southern part of France. It extends a distance of about 400 miles, from the Vosges in the northeast to the Pyrenees in the southwest, and separates the basins of the Loire and the Garonne from those of the Rhone and the Saône. With it is included the Côte d'Or, which is sometimes classed with the Vosges system. Mont Mézenc, the highest peak, has an elevation of 5,754 feet, and the average elevation is about 3,500 feet. The rocks consist chiefly of limestone, sandstone, and granite. The Albigenes, the Camisards, and the Waldenses were sheltered from persecution in these mountains during the religious warfares of France.

**CEYLON** (sê-lŏn'), a large island in the Indian Ocean, lying southeast of the peninsula of Hindustan, to which it is almost joined by a chain of reefs known as Adam's Bridge. It is separated from continental Asia by the Gulf of Manar and Palks Strait. The length north and south is 265 miles; greatest breadth, 140 miles; area, 25,332 square miles. The soil is exceedingly fertile. Large tracts consist of marshy flats and jungles, but where these have been



drained they constitute the richest and most productive land. The animals common to Asia abound on the island and consist of crocodiles, pangolin, armadillos, wild hogs, monkeys, jackals, buffaloes, leopards, hyenas, elephants, bears, flying foxes, numerous snakes, and a large variety of beautiful birds of song and plumage. The most important stream is the Mahavelliganga. Other rivers include the Kalawa, Oga, Moondini Aar, and Gindura Ga. The forest productions are exceedingly valuable, and the fisheries and minerals are a considerable source of wealth. The productions and exports consist largely of live stock, coffee, tea, plumbago, cinchona, cinnamon, tobacco, cereals, cocoanuts, and many varieties of excellent fruits. Among the minerals are iron, zinc, salt, and plumbago.

The history of Ceylon extends back to remote antiquity, but authentic accounts date only to the year 543 B. C., when it was governed by a series of kings, who had their seat of government at the ancient capital of Anuradhapura. In the year 307 B. C. Buddhism was introduced by the invaders of India. Indian civilization was a potent factor in the building of cities and the development of agriculture, commerce, and the arts. The capital city was a place of much wealth and magnificence, a fact attested by the ruins still found at its former location. Ceylon became known to the Europeans at the time of Alexander the Great, when he made his noted expedition from Greece to India. The Malabars invaded it in the Middle Ages and later it became tributary to China. When visited by Marco Polo, near the end of the 13th century, it had declined materially in prosperity. In 1505 it was visited by the Portuguese and later was made subject to them. At that time the seaports in the northern part of the island were held by the Arabs, or Moors, who carried on an extensive trade, and those in the southern part were in possession of the Malabars.

In 1658 the Dutch expelled the Portuguese, and they in turn were conquered by the British in 1796, but it was not annexed by the latter until 1817. The island still remains under British influence. It is governed by a local magistrate and an executive council of five members, and the legislative power is vested in a council of seventeen members. Buddhism is the prevailing religion, though there are a considerable number of Christians and Mohammedans. Several railroads, highways, and telephone and telegraph lines are maintained. A plan has been projected to connect the island with the continent by railway. Colombo is the capital. Among the other important cities are Jaffna, Point de Galle,

Kandy, and Trincomali. Population, 1906, 3,680,195.

**CHAGOS** (chä'gös), the name of a small island archipelago in the Indian Ocean, a colonial possession of Great Britain and a dependency of Mauritius. These islands are of coral formation. Diego Garcia, the largest island of the group, is about six miles wide and twelve miles long, and has a population of 526. Fruit and cocoanut oil are the chief products. Population, 1906, 1,028.

**CHAGRES** (chä'grës), a seaport of Panama, on the Caribbean Sea, at the mouth of the Chagres River. This stream is about 100 miles long and flows nearly across the isthmus of Panama, entering the sea a short distance west of Colon, and its waters are used in connection with the Panama Canal. The town has a considerable trade and will be benefited as an outlet when the canal is completed. Population, 1,175.

**CHAIN**, in surveying, a line made of a hundred iron links, each 7.92 inches long. Its total length is four rods, or sixty-six feet, and ten square chains equal one acre. It is often called *Gunter's chain* from its inventor.

**CHAIN**, a line formed of a series of metal links, connected with or fitted into each other. In the manufacture of chains the best quality of soft iron is used, as they require strong material possessing capability of being easily welded. Chains are used for support, connection, restraint, transmission of mechanical power, and many other purposes in construction and machinery. The chain pump has an endless chain and is used mainly for pumping water from deep wells.

**CHAISE** (shāz), a vehicle with two wheels, usually drawn by one horse, and furnished with a calash top. The body is hung on leather straps, or through braces, and is intended for two persons. Oliver Wendell Holmes in his poem, "The Wonderful One-Hoss Shay," immortalized this kind of a vehicle. More recently the name has come to be applied to a light carriage with four wheels.

**CHALCEDON** (käl-sē'dün), a city of ancient Bithynia, in Asia Minor, near the Bosphorus, opposite Byzantium. It was about one mile distant from the site of the present city of Constantinople and its site is now occupied by the modern town of Kadiköi. It was founded about 685 B. C. and was long important as a military and commercial center. The Romans captured it in 74 B. C. and made it a free city. In 451 A. D. it was the seat of a general council of the Christian Church, which was attended by 600 bishops and other representatives. It was convoked by Emperor Marcianus to settle the



doctrinal disputes of the Nestorians and Monophysites, and after long deliberations it adopted the orthodox confession of faith, adjusted differences between the sees of Antioch and Jerusalem, and defined the duties and obligations of bishops.

**CHALCEDONY** (käl-sěd'ō-nŷ), a beautiful mineral quartz mixed with opal. It is named from Chalcedon in Bithynia, where it is found in considerable quantities. It also exists in basaltic rock formations, such as abound in Iceland and Scotland. The varieties are different in color and hardness. When arranged in stripes or layers, chalcedony is called *agate*; if the stripes or layers are horizontal, it is termed *onyx*; besides these are greenish, flesh-red, and grayish-red varieties. Many species of chalcedony are either transparent or translucent with a luster nearly the same as that of wax. The principal uses are for ornaments, necklaces, and brooches. Chalcedony is a favorite article for cups, ornamental boxes, and souvenirs. Various articles and figures made of chalcedony by the ancients may be seen in the museums of America and Europe. Some varieties are rich in vegetable fossils, which were likely incased while the mineral was forming.

**CHALCIS** (käl'kīs), a town of Greece, capital of the nomarchy of Euboea, 18 miles north-east of Thebes. It is on the island of Euboea, which is separated from the mainland by the strait of Euripos, and the strait is crossed by a stone bridge about 120 feet long. Through the narrow channel passes a strong current, and this has been improved by deepening so the larger vessels can pass safely through it. It is thought that the vicinity of Chalcis was colonized from Athens at a very remote date, and it is known that Aristotle died here in 322 B. C. The Venetians captured it in 1205 A. D., but it passed to the Turks in 1470 and to the Greeks in 1821. The streets are narrow and few ancient ruins are in the vicinity. Most of the inhabitants are Greeks and Italians, but a few Mohammedans and Jews reside here. Population, 1907, 10,150.

**CHALDAEA** (käl-dē'ā), in ancient geography, the southern part of Babylonia, but the name is applied by some writers to the entire Babylonian Empire. The Chaldaeans were devoted to the pursuit of natural astronomy and magical science. Their language consisted of the Aramaean, one of the principal dialects of the ancient Semites. The portion of the Bible including Daniel from Chap. ii, 4, to Chap. vii, 28; Ezra, Chap. iv, 8, to Chap. vi, 18; Chap. vii, 12-16; and Jeremiah, Chap. x, 11, were written in the Chaldee language, but it included several shades of dialects. A number of the Jewish

writings were in the Chaldee language. See **Babylon**.

**CHALDEE LANGUAGE** (käl'dē), the eastern dialect of the Aramaean language, of which the Syriac is the western branch. It was written in cuneiform characters, probably borrowed from the Assyrians, and its literature is known to us only through the writings of Jews. Many inscriptions have been discovered in modern Armenia that are assigned to this language, though they show some differences in the dialects, and they are generally classed with the Hittite and other early languages of Asia. The older writings in the Chaldee language are represented in certain chapters of the books of Ezra, Daniel, and Jeremiah, and the more recent are found in the later writings of Jews, such as those in the *Targums*. It is thought that Abraham used the Chaldee language before migrating to Palestine.

**CHALEURS BAY** (shā-lērs'), an inlet on the eastern shore of the Gulf of Saint Lawrence, which forms part of the boundary between Quebec and New Brunswick. Its length from east to west is about ninety miles, the breadth is from twelve to twenty miles, and the depth is about 250 feet. It received the discharge from a number of small streams, including the Patapedia River from the west and the Nepisiguit River from the south. The fisheries are important, and it has deep water in many places along the shore, affording safe anchorage for large vessels. It was so named by Jacques Cartier, who discovered and explored it in 1535.

**CHALICE** (chāl'is), an ordinary drinking cup used by the ancients, but the term is now applied to the cup in which the wine of the holy sacrament is administered. It consists of the foot, the stem, the knop, and the bowl. In most cases the foot or base is wide so as to prevent the vessel from upsetting. Anciently the chalices were made of wood, horn, or gold, but now they are chiefly of gold, silver, or glass, and are adorned with elaborate designs. Some are enriched with inscriptions and even settings of precious stones.

**CHALK** (chāk), an earthy limestone belonging to the cretaceous system. It is white, yellowish, or grayish in color and readily imparts its color to surfaces over which it is rubbed. Chalk is composed mainly of the mineral remains of animals, such as the teeth of fish and reptiles and the shells of turtles and mollusks. On the coasts of France and Great Britain, and in other localities, it occurs in quantities sufficiently large to form cliffs many feet high. Texas has a belt of chalk deposits that is about



250 miles long and 600 feet thick. In laying the Atlantic cable great oozes were discovered, proving that the process of formation is still going on in the sea at a depth of from 5,000 to 15,000 feet. The principal uses of chalk are for writing on blackboards, for cleaning purposes, for manure when burnt with lime, and for medicine. Several varieties furnish a fine mortar and whitewash. Red chalk consists of a clay-iron ore and black chalk contains a carbon, while French chalk is a kind of soapstone. These well-known varieties are used extensively in making colored crayons and in drawing.

**CHALLENGER EXPEDITION** (chäl'lĕn-jĕr), an exploration made by the British government in 1872-76. The *Challenger*, a vessel of 2,306 tons, was sent out in 1872 to make soundings and study the surface as well as the bottom of the sea. Captain Nares had charge of the expedition, and during the three and a half years traveled 68,900 nautical miles. The depth and the character of the surface and bottom, including the temperatures, currents, atmospheric conditions and fauna, were studied at 362 stations. The deepest soundings were made between Japan and the Admiralty Islands, where the depths were found to be 4,575 fathoms.

**CHÂLONS-SUR-MARNE** (shä-lôn'sür-märn'), a city of France, capital of the department of Marne, ninety-five miles east of Paris. It is nicely located on the Marne River, which is crossed by a fine stone bridge, and has extensive railroad conveniences. It has a seminary, an industrial school, a museum, and a public library. The manufactures include leather, machinery, and cotton and woolen fabrics. It has a brisk trade in grain, merchandise, and champagne. Châlons was captured by Aurelian in 274 A. D., and near it were defeated Attila and his Huns, who had made an attack on the Romans and Visigoths. It was captured by the Germans in 1814 and again in 1870. Napoleon III. established a military training camp near Châlons in 1856. Population, 1906, 21,860.

**CHÂLONS-SUR-SAÔNE** (sür-sôn'), a city of France, capital of a district in the department of Saône-et-Loire, thirty-two miles north of Mâcon. It is on the Saône River, at a point where the Canal du Centre joins that river with the Loire. The surrounding country has fine vineyards and cultivated fields. Many of the streets are irregular, but some of the newer buildings are modern and commodious, and the streets are well improved with paving and drainage. It has a college, several fine churches, and a public library of 25,000 volumes. The manufactures consist chiefly of pottery, clothing, jew-

elry, and hats. It has a growing trade in live stock and agricultural products. Population, 1906, 26,850.

**CHAMBER** (chäm'bĕr), the term used in many countries to denote the legislative branch of the government, as the chamber of deputies in France, and the imperial chambers of the German Empire in the time of Maximilian I. Chambers of commerce are organizations which are maintained by business men in cities to further commercial interests. See **Board of Trade**.

**CHAMBERSBURG**, a borough in Pennsylvania, county seat of Franklin County, fifty-two miles southwest of Harrisburg, on the Western Maryland, the Philadelphia and Reading, and other railroads. It is surrounded by a mineral and agricultural district, and has a large trade in produce and merchandise. Its industries include flouring mills, iron foundries, and factories for the production of furniture, shoes, farm machinery, and wood products. It is the seat of Wilson College and a fine school system. The municipal improvements include electric lights, waterworks, a public library, and street pavements. It was settled by Benjamin Chambers in 1730 and was incorporated in 1803. Population, 1900, 8,864.

**CHAMBLY** (shän-blĕ'), a town of Quebec, in Chambly County, about twenty-five miles southeast of Montreal. It is situated on the Richelieu or Sorel River, at the rapids of the river, the outlet of Lake Champlain, and is connected by canal with Saint Johns. The British had a post at Chambly in 1775, and General Montgomery, who was besieging Saint Johns, aided by some Canadian scouts, surprised and captured the post after a short fight. The Americans secured a large quantity of provisions and military stores and captured the colors of the seventh regiment of British regulars, which was sent to the Continental Congress as the first trophy of war received by that body. This disaster hastened the downfall of Saint Johns.

**CHAMBORD** (shän-bôr'), a village of France, in the department of Loir-et-Cher, ten miles east of Blois. It is noted for a castle of its own name, which is surrounded by a beautiful park twenty-one miles in circumference. This castle was begun in 1526 under the direction of Francis I., and was given by Louis XV. to Marshal Saxe, who lived here from 1745 until his death in 1750. Napoleon I. bestowed it on Marshal Berthier, and in 1821 it was purchased and presented to the Duke of Bordeaux, who afterward became the Count of Chambord. This building has 440 rooms, is in the Renaissance style, and is surmounted by six towers, each of which is sixty feet in diameter.



**CHAMELEON** (kâ-mē'lê-ŭn), a genus of reptiles belonging to the order of lizards, and native to Eurasia and Africa. They are sluggish and move silently and slowly, but possess remarkable quickness of eye and tongue. The tongue is wormlike and is thrust out with much precision in catching insects, upon which they feed. In size they range from six to eight inches long, with a tail about five inches, and the feet are suitable for fastening themselves to branches. They have but five cervical vertebrae, five toes, and very large lungs, and are reproduced by means of eggs. Their capacity to inflate themselves with air has given rise to the fable that air is their food, but this is erroneous, as they live on insects caught by thrusting the long, viscid tongue outward and grasping flies, beetles, and other insects. The peculiarity of chameleons consists mainly in their ability to assume colors agreeable to their surroundings, thus rendering themselves in appearance like the leaves or branches of the trees for protection. Some writers assert that they change colors, at least in some cases, to display displeasure when they are disturbed. These changes are brought about by cells at various depths in the skin, by which expansion and contraction are effected, the contractile cells being under the influence of the nervous system.

**CHAMOIS** (shăm'mÿ), the only wild antelope found in Europe, known to the Germans



CHAMOIS.

as the *gemse*. It is found in the Alps, Carpathians, Pyrenees; in Greece, and in Western Asia, particularly in the Taurus and Caucasus mountains. In size it is about three feet long

and two feet high, and is similar to the roebuck in structure and general characteristics. Its horns are from six to eight inches long. They are smooth, round, and straight, with a short curve at the ends. The hairs are longest in the winter and of a chestnut-brown color, but in the summer season assume a much lighter hue, approaching gray in the spring. It inhabits the precipitous and rocky mountain peaks, moving to higher altitudes in the summer season and to the lower slopes in the winter. Herds of from ten to twenty feed in the mornings and evenings, while in the day they are inclined to seek places of safety, usually isolating themselves for that purpose. The habits are quick and watchful, and the power of smell is remarkable, thus rendering capture difficult. The flesh is a favorite article of food, while the celebrated chamois skin is made from the hide.

**CHAMOMILE** (kăm'ō-mīl), or **Camomile**, a plant native to Southern Europe, but now cultivated extensively in gardens. It has branched stems, is perennial, and bears a white flower with a yellow center. It yields an essential oil useful in medicine. The leaves and flowers are used for an infusion, as a stimulant, and for poultices.

**CHAMOUNI** (shâ-mōō-nē'), or **Chamonix**, a famous valley and village located among the Alps in France. The village is the gathering place of about 20,000 tourists annually, on account of the beautiful location and grandeur of the scenery found in the valley and adjacent mountains. The valley is located 3,400 feet above sea level, is two miles wide and thirteen miles long, and south of it is the celebrated group of Mont Blanc. Vast glaciers slide from the mountains. The large lake of ice called Mer de Glace merges into the Glacier de Bois, which reaches to the lower portion of the valley even during the summer season. Mont Blanc, as seen from the village, affords a view that is remarkable for its simple and massive sublimity, and has caused an inspiration for beautiful writings by Shelley, Byron, Wordsworth, Coleridge, Lamartine, and Ruskin.

**CHAMPAGNE** (shăm-pān'), a celebrated brisk and sparkling wine now made chiefly in the department of Marne, but formerly in the province of Champagne, France. The finest quality is made of black grapes, but similar grades are made in Germany. The effervescent wines made in California are pronounced equal to the best French product.

**CHAMPAIGN**, a city of Champaign County, Illinois, 127 miles southwest of Chicago, on the Illinois Central, the Wabash, and other railroads. It is surrounded by a fine agricultural country.



The streets are improved by avenues of trees, pavements, waterworks, and sewerage. It has a public library, a fine high school, and a fine public park. The manufactures include machinery, cigars, earthenware, and implements. The University of Illinois is located near the city. It is connected with Urbana, the county seat, by an electric railway. Champaign was settled in 1855 and incorporated in 1860. Population, 1900, 9,098.

**CHAMP DE MARS** (shān'de-märs), meaning Field of Mars, a celebrated square in Paris, France, where the feast of the revolution was held on July 14, 1790, and Louis XVI. swore to defend the new constitution. Besides being a seat of many noted feasts and demonstrations, it was the site of the great expositions of 1867, 1878, 1889, and 1900.

**CHAMPLAIN** (shām-plān'), a beautiful lake located between New York and Vermont and extending into Canada. Its greatest breadth is about fifteen miles; length, 110 miles; and area, 600 square miles. It is connected with the Hudson River by a canal. The discharge is carried by the Richelieu River, which flows into the Saint Lawrence. A large number of small islands are located in the lake, some of which are highly productive, and its beautiful scenery attracts many visitors. The name was given to it from its discoverer, Samuel de Champlain. It was the scene of an important battle between the Americans and British in 1814, when the latter were defeated.

**CHAMPS ELYSÉES** (shān-zā lē-zā'), a fashionable promenade established at Paris, France, in 1616, when it was planned by Marie de Medicis. It extends from the Arc de l'Etoile to the Place de la Concorde, a distance of one and one-third miles. At the lower end are many cafés and restaurants. Those who visit Paris find the promenade one of the finest sights, especially in the afternoon, when many carriages and pedestrians are on the Champs Elysées.

**CHANCELLOR** (chān'sēl-lēr), an officer who presides over a court of chancery, similar to the judges of a court of law. He is usually selected from among judges by other judges, to sit as a chancellor. In a university the chancellor is the chief officer of the institution, but generally an honorary officer. In Great Britain the lord high chancellor is a state officer of large functions. His office is one of the highest civil positions in the land and when raised to the peerage he takes precedence immediately after the Archbishop of Canterbury. He is an important official of state, acts for both England and Scotland, and in some respects

for the United Kingdom. The chancellor is the chairman or speaker of the House of Lords.

**CHANCELLORSVILLE**, a village in Spottsylvania County, Virginia, about sixty-five miles northwest of Richmond. It was the scene of a number of battles fought on May 2-4, 1863, between the Union and Confederate armies. General Hooker commanded the army of the Potomac and the Confederates were commanded by General Lee. The Union army numbered 100,000, while the Confederates consisted of 90,000 men. In the terrible conflict of three days the Union army was defeated with a loss of 18,000 men, while the Confederates lost 13,000, including their able and brave general, Stonewall Jackson, who fell mortally wounded and died about a week later. This loss was irreparable.

**CHANG-CHOU** (chāng'chou), a city in the province of Fu-Kien, China. It is located in the valley of the Chang River. The city is surrounded by a wall about five miles in circumference and is ancient and uncouth. In it are several Buddhist temples, among them a magnificent structure erected in the 8th century. The industries include manufactures of utensils, sugar, porcelain, opium, and paper and silk goods, and a large export and import trade. Its location on a navigable river only twenty-five miles from the sea renders it an important commercial center. Population, 900,190.

**CHANNEL ISLANDS**, a small group of islands in the English Channel, off the coast of France. The area is 108 square miles. The most important islands of the group include Sark, Alderney, Guernsey, and Jersey, the last three giving the names to the celebrated milch cows exported from them. Much of the surface is productive and well cultivated. The principal industries are agriculture and dairying. The language spoken is Norman-French, the official language is French, and the government is under the British. These islands became a possession of Britain at the time William the Conqueror made his famous invasion. A number of strong fortifications still indicate the English possession of Norman provinces, of which they are the only remains. Population, 1907, 95,974.

**CHANTILLY** (shān-tē-yē'), a town of France, in the department of Oise, twenty-four miles northeast of Paris. It is a picturesque place and is noted for its manufacture of fine lace and porcelain. Several parks are maintained, one of which belonged to the Condé family from 1632 until 1830. The remains of Coligny were interred in the parish church of Chantilly, after his head had been cut off and



sent to Catherine de' Medici. In one of the châteaux is a splendid art collection, which was presented by the Duc d'Aumale to the Institute of France in 1887. Population, 1906, 4,750.

**CHANTILLY** (shān-tī'li), a village of Virginia, in Fairfax County, twenty miles west of Washington, D. C. It was the scene of an indecisive battle of the Civil War on Sept. 1, 1862, when the Federals under Generals Hooker and Kearny made an attack upon the Confederates under General Jackson. Both sides lost heavily and Generals Philip Kearny and Isaac J. Stevens were among the Federal dead.

**CHANUTE** (chā-nōōt'), a city of Kansas, in Neosho County, 125 miles southwest of Kansas City, Mo., on the Missouri, Kansas and Texas and the Atchison, Topeka and Santa Fé railroads. It is surrounded by a country that produces gas and oil. Among the public utilities are waterworks, street pavements, a public library, and several fine schools. It has manufactures of machinery, clothing, and ironware. The first settlement was made in 1872 and it was incorporated the following year. Its rapid growth and prosperity is due to its convenient location on important railways and within a productive field of oil and natural gas. Population, 1904, 10,116.

**CHAOS** (kā'ōs), the void existing before the creation, or the mass of matter existing in confusion before the elements were arranged according to class, kind, and form by creation. The term is also used to express any condition of being in which the elements or parts are in utter disorder or confusion.

**CHAPALA** (chā-pā'la), a beautiful lake located in Mexico, in the states of Jalisco and Michoacán, and forming part of their boundary. The lake has excellent fisheries. Near it is the railroad city of Ocotlan. The area of the lake is 1,390 square miles. It receives the inflow from the Rio Lerma and the discharge is carried by the Rio Santiago, which issues from the north side.

**CHAPERON** (shāp'ēr-ōn), a cap or hood worn by knights. The name is also applied to a device placed on the foreheads of horses drawing a hearse, especially at stately and pompous funerals.

**CHAPLAIN** (chāp'lin), a name originally applied to a spiritual adviser of a regiment of soldiers, but now used to signify the spiritual adviser of any organization or collection of persons. Such an officer is employed by legislative bodies, naval organizations, and military institutions, while many noblemen and sovereigns also engage them. In the prisons the chaplain ministers to the comfort and need of

the inmates. The chaplain of the United States army usually holds the rank of captain. He ranks from lieutenant up to captain in the navy, this depending upon the time of service.

**CHAPULTEPEC** (chā-pōōl-tā-pēk'), a fortress two miles southwest of the city of Mexico, located on a rock formation 150 feet high, and crowned by a castle erected in 1785 by the Spaniards. It was the scene of the decisive battle in the Mexican War. General Scott first stormed Molino del Rey on Sept. 8, 1847, and engaged the attention of the Mexicans by heavy fire from the batteries at the south end of the city. On Sept. 13, under the cover of guns, picked men forming two columns assaulted and captured the fortress. The Americans lost less than 900 killed and wounded. The fall of Chapultepec opened the causeway to the capital of the republic and compelled the Mexicans to terminate the war. Since then the castle has been transformed into a beautiful summer residence for the President of Mexico, while adjoining it is the Mexican military school, often called the West Point of Mexico.

**CHARADE** (shā-rād'), a kind of enigma, which consists in dividing a word into syllables, each of which must be a complete word and vaguely define without naming each of the parts and the whole word. For a charade to have literary worth its members must have some relation to each other, and unite in an epigrammatic point. It was invented in the latter part of the 18th century and had been used most extensively in Germany and France. In some countries the charade forms a kind of parlor drama, in which each syllable is introduced prominently in the successive scenes, and the whole word is brought out in the last act.

**CHARCOAL** (chār'kōl), a pure variety of carbon prepared from bones or vegetable substances. Other sources of charcoal are coke, ivory, and various semiorganic substances. Charcoal made of bones is used in refining sugar and as a medium to filter and disinfect. It is prepared by calcining bones in closed vessels, which are in the form of earthen pots, and are filled with bones and highly heated, or are made of retorts and treated much like those used in distilling coal for the production of illuminating gas. It requires about sixteen hours of firing to complete the charring of fifty pounds of bones to a pot. After calcining, the bones are ground between rollers to form granulated material serving to charge the filters of the sugar refiner. *Bone charcoal* is particularly valuable for removing color and impurities from sugar. *Wood charcoal* is made



by burning wood with but little access of air. Before burning, the wood is piled in a heap and covered with sand or earth. The fire is applied at an opening near the bottom of the pile, and small openings are constructed above for the escape of the gases. Since wood consists of carbon, hydrogen, and oxygen, the carbon remains to form the charcoal, while the hydrogen and oxygen gases escape. In making a fine grade of charcoal, useful in the manufacture of gunpowder, such woods as the willow are used, and the burning is done in iron cylinders or retorts, in which the hydro-carbons and acids are removed by a process of distillation. In this way the process can be accurately regulated, and the products are increased correspondingly in value. The many useful purposes to which wood charcoal is put include its employment as an essential element in the manufacture of gunpowder, fireworks, galvanic batteries, and electric lamps. It is valuable as a fuel, a polishing powder, a means to remove color and unwholesome smells from solutions and water, an absorbent of gases and vapors, and a nonconductor in safes, refrigerators, and ice houses. The best grades of charcoal contain from sixty-five to ninety-six per cent. of carbon. Charcoal consisting of lamp-black, ivory black, and kindred substances is used as the basis of black paint, and is of value as a constituent of printing ink when mixed with resinous matter and oils. Other uses of the several varieties are for medicine and in the toilet for tooth powder.

**CHARENTE** (shä-ränt'), a river in the western part of France, rises about fourteen miles northwest of Châlus, and after a course of 220 miles discharges into the Bay of Biscay, opposite the Aix and Oléron islands. It is navigable to Angoulême, a distance of 104 miles, but steamboats do not ascend farther than Saintes, which is at the head of tidewater.

**CHARIOT** (chär'ï-öt), a vehicle used for pleasure and war by the early Assyrians, Egyptians, Greeks, Romans, and other ancient peoples, but now used principally in exhibitions. It has two wheels and is closed in front and open behind, and those used by ancient warriors had quivers to contain the arrows attached to the side. Three men—the *warrior*, the *shield-bearer*, and the *charioteer*—were necessary to fully equip the vehicle of war. In the ancient chariot races two or four horses were commonly used, while in war two horses generally served the purpose of drawing this vehicle. The chariots employed by the Romans in the campaigns in Germanic countries and Gaul were provided with a scythelike implement, hooks,

and other offensive weapons. They were attached to each extremity of the axle, on the outside of the wheels. The sculptures of ancient Assyria give definite ideas of the construction of the vehicles that were peculiar to their time.

**CHARITY, Sisters of**, a sisterhood of the Roman Catholic Church, founded by Saint Vincent de Paul at Paris in 1629. The primary object of this organization at the time it was instituted was to nurse patients in hospitals, but the care of poor children, free schools, almshouses, and hospitals were soon placed under their management. Branch organizations are now maintained in all countries where the Catholic Church is represented, the total being about 40,000. Besides these are the Sisters of Charity organized at Dublin, Ireland, in 1815, and the Sisters of Charity of Saint Paul, instituted by a French curé in 1704. The vows of the members in the last two are perpetual, while in the former they renew their vows annually. The work of these helpful organizations consists largely of giving instruction to the children of the poor and in parochial schools.

**CHARITY ORGANIZATIONS**, the name applied to associations having for their object the improvement of morals and the conditions of human life. In some countries they are known as *United Charities* or *Bureau of Charities*. The first society of this kind had its beginning in London in 1869, and its plan was copied in 1873, when a similar society was formed at Germantown, Pa. The Buffalo Charity Organization Society was founded in 1877, and since then many similar societies have been formed. In 1908 there were 142 cities in the United States that had societies of this kind. In the same year ten cities of Canada had organizations of this kind, and similar societies were maintained in Australia and most countries of Europe.

The general object of charity organizations may be said to be the cure of social evils as well as the alleviation of distress suffered by the poor and unfortunate. Where those in poverty are absolutely in need of alms it is customary to give relief, but as a general rule the practice is to train people to help themselves. In many cases trained workers of the local association visit the homes of improvident families with the object of helping them to help themselves, or rather to put them on a footing where they will be able to live under improved conditions and become competent to sustain themselves by following some useful occupation.

Much good has been done by studying san-



itation with the view of inducing cleanliness and supplying the needy with pure water and good ventilation. In this connection the tenement houses have been improved, especially in the congested districts of large cities. The Charity Organization Societies of New York City, after taking steps to improve housing by advocating restrictive legislation and sanitary inspection, effectually turned attention to the project of stimulating a higher conception of life by means of general education. Recently the Chicago Bureau of Charity carefully investigated the treatment of youthful offenders and worked out a plan to rescue children under arrest for crime. This movement caused the establishment of the Chicago Juvenile Court, which was organized under a law that went into effect in 1901, and it has jurisdiction of cases in which children under ten years of age are arrested for begging, singing, selling articles, or playing musical instruments on the streets. Under this plan of treating youthful vagrants, or semicriminals, it has been possible to not only reduce the number of misdemeanors committed by neglected children, but also to rescue juveniles and bring about permanent reform. Similar provisions are now enforced in Baltimore, Minneapolis, New York, Philadelphia, and other American cities. In order to prevent a tendency to crime, or reform those who have erred, it is the general rule to deal with the head of the family. Mothers' meetings, home libraries, penny saving banks, and local organizations have proven wholesome means to carry on charity work.

**CHARIVARI** (shà-rē-và-rē'), a serenade given by a company who make discordant music at marriages as a token of good feeling or for merriment. In some countries the practice is perpetrated as a mark of disregard. In France the name has been applied to several comic journals, as the Paris *Charivari*.

**CHARLEROI** (shär-le-roi'), a borough of Pennsylvania, in Washington County, 40 miles south of Pittsburg. It is located on the Monongahela River and on the Pittsburg, Virginia and Charleston Railroad, and is a manufacturing and commercial center. Among the manufactures are glass, utensils, and machinery. The principal buildings include several fine schools and churches. The first settlement on its site was made in 1890, and its prosperity is due to its extensive manufacturing enterprises. Population, 1900, 5,930; in 1910, 9,615.

**CHARLES CITY**, a city of Iowa, county seat of Floyd County, on the Cedar River, 140 miles northwest of Dubuque. It is on the Illinois Central and the Chicago, Milwaukee

and Saint Paul railroads, and the surrounding country is fertile, producing cereals and live stock. The Cedar River furnishes good water power. Among the manufactures are wagons, clothing, furniture, and farming machinery. It is the seat of Charles City College, a Methodist Episcopal institution founded in 1891. The chief buildings include a courthouse, a library, an opera house, and several fine churches. All the public utilities have been provided, such as waterworks, sewerage, and electric lighting. The first settlement was made on its site in 1856 and it was incorporated in 1869. Population, 1905, 4,546.

**CHARLES RIVER**, a river in the eastern part of Massachusetts, rises in Norfolk County and flows into Boston Harbor. It separates Charlestown from Boston, and on its banks are Cambridge, Watertown, Waltham, and Newtons. Tidewater extends to Watertown, and between Cambridge and Boston is an estuary.

**CHARLESTON** (chärلز'tün), a city of Illinois, county seat of Coles County, forty-seven miles west of Terre Haute, Ind., on the Big Four and the Toledo, Saint Louis and Western railroads. The surrounding country is devoted to farming and stock raising. It has an important trade in merchandise and manufactures of tile, flour, woolen goods, and hardware. The chief buildings include a courthouse, a free library, and a number of fine schools. It is the seat of the Eastern Illinois Normal School. The first settlement was made in 1830, and its incorporation dates from 1855. Population, 1900, 5,488.

**CHARLESTON**, a city and port of entry in South Carolina, county seat of Charleston County, on a peninsula between Cooper and Ashley rivers, eighty-two miles northeast of Savannah, Ga. It is on the Southern, Atlantic Coast Line, and other railroads, and has regular steamboat connections with Boston, New York, and the leading ports of Europe. The harbor is landlocked and safe, and has been improved by jetties so as to admit the large sea-going vessels. A lighthouse with a flashing light, elevated 133 feet, stands west of the channel. The harbor is defended by Fort Moultrie, on Sullivan's Island, which has been improved by the Federal government.

Charleston has a water front of nine miles and the larger part has regularly platted and well-improved streets, but some of the thoroughfares in the older parts are narrow. The architecture is generally substantial, constructed mostly of stone and brick, and the newer buildings are tall structures with steel frames. The



county courthouse is at the corner of Broad and Meeting streets, and near it are the city hall and the post office. Other fine buildings include the customhouse, the Thomson Memorial Normal School, the Saint Michael's Church (Protestant Episcopal), and the Roman Catholic Cathedral. It has a public library of 25,000 volumes. Among the educational institutions are the College of Charleston, the South Carolina Military Academy, the South Carolina Medical College, and the Avery Normal School for colored students. The Euston Home, the Charleston Orphan House, the city hospital, and the Confederate Home are among the charitable institutions. White Point Garden, a finely wooded park, contains the Jasper monument. Other objects of interests are the bust of Henry Timrod and the monuments of William Pitt and John C. Calhoun. The Battery, near the harbor, is a popular promenade.

Charleston is preëminently a manufacturing and commercial city. In the early years of the last century it was the chief cotton port of North America, but it still has a large coastwise and foreign trade. The manufactures include clothing, phosphates, furniture, cigars, machinery, refined oil, flour, boilers, and spirituous liquors. Large quantities of fruit and early vegetables are grown in the vicinity and shipped to the markets in the North. It has an important wholesale and jobbing trade with cities of the interior. The exports consist chiefly of rice, cotton, fertilizers, lumber, cereals, and live stock.

Charleston was settled by the English in 1670, when a colony under William Sayle was planted on the west bank of the Ashley River, about three miles from the present city. The public offices were shortly after removed to the present site of Charleston, which soon became one of the chief seaports in America. It was held by the Americans during the early part of the Revolution, but was captured by the British in 1780, with a force of 16,000 under Sir Henry Clinton. The first bale of cotton exported from America to Europe was shipped from this port in 1784. The ordinance of secession was passed in Charleston, and Fort Sumter, in the harbor, was the scene of the first hostility of the Civil War. Half of the city was burned in 1864 by the Union forces, and the last two years of the war it was held by the Federals in a state of siege. A great earthquake destroyed much property in August, 1886. In 1901 it was the seat of the South Carolina Interstate and West Indian Exposition. Population, 1900, 55,807; in 1910, 58,833.

**CHARLESTON**, the capital of West Vir-

ginia, county seat of Kanawha County, on the Kanawha and Elk rivers. It is on the Ohio Central, the Chesapeake and Ohio, and other railroads, and has regular steamboat connection with many river ports. The chief buildings include the capital, the county courthouse, the customhouse, and an opera house. It has extensive dry docks and shipbuilding yards. The manufactures include furniture, wagons, ice, iron fences, and machinery. It is lighted by gas and electricity, and surrounded by extensive coal fields, and has a large trade in coal and produce. A fort was built here in 1786 and the city was incorporated in 1794. Charleston was made the capital of the State in 1869, but it was removed to Wheeling in 1875. It became the permanent capital in 1885. Population, 1900, 11,099; in 1910, 22,996.

**CHARLOTTE** (shär'löt), a city in North Carolina, county seat of Mecklenburg County, 110 miles north of Columbia, on the Southern, the Seaboard Air Line, and other railroads. It occupies a fine site on Sugar Creek and is surrounded by an agricultural country, which has deposits of gold and commercial clays. The chief buildings include a Carnegie public library, the county courthouse, the Young Men's Christian Association building, a military institute, and a United States mint. Among the industries are cotton mills, machine shops, tobacco factories, and carriage works. The general manufactures include cigars, earthenware, cotton goods, clothing, and machinery. It is the seat of a Lutheran and a Presbyterian college and of the Biddle University, a Presbyterian institution for colored students. Gas and electric lighting, pavements, sewerage, waterworks, and electric street railways are among the public utilities. It was settled in 1750 and incorporated in 1768. The Mecklenburg Declaration of Independence was adopted here in 1775 and the signers of this document are commemorated by a monument. Population, 1900, 18,091; in 1910, 34,014.

**CHARLOTTENBURG** (chär-löt'ten-böörg), a city of Germany, on the Spree River, three miles southwest of Berlin. It is connected with the capital city by an elevated railway and electric lines through the famous Thiergarten, which is a favorite promenade and zoölogical garden. The chief buildings include a royal palace, the Technical Academy, a military school, a fine public library, and numerous gymnasiums. It is the seat of the Royal Porcelain Factory, founded in 1761. Among the manufactures are glass, pottery, electrical apparatus, hosiery, clothing, cotton goods, toys, chemicals, and machinery. Charlottenburg was founded in



1705 by Frederick I., but its rapid growth is recent. The park has a Doric mausoleum which contains the remains of Frederick William III. and his wife, Queen Louisa, and their statues executed by Rauch. It is one of the most flourishing and beautiful cities in Europe. Population, 1905, 239,559.

**CHARLOTTESVILLE** (shär'löts-vil), a city of Virginia, county seat of Albemarle County, 100 miles northwest of Richmond. It occupies an elevated site on the Rivanna River and has transportation facilities by the Southern and the Chesapeake and Ohio railroads. The chief buildings include the county courthouse, the Albemarle College, the Rawlings Female Institute, and the University of Virginia. Monticello, the home of Jefferson, is a short distance southeast of the city. Charlottesville has manufactures of flour, cigars, machinery, and earthenware. Waterworks, electric lighting, and sewerage are among the public utilities. It was settled in 1744 and incorporated as a city in 1888. Population, 1900, 6,449.

**CHARLOTTETOWN**, a city of Canada, capital of the province of Prince Edward Island, in Queen's County, on the Prince Edward Island Railway. It is located on Hillsborough Bay, on the southern coast, and has an excellent harbor. Steamers carry trade regularly with the principal ports of Canada, and the railroad furnishes transportation facilities to all points of the island. It has manufactures of cotton and woolen goods, machinery, hardware, and clothing. The fisheries are important in that they supply catches for the trade and for canning. Among the public utilities are electric and gas lights, waterworks, sewerage, and paving. The Dominion buildings, the city hall, the courthouse, and a number of fine schools and churches are among the chief buildings. It is the seat of the Prince of Wales College and of a normal school. The French founded Charlottetown in 1750 and named it Port la Joie. Population, 1901, 12,080.

**CHARNEL HOUSE** (chär'něl), a depository under or near churches for the bones of the dead. In many ancient churches the crypt under the chapel was used for the purpose of reverently storing the bones, which are still preserved with much care.

**CHART**, a representation of the whole or a portion of the earth's surface projected on a plane, by which the contour of the continents, the islands, and the ocean may be studied. Charts intended for navigators' use are made to represent the seas and oceans, and merely include the outlines of the coast and islands.

The best known chart is the projection of the earth's surface by Mercator, called *Mercator's chart*. A *plane chart* is the representation of some part of the superficies of the earth, in which the spherical form is disregarded, the meridians are drawn parallel, the parallels of latitude are represented at equal distances, and the degrees of latitude and longitude are supposed to be of equal length. A chart representing the surface of the moon is called *selenographical*, while one representing the small parts of the earth is known as a *topographical*. See **Map**.

**CHARTERHOUSE** (chär'ter-hous), a school and hospital in England, founded by Thomas Sutton in 1611. It occupies the site of the celebrated Carthusian monastery established in 1371. After the monasteries were dissolved by Henry VIII., the land passed through several hands, until it was purchased by Thomas Sutton, who endowed the institution located here at present. The school is one of the largest in England and among its graduates are Grote, Steele, Blackstone, Addison, Thackeray, and John Wesley. In recent years the average attendance has been over 500 students. The hospital is maintained for the benefit of poor men, and those admitted must be bachelors, not less than fifty years of age, and members in good standing of the Church of England.

**CHARTER OAK**, an oak tree that formerly stood in Hartford, Conn., and became associated with early history. In 1687 Sir Edmund Andros marched to Hartford as the representative of King James II. to demand the charter of the colony with the intention of revoking it. Capt. James Wadsworth, hearing of the intention, hid the charter in the hollow of this oak. The tree was destroyed by a gale on Aug. 21, 1856, but fortunately a drawing had been made of it a few years previous.

**CHARTRES** (shär'tr'), a city of France, capital of the department of Eure-et-Loire, forty-eight miles southwest of Paris. It is located on the Eure River, has ample railway facilities, and carries a brisk trade in merchandise and produce. Some of the streets are narrow and crooked, but the newer parts are well built. It has a fine Gothic cathedral of the 11th century, surmounted by a tower 382 feet high, and the public library has 35,000 volumes. Among the manufactures are clothing, leather, hosiery, and machinery. Chartres was founded by the Carnutes, was the seat of the College of Druids, and Francis I. made it a duchy. Henry IV. captured it in 1519. It was occupied by the Germans in 1870. Population, 1906, 19,850.



**CHARYBDIS.** See *Scylla and Charybdis*.

**CHAT**, a small bird of the warbler family, found in North America, chiefly along the eastern coast.\* The tail is somewhat longer than the wing, the color is greenish above and yellowish beneath, and the song uttered by the male in the mating season is a curious mixture of caws and whistles. It feeds on insects and inhabits thickets and copses. The nest is built in bushes near the ground. The *whinchat* of England belongs to this class of birds.

**CHATHAM** (chăt'am), a town of Kent County, Ontario, on the Thames River, forty-five miles northeast of Detroit, Mich. It is on the Erie and Huron and the Grand Trunk railroads and has regular steamboat communication. The chief buildings are the town hall and several schools and churches. The manufactures include woolen goods, machinery, and furniture. It has public waterworks, sewerage, electric lighting, and a large trade in farm produce, soap, tobacco, and lumber. Population, 1901, 9,068.

**CHATHAM**, a town of New Brunswick, in Northumberland County, on the Miramichi River. It is pleasantly situated near Miramichi Bay, six miles northeast of Newcastle, and has transportation facilities by an important railway. It has a fine harbor and is a port of entry. The chief industries include foundries, gas works, shipyards, and flouring and lumber mills. It has a college, a hospital, several fine churches, and a Roman Catholic cathedral. The export trade is chiefly in fish, lumber, and merchandise. Population, 5,500.

**CHATHAM**, a fortified city of England, in the county of Kent, thirty miles southeast of London. It is located on the estuary of the Medway, near Rochester, with which it is closely united socially and commercially. Some of the streets are narrow and irregular, but the newer thoroughfares have been improved by paving and modern architecture. It is important as a military post, has a military hospital and school of engineering, and its fortifications are the scenes of many drills and reviews. About 500 acres are included in the royal dockyard, which was established by Queen Elizabeth, and its shipyards are ample for the construction of the largest vessels. Chatham is not important as a manufacturing center aside from its shipyards and metal mills, in which about 5,000 men are employed. It has considerable trade in merchandise and produce and has modern utilities, such as gas and electric lights and urban and interurban rapid transit. Population, 1907, 40,840.

**CHATHAM ISLANDS**, an island group

located in the Pacific Ocean, about 450 miles east of New Zealand, under which the government is administered. The area is 375 square miles. The soil is fertile and produces cereals, vegetables, and fruit. Sheep and cattle raising and whaling are the leading industries. The islands were discovered by Lieutenant Broughton in 1791 and were so named from his ship. A majority of the inhabitants are Maoris and Morioris. Population, 1906, 399.

**CHATTAHOOCHEE** (chăt-tà-hōō'chê), a river in Georgia, having a length of about 510 miles. It is navigable for boats 325 miles. It rises in the Blue Ridge Mountains, in Georgia, flows south, forming part of the boundary between Alabama and Georgia, and unites with the Flint River to form the Appalachicola.

**CHATTANOOGA** (chăt-tà-nōō'gà), a city of Tennessee, county seat of Hamilton County, on the Tennessee River, about 155 miles southeast of Nashville. It is finely situated in a fertile valley, on the Queen and Crescent, the Southern, the Central of Georgia, and other railroads. Several electric lines furnish transportation to suburban and interurban points. The surrounding country is rich in agricultural and mineral products. The manufactures include clothing, ironware, nails, machinery, cigars, furniture, cotton and leather goods, railroad cars, and flour. It has about 325 manufacturing establishments, gas and electric lighting, waterworks, and numerous jobbing houses. The obstructions formerly in the Tennessee River were removed by the United States government, and it is navigable about eight months of the year.

Chattanooga has a fine county courthouse, a public library, a customhouse, a Federal building, and an opera house. Among the public institutions are the Grant University, the Chattanooga Medical College, a Dominican convent, and a number of commercial colleges and private schools. A short distance south is Lookout Mountain, near the line between Georgia and Alabama, which furnishes a fine view of the surrounding country. In the Civil War it was the scene of severe contests. It was with-in hearing of the famous battles of Missionary Ridge, Chickamauga, and Lookout Mountain. A national military park has been platted by the government on the site of the Battle of Chickamauga, a short distance southeast of the city. The first settlement was made on the site of the city in 1836 and it was known as Ross's Landing, but was incorporated as Chattanooga in 1851. Population, 1910, 44,604.

**CHATTEL** (chăt't'l), in law, a term used to describe, with certain exceptions, all property



of a personal or movable nature. It embraces the portion of *personal property* that can be possessed and delivered, and in a general sense includes all property which is less than a life estate in land. Real chattels pertain to *real estate*, such as a lease of land or a mortgage taken as security. *Personal chattels* are things movable, which may be carried about by the owner, such as money, animals, household goods, promissory notes, etc., though in the common parlance of some countries the term does not include money or evidences of indebtedness.

**CHAUDIÈRE** (shō-dyâr'), a river of Canada, in the province of Quebec. It is the outlet of Lake Megantic, near the northwest boundary of Maine, and flows in a general course toward the northwest to the Saint Lawrence, into which it discharges about seven miles above Quebec. Chaudière Falls, about 115 feet high, are three miles above its mouth. The river is 120 miles long and the scenery on its banks is very diversified and picturesque.

**CHAUDIÈRE LAKE**, an extension of the Ottawa River, in Canada, immediately above the city of Ottawa. Below the lake are the Chaudière Falls, which are spanned by a railway bridge and a road bridge, connecting Ottawa with Hull. Chaudière Lake extends properly from these cities to the mouth of the Mississippi River, a distance of about thirty miles.

**CHAUTAUQUA** (shà-tà'kwà), a celebrated summer resort on Chautauqua Lake, in Chautauqua County, New York. Chautauqua Lake is about two miles wide and eighteen miles long, 1,300 feet above the sea, with an outlet into the Allegheny River. The grounds were purchased in 1874, by the Chautauqua Sunday School Assembly. Subsequently many edifices for religious service and instruction have been erected, besides a large number of villas and hotels to accommodate visiting delegations. The lectures are devoted to religious instruction, art, languages, temperance, sciences, and industrial and fine arts. They attract large throngs of people annually. The town is the seat of the New York State Summer Institute. Population, 1905, 3,972.

**CHAUTAUQUA Literary and Scientific Circle**, an institution incorporated for study and instruction. It was first promoted largely under the influence of Louis Miller of Akron, Ohio. In 1878 it was organized at Chautauqua, N. Y., with Louis Miller as president and John H. Vincent as chancellor. The object is to promote habits of reading and study in the sciences, arts, nature, and secular and sacred

literature, and to enable the members to make a review of the college courses. Enrollment is effected by the payment of a fee of fifty cents, no examination being necessary. The enrollment may be for one year, but the course consists of four years, after the completion of which a diploma is granted. The annual meeting usually occurs in July and August. The official organ, *The Chautauquan*, is published at Meadville, Pa.

At present there are a large number of Chautauqua assemblies in the United States, Canada, Japan, India, England, South America, Australasia, and Africa; the membership exceeding over half a million persons. About 10,000 circles were established during the first twenty years of the movement, and about 40,000 of the total enrollment completed the course. The Catholic Summer School, organized at Plattsburg, N. Y., is a similar organization. The courses of Chautauqua assemblies consist of work in literature, languages, mathematics, science, pedagogy, music, fine arts, expression, physical education, practical arts, and sacred literature. As a general rule the study work is done largely in the homes, while the summer meetings are inspirational and bring the members in contact with prominent thinkers and speakers of the world, as well as to aid in the way of sociability.

**CHEBOYGAN** (shê-boi'gan), county seat of Cheboygan County, Michigan, at the extreme northern portion of the southern peninsula, on the Michigan Central Railroad. It is finely located at the mouth of the Cheboygan River, on Lake Huron, and has a large lake and railway trade. The chief buildings include the courthouse, a public library, and the high school. It has manufactures of flour, lumber, machinery, and wood products. Several iron foundries, planing mills, and sawmills produce large quantities in their lines. The country toward the south is productive in agriculture and fruit. Cheboygan was settled in 1849 and incorporated in 1877. Population, 1910, 6,859.

**CHECK**, a bill of exchange made payable to the bearer, or to the order of the payee, on demand. A check made payable to the bearer may be transferred without endorsement, while one made payable to order must be *indorsed* to be transferred or paid, that is, the name of the person in whose favor it is drawn must be written on the back of it. Checks are used to transact the largest volume of business. They are a commercial convenience, both in local trade and in making payments to parties at a distance.

**CHECKERED BEETLE**, an insect more



or less widely distributed in North America, so named from its peculiar markings, usually dark brown with checks of white and yellow. Many species are included, some of which have a form much like an ant. They subsist largely on the sweet sap of plants, but some frequent the hives of bees and others feed on the carrion of animals. A number of species are harmful to bee keeping, since they enter the cells and feed on the honey and the young bees.

**CHECKERS**, a game played by two persons with *men* or *checkers* on a board divided into sixty-four equal squares, colored white and black. Each player has twelve men or checkers, colored differently, usually made flat and circular. The squares are numbered alternately from one to thirty-two, and the players place the board so the corners four and twenty-nine are at the left hand. It is immaterial whether the men are placed on the black or white squares, or whether any of the squares are numbered, but the contestants cover the squares from one to twelve and from twenty-one to thirty-two, respectively, and the moves are confined to one step diagonally at a time. When a player leaps over one or more men belonging to the opponent under the rules of the game, these men are said to be *taken*, and the game is won by the player who succeeds in taking all of the checkers of the opponent. Moves are made only in the direction of the side occupied by the opposing player until a man is moved into the last line of the opposite side, when he is crowned as *king*, and after that may be moved diagonally in any direction.

**CHEDUBA** (chê-dōō'bâ), an island in the Bay of Bengal, about ten miles from Arakan, to which province it belongs. The area is 245 square miles. The soil is fertile and produces rice, sugar cane, tobacco, cotton, hemp, and indigo. Petroleum is the chief mineral product. Several extinct volcanoes are located near the coast, and some of the volcanic cones emit gas and mud. Cheduba, or Manaung, is the chief town and has a population of 2,150. The island has been a British possession since 1824. Population, 1906, 24,500.

**CHEESE** (chēz), an important dairy product made of the curd or casein of milk, with variable quantities of butter and salt, formed into molds and cured or ripened by keeping for a time. In America it is made almost entirely of milk of the cow, but in parts of Europe the milk of goats and ewes is used, while in Arabian countries it is produced largely from the milk of mares and camels. The cheese generally sold in the American markets is known as *Cheddar* and *Swiss*. Other varieties of cheese in-

clude *Brick*, *Limberger*, *Neuchâtel*, *Edam*, and *Roquefort*. The Cheddar is the favorite in the markets of the United States and Canada. This kind of cheese includes several classes, such as the whole milk, skim milk, and cream cheese. The whole milk cheese is made from unskimmed milk and contains from twenty to forty per cent. of fat or cream, and thirty to forty per cent. of casein. Skim milk cheese is poor in fat, containing only from one to four per cent. Cream cheese is the richest, containing from sixty to seventy per cent. of fat, and is more digestible than any other kind, owing to its containing less casein. The production of cheese is one of the important industries in many agricultural districts. Farmers usually sell their milk or cream to private individuals, or operate a factory on the coöperative plan, owned by the farmers themselves.

In making Cheddar cheese, the milk is curdled or coagulated by adding an acid, sour milk, or rennet, and the watery portion or *whey* is separated from the insoluble *curd*. The curd is then worked into a uniform mass, after which salt is added, and the whole is pressed into a vat or mold to form cheese, after which it is placed in a curing room and allowed to ripen or cure. It is best to have the temperature of the curing room range at from 70° to 80°, but the temperature should be kept uniform at all times. The cheese is turned each day, and the upper surface is rubbed with the hand. After from three to six weeks it is sold on the market as mild, soft cheese, but the Cheddar does not reach its best condition until from three to six months of curing.

**CHEESE FLY**, a two-winged fly, mostly of a shining black color, which lays its eggs on cheese and cured meat. It is a pest in stores and dairies. The eggs are white and hatch in about thirty hours, and the larva or maggot feeds voraciously and matures in about ten days. The maggot is known as *cheese hopper* from its habit of forming a circle by bringing the two ends of the body together and then jerking abruptly, causing itself to be thrown a considerable distance. An insect known as cheese mite, a small, whitish mite, feeds upon cheese, flour, sugar, etc.

**CHELSEA** (chěl'sê), a suburb of London, England, on the Thames River, distinguished principally for containing the Chelsea Hospital, an asylum for old and disabled soldiers of the British army. The foundation of this institution was laid by Charles II. in 1682, and the structure was completed in ten years at a cost of \$750,000. It is supported by Parliamentary grants, and is designed for the accommodation



of sick, maimed, and superannuated soldiers. Chelsea is famous as the home of many celebrated persons, among them Princess Elizabeth, Sir Thomas Moore, Carlyle, Swift, Walpole, and George Eliot. It has a number of charities, several fine schools and churches, and a considerable trade. Population, 1907, 78,524.

**CHELSEA**, a city in Suffolk County, Massachusetts, three miles north of Boston, on the Boston and Maine Railroad. It is connected with Boston by a system of electric railways. On the opposite of the Mystic River is Charlestown, with which it is connected by a bridge. The chief buildings include the city hall, the courthouse, the Fitz public library, and several hospitals. It has manufactures of chemicals, rubber, sewing machines, linseed oil, brassware, safes, woolen goods, tools, and brushes. The first settlement was made in 1626 and it was incorporated under its present name in 1638. Many Boston business men reside in Chelsea. Population, 1905, 37,277; in 1910, 32,452.

**CHELTENHAM** (chělt'năm), a famous water place in Gloucestershire, England, among the Cotswold Hills. George III. made a visit to its mineral springs in 1788, and since then it has grown largely in popularity. It has a number of colleges, public and private edifices, parks, and promenades, and a large trade in merchandise. Among the chief buildings are the public library, an art school, and the Gothic Church of Saint Mary. Being chiefly a resort and educational center, it has no manufactures. Population, 1907, 53,394.

**CHEMISTRY** (kěm'is-trý), the branch of physical science which investigates the elements of which bodies, whether organic or inorganic, are composed, and treats of the relations of one kind of matter to another. The word was derived from Khem, the name of the Egyptian god of generation, productiveness, and vegetation.

**HISTORY.** In its infancy chemistry was the art of distilling the juices of vegetable substances for healing purposes, and the first marked stages of its development were effected by the Greeks, who devoted much thought to investigation of the medical properties and uses of plants. Alchemy was the forerunner of chemistry, and bore a relation to it quite like astrology did to astronomy. The science was brought from Egypt to Asia by the Arabs, and by the Moors to Spain, from whence it was made known throughout Western Europe. However, its early history is quite closely associated with that of alchemy, and it did not take on the form of a distinct science until after the Middle Ages.

Robert Boyle (1627-1691) may be regarded

the first modern chemist. He published his "Skeptical Chemist" in 1669 and was the first to introduce chemical tests or reagents. That respiration and combustion produce the same effect on atmospheric air was discovered by Mayhow, of Oxford, in 1674. Priestley discovered oxygen in 1774, and Cavendish in the same year announced the exact constituents of water, while Scheele made known the existence and nature of chlorine. These and other discoveries enabled Lavoisier to revolutionize and systematize the science. Vanquelin discovered chromium in 1797, Dalton introduced the atomic theory in 1803, Sir Humphrey Davy announced the existence of potassium and sodium in 1807, and Klaproth analyzed about 200 minerals prior to 1870. Others contributing to the advancement of chemistry include Wöhler, Wurtz, Rutherford, Liebig, Faraday, Bunsen, Berzelius, Crookes, Hoffmann, and Berthelot.

**BRANCHES OF CHEMISTRY.** Modern chemistry is divided into *organic* and *inorganic*, the former treating of the hydro-carbons and the compounds derived from them, and the latter of metallic and nonmetallic elements. Another classification is *pure* or *theoretical* chemistry, and *applied* or *practical*. Theoretical chemistry treats of the laws governing chemical action, while practical chemistry deals with the application and economic relation of chemistry to the arts. The latter is usually designated according to the arts or occupations to which it relates, as agricultural, medical, sanitary, physiological, metallurgical, etc. Some writers group the subject under *analytical* and *descriptive* chemistry. Analytical chemistry is concerned with the art of determining the composition of substances, while descriptive chemistry deals more particularly with the chemical and physical characteristics of substances.

**ELEMENTS AND COMPOUNDS.** Matter may be defined as anything that occupies space. It is capable of being measured and weighed. The various kinds of matter constitute different substances, which differ from each other by such general properties as relative weight, color, hardness, etc. Some substances are capable of existing in the form of solid, liquid, and gas. This is easily recognized in water, which may exist as mist, fog, rain, frost, snow, and ice. In any of these forms it represents the same substance, the nature of which is not changed in the process of being converted from one into another. These and similar changes are called physical changes, and differ from chemical changes in that new substances are produced in the latter. The rusting of iron and the burning of wood are examples of chemical changes.



In a physical change the composition of the molecule is not affected, while in a chemical change the atoms are rearranged so as to form new molecules and the specific properties of a substance are destroyed. There are two general classes of matter, known as *compounds* and *elements*.

Compounds embrace all those substances which are composed of more than one kind of matter, as, for instance, water, which consists in the proportion of two volumes of hydrogen to one of oxygen. Chemists are acquainted with only about seventy substances which they have been unable to change into more simple forms and these are designated *elements*. In elements the atoms, which form small indivisible particles, are all of the same kind. On the other hand, in compounds there is a notable difference in the atoms—a fact easily ascertained by the use of a microscope. There is also a notable difference between compounds and mixtures. For instance, gunpowder is a mixture of charcoal, saltpeter, and sulphur. That it is not a chemical compound can be proven by microscopic examination, and also by the circumstance that the three constituents may be again separated by a process of decomposition. However, if a sufficient degree of heat to explode the powder is applied, a chemical change takes place which produces gases and solids of an entirely different kind than the matter contained in the powder. The atoms common to the different kinds of matter are held together by a force called *chemical affinity*. It depends not only upon the kinds of atoms between which it is exerted, but also upon temperature, its intensity varying in different substances at different temperatures.

The elements are classed as metals and non-metals, and, like the compounds, are designated by a system of symbols, thus Cu=copper; Ba S=baric sulphide. Ductility, malleability, metallic luster, and marked ability to conduct heat and electricity are the essential points in which metals differ from the nonmetallic elements. The following are the nonmetals: hydrogen, helium, chlorine, bromine, iodine, fluorine, oxygen, sulphur, selenium, tellurium, nitrogen, phosphorus, arsenic, antimony, boron, carbon, silicon, and argon. Below is a list of the elements, together with their symbols and the approximate weight of their atoms compared to the weight of an atom of hydrogen:

NAMES OF THE ELEMENTS. (Continued.)	SYMBOLS.	ATOMIC WEIGHTS.
Arsenic.....	As	75
Barium.....	Ba	137
Bismuth.....	Bi	208
Boron.....	B	11
Bromine.....	Br	80
Cadmium.....	Cd	112
Caesium.....	Cs	133
Calcium.....	Ca	40
Carbon.....	C	12
Cerium.....	Ce	141.2
Chlorine.....	Cl	35.5
Chromium.....	Cr	52.5
Cobalt.....	Co	59
Columbium.....	Cb	93.7
Copper.....	Cu	63.1
Didymium.....	Di	145.4
Erbium.....	Er	166
Fluorine.....	F	19
Gallium.....	Ga	69
Germanium.....	Ge	72
Glucinum.....	Gl	9
Gold (aurum).....	Au	195.7
Helium.....	He	4
Holmium.....	Ho	16.2
Hydrogen.....	H	1
Indium.....	In	113.4
Iodine.....	I	127
Iridium.....	Ir	192
Iron (ferrum).....	Fe	56
Krypton.....	Kr	58.74
Lanthanum.....	La	139
Lead.....	Pb	207
Lithium.....	Li	7
Magnesium.....	Mg	24
Manganese.....	Mn	55
Mercury.....	Hg	200
Molybdenum.....	Mo	96
Neon.....	Ne	19.94
Nickel.....	Ni	59
Niobium.....	Nb	94
Nitrogen.....	N	14
Osmium.....	Os	190
Oxygen.....	O	16
Palladium.....	Pd	106.6
Phosphorus.....	P	31
Platinum.....	Pt	193.5
Polonium.....	Po	12.6
Potassium.....	K	39.1
Radium.....	Ra	223.3
Rhodium.....	Rh	102.2
Rubidium.....	Rb	85.2
Ruthenium.....	Ru	100.9
Scandium.....	Sc	44
Selenium.....	Se	79.5
Silicon.....	Si	28
Silver.....	Ag	108
Sodium.....	Na	23
Strontium.....	Sr	87.5
Sulphur.....	S	32
Tantalum.....	Ta	182
Tellurium.....	Te	125
Thallium.....	Tl	204
Thorium.....	Th	234
Tin (stannum).....	Sn	118
Titanium.....	Ti	48
Thulium.....	Tu	170.4
Tungsten.....	W	184
Uranium.....	Ur	238
Vanadium.....	V	51
Xenon.....	Xe	128
Ytterbium.....	Yt	173
Yttrium.....	Y	89
Zinc.....	Zn	65
Zirconium.....	Zr	90

NAMES OF THE ELEMENTS.	SYMBOLS.	ATOMIC WEIGHTS.
Actinium.....	Ac	58.3
Aluminium.....	Al	27
Antimony.....	Sb	120
Argon.....	A	40

**CHEMNITZ** (kēm'nīts), a city of Germany, at the base of the Erzgebirge, on the Chemnitz River, in the kingdom of Saxony. The older part has narrow streets, but the newer portion and the suburbs are regularly platted and well



built. Schillerplatz is a beautiful square and contains the Church of Saint Peter and the Royal Technical School. Other noted buildings are the railway depot, the post office, the Imperial Bank, and the city hall. It is particularly noted for its manufacture of cotton prints, woolen and silk textiles, handkerchiefs, chemicals, machinery, and books. It has a brisk trade in produce and is a large exporter of merchandise. The streets are generally paved with stone and macadam. An extensive system of electric railways furnishes communication to all parts of the city and many interurban points. The waterworks, sewerage, and public library are owned by the municipality. Population, 1905, 244,927.

**CHENAB** (chê-nâb'), a river of British India, in the Punjab. It rises in the Himalaya Mountains, joins the Ghara near Uchh, where it assumes the name of the Panjnad, and near Mithankot flows into the Indus. The length is about 775 miles and it is navigable a considerable of this distance. In the lower course it is about one mile wide.

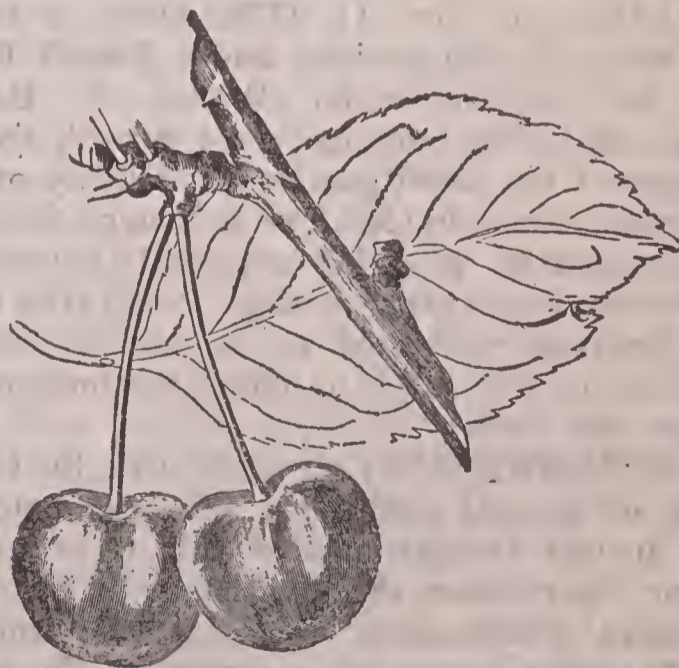
**CHER** (shâr), a river of France, rises in the department of Creuse, and after a course of 200 miles toward the northwest joins the Loire near Tours. It is navigable to Vierzon, 45 miles from its mouth, and the Berry Canal runs parallel to it in the upper course. The Arnon, Evre, and Tardès are its chief tributaries.

**CHERBOURG** (shêr'bûrg), a strongly fortified naval station and seaport of France, at the mouth of the Divette River, on the English Channel. It has railroad facilities and a mild climate, and is protected by a substantial breakwater, which incloses a space of nearly 2,000 acres. This breakwater is one of the most famous in the world. It is built so as to be protected on three sides by the land, and at the apex of the angle formed by the meeting of the two branches is a central fort or battery. The city is defended by regular forts and redoubts and has two harbors, one for naval and the other for commercial enterprises. Among the chief industries are machine shops, sugar refineries, cotton and woolen mills, tanneries, and shipyards. The chief buildings include the church of Saint Trinité, the Hôtel de Ville, a museum, and a marine library with 30,000 volumes. Cherbourg owes its prosperity to Napoleon I., who planned and constructed the great defenses as a means of protecting France against an invasion from the north, and his plans were enlarged by Napoleon III. and others. Population, 1906, 43,837.

**CHEROKEES** (chêr-ô-kêz'), a tribe of North American Indians who occupied the

upper valley of the Tennessee River prior to 1830. They were friendly to the English in the wars against the French, and ceded lands to Governor Glen for the construction of forts within their territory in 1755. Hostilities soon after arose between them and the English, which terminated in their defeat in 1761. They joined the English at the commencement of the Revolution, served at Augusta in 1780, but were reduced by General Pickens and acknowledged the sovereignty of the United States in 1785. They ceded portions of their territory to the United States, and in 1790 a part of the tribe migrated to Louisiana. In 1812 they rendered valuable service in General Jackson's army against the British. Their lands were ceded to the United States as early as 1817 in exchange for lands on the Arkansas and White rivers, a portion of which is now occupied by Oklahoma. They were removed thither by the government in 1838. In the Civil War they sided with the Confederates, taking part in the Battle of Pea Ridge, but afterward were divided into two factions. The Cherokees are noted as the most progressive of the Indian tribes. They have an alphabet and convenient vocabulary, and publish newspapers and books in their own language. The government of the United States provided schools and colleges for their education. Their architects have learned to construct beautiful houses. Many Cherokees have grown exceedingly wealthy. At present they number about 20,000.

**CHERRY** (chêr'ry), an ornamental fruit tree of the plum or prune variety, extensively culti-



CHERRY: LEAF AND FRUIT.

vated in the Temperate zones. It is of Asiatic origin, and, according to Pliny, was brought to Italy by Lucullus about 68 B. C. It thrives best in temperate climates and bears abundantly.



The fruit is eaten fresh, dried, and canned. *Kirschwasser* and *maraschino* are brandies made of the fruit. Wild species thrive in many countries and yield excellent woods for cabinet work and furniture. Among the wild cherries are the chokecherry and the black cherry. The fruit furnishes astringent medicines. The native trees in North America attain a height of a hundred feet, and a diameter of from three to four. The species cultivated extensively in gardens and parks for ornament and fruit belong mainly to two kinds, the *gean cherry* and the *bird cherry*. However, many species have been improved by cultivation, such as the black cherry, red heart and white heart. Cherries are grown extensively in Kansas, Pennsylvania, Indiana, British Columbia, and other sections of the continent.

**CHERRY LAUREL**, the name of several evergreen shrubs and trees native to Asia Minor. The common cherry laurel has lanceolate leaves and racemose flowers, and is cultivated extensively in the gardens of Europe and America. The leaves are poisonous from the abundant hydrocyanic acid which they contain. They yield the laurel water, known in German as *kirschwasser*, which is used in medicine as a substitute for hydrocyanic acid. An oil somewhat similar to that derived from the bitter almonds is obtained from the leaves, but must be used with caution in flavoring sauces, pudding, etc.

**CHERRY VALLEY**, a village of New York, in Otsego County, sixty-eight miles west of Albany. It was the scene of the Cherry Valley Massacre at the time of the American Revolution, on Nov. 11, 1778, when an attack was made by 600 Indians under Joseph Brant and 200 English under Walter N. Butler. Nearly all of the buildings were burned, sixteen soldiers of the small garrison and thirty of the inhabitants were killed. The prisoners, seventy-one in number, were led away half naked and were treated with great cruelty. Soon after General Sullivan conducted an expedition through the State of New York to punish the Indians and protect the settlers.

**CHERSONESUS** (kēr-sō-nē'sūs), the Greek name of several peninsulas and promontories. The ancient Greeks applied this term to the Tauric Chersonese, the modern Crimea; to the Cimbrian Chersonese, now Jutland; and to the Tracian Chersonese, a region northwest of the Hellespont.

**CHERUSCI** (kê-rūs'si), an early German tribe which dwelt between the Weser and Elbe rivers. The Cherusci are noted for the great victory of their leader, Arminius, who formed

an alliance with other German tribes and conducted a warfare against the Romans under Varus, whose forces he defeated and annihilated in the forest of Teutoburg, in the year 9 A. D. The tribe was overcome by the Chatti, after the death of Arminius, and later became subject to the Franks.

**CHESAPEAKE** (chēs'ā-pēk), a large bay in Maryland and Virginia, dividing Maryland into two parts. It enters the United States from the Atlantic Ocean between Cape Charles and Cape Henry, where it is sixteen miles wide. The width is from four to forty miles. It contains many harbors, is valuable for its excellent oyster fisheries, and is safe and easy to navigate. The general depth is from thirty to sixty feet. It receives the waters of the James, Potomac, Rappahannock, Susquehanna, and other streams. The chief cities on its shore include Baltimore and Annapolis.

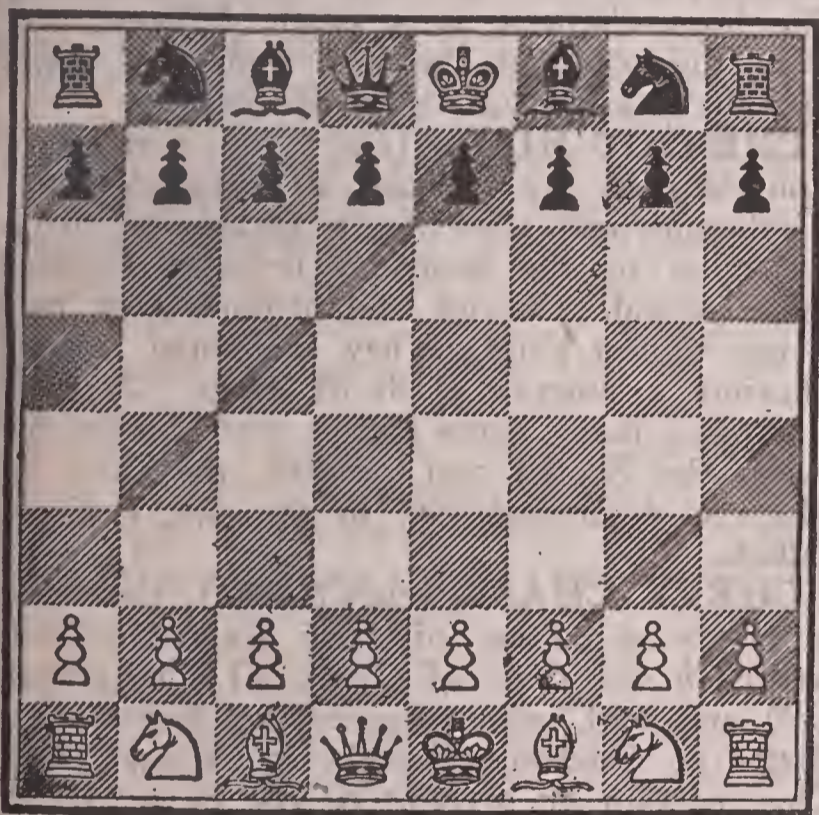
**CHESAPEAKE, The**, an American vessel built in the early part of the 19th century, famous in the history of the American navy. She was repaired in the Washington navy yard in 1807 and put under command of Commodore James Barron, and with an untrained crew started on a cruise across the Atlantic. While en route, she was halted by the British frigate *Leopard*, whose commander demanded the return of British deserters who were supposed to form a part of the crew of the *Chesapeake*. Commodore Barron refused to permit his vessel to be searched, when the *Leopard* opened fire and killed three and wounded eighteen, after which the *Chesapeake* surrendered, and four of her crew were taken prisoners. England refused to make reparation when requested to do so by the American government, and the "Chesapeake Affair," as it became known, was one of the chief causes that led up to the War of 1812.

The *Chesapeake*, commanded by Captain James Lawrence, fought a battle in Massachusetts Bay with the British vessel *Shannon* on June 1, 1813. The latter was commanded by Captain Broke and had a trained crew. A terrific fire was kept up for fifteen minutes, when the *Chesapeake* was set on fire and surrendered. Lawrence was mortally wounded and exhorted his men with the words, "Don't give up the ship," which were adopted as the motto of the American navy. The *Chesapeake* had a crew of 379 and the *Shannon* had 330, while the former lost 61 killed and 85 wounded and the latter lost 33 killed and 50 wounded. The British took the *Chesapeake* to Halifax as a prize and fitted her up as a war vessel, but sold her for old timber in 1820.



**CHESAPEAKE AND OHIO CANAL**, a waterway completed in 1850, extending from Georgetown, D. C., to Cumberland, Md. It follows the Potomac River the entire distance, 184.5 miles, and serves as a means of transportation to Washington, D. C., where the Potomac becomes a tidal stream and is navigable for large ships. This canal is six feet deep and sixty feet wide, and has a lift of 609 feet by means of 74 locks. Much of its distance is paralleled by railways, but it is still used for the transportation of coal and other freight.

**CHESSE**, a game played by two persons on a chessboard, which consists of eight rows of alternate light and dark squares, eight in each row, a total of 64. It is played with two differently colored sets of men, 16 in each set.



CHESSEBOARD.

Position of men at beginning of game.

Each player has eight *pawns*, two *castles* or *rooks*, two *knight*s, two *bishop*s, a *queen*, and a *king*. The game is one of the oldest and most scientific amusements and is thought to have originated in India, whence it was brought by way of Persia and Arabia to Europe. It was made popular in America through Benjamin Franklin, who both played it and wrote in its favor. The first national congress of chess clubs was held in 1857, at which Paul Morphy of New Orleans was awarded the championship. The rules differ materially and are set out most completely in a work entitled "Chess Praxis," published in London, England, in 1860.

**CHEST**, or **Thorax**, in anatomy, the part of the human body which lies below the neck and above the abdomen. It consists of the upper portion of the trunk, to which are at-

tached the breasts, the arms, and the shoulders. Within the cavity are the heart and lungs. The walls are composed chiefly of the ribs and the muscles attached to the ribs. The dorsal portion of the spinal column forms the back part of the chest, and the front is comprised of the sternum, or breast plate. In form it is conical, with the apex upward, and the neck connects it with the head. Inspiration takes place by air being drawn through the trachea, or windpipe, and the bronchial tubes, causing an extension, and during expiration the muscles contract and the diaphragm descends. Many of the most dreaded diseases affect the chest and the organs located within, including cancer, pleurisy, bronchitis, pneumonia, and consumption.

**CHESTER** (chēs'tēr), a city of Pennsylvania, in Delaware County, on the Delaware River, twelve miles southwest of Philadelphia. It is on the Baltimore and Ohio, the Pennsylvania, and the Philadelphia and Reading railroads. The chief buildings include the Pennsylvania Military College, the Crozer Theological Seminary, and the public library. The house of William Penn is an object of interest. It has extensive systems of waterworks, sewerage, and electric railways. The principal industry is shipbuilding, in which several thousand men are employed. Other manufactures are implements, machinery, clothing, cotton and woolen goods, and building material. It was settled by the Swedes in 1643, who named it Upland, and is the oldest city in the State. The name was changed to Chester under a charter of William Penn in 1699. Population, 1900, 33,988; in 1910, 38,537.

**CHESTER**, a city in England, capital of Cheshire County, on the Dee River, fifteen miles southeast of Liverpool. It is located on an elevated site made up largely of sandstone and is the focus of several important railways. Ancient walls about two miles in length and seven feet thick surround the city, which is entered by four gates. Chester was founded by the Romans, who cut the streets in solid rock from two to eight feet below the buildings, many of which are reached by flights of steps. A covered way for foot passengers called the "rows" is located in front of the second stories of the houses, which are used for shops. The chief buildings include a cathedral in the Norman-Gothic style and a castle founded by William the Conqueror. A fine stone bridge crosses the Dee. Several schools, a museum, a public library, and a theater are maintained. The manufactures consist chiefly of ironware, shoes, clothing, machinery, and



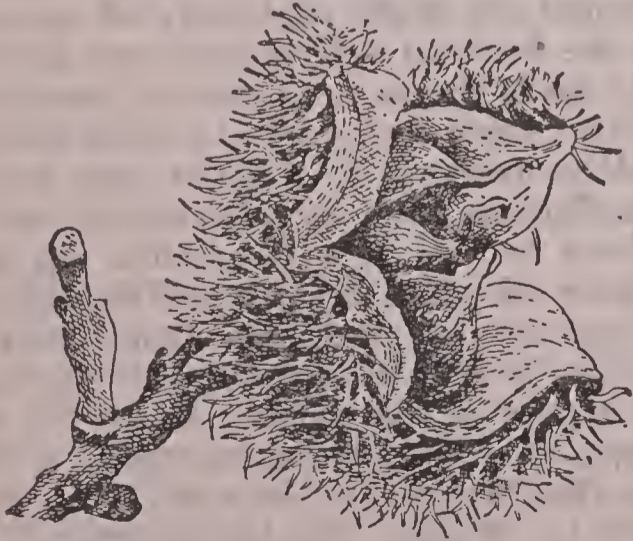
sailing vessels. It has a large trade in cheese, produce, and merchandise. Among the public utilities are sewerage, gas and electric lights, and a system of rapid transit. Near the city is Eaton Hall, the splendid country seat of the Duke of Westminster. Population, 1907, 39,303.

**CHESTER**, a city of South Carolina, county seat of Chester County, sixty miles north by west of Columbia, on the Southern, the Seaboard Air Line, and other railroads. It is surrounded by a fertile agricultural country. The manufactures include flour, cottonseed oil, machinery, and cotton goods. It is an important shipping point of cotton and farm produce. The chief buildings include several public schools and churches. Population, 1900, 4,075.

**CHESTER**, a port of entry of Nova Scotia, in Lunenburg County, forty-five miles southwest of Halifax. It is located on Mahone Bay, and is popular as a summer resort. The fishing industries supply a large revenue. It has manufactures of clothing and machinery. It was founded by people from New England in 1760. Population, 1901, 985.

**CHESTERFIELD** (chēs'tēr-fēld), a town of England, in Derbyshire, at the confluence of the Hipper and Rother rivers. It is twelve miles south of Sheffield, with which it is connected by railway and electric lines. The manufactures include lace, leather, earthenware, and machinery. Iron, coal, lead, and clay are mined in the vicinity. The public utilities include gas and electric lighting, waterworks, public baths, and two parks. It is the seat of several schools and has a number of fine churches, including the parish church of All Saints. King John reigned at the time the first charter was granted. Population, 1907, 27,860.

**CHESTNUT**, a genus of plants allied to the beech. A large number of species are found



CHESTNUT: FRUIT AND BUR.

in the different continents, and three of the species are valuable for their nuts and wood. These include the *American*, the *European*, and

the *Japanese* chestnuts. They grow to a height of 100 feet and bear ample and graceful foliage. The tree is widespreading and attains a great age, often many centuries. The leaves are smooth and green on both sides, and are pointed at the end. From two to five nuts are borne in a prickly sack. Chestnuts are prized as food among the peasants of Italy and Spain. The wood somewhat resembles oak, but is less valuable, and is used for house building and furniture. The nuts may be eaten raw, boiled, or roasted, and in some countries are ground into flour, which is used in making bread. In Southern Africa, the cape chestnut abounds, which belongs to the rue family, while in Australia a similar tree is known as the Moreton Bay chestnut, and resembles the American species. The horse-chestnut is a much different tree from the common chestnut, and the water chestnut is known as the water caltrop.

**CHEVIOT HILLS** (chē'vē-ūt), a range of mountains in the counties of Roxburgh and Northumberland, stretching a distance of thirty-five miles on the boundary between England and Scotland. Cheviot Hill, altitude 2,660 feet, is the highest point. They are noted for the Cheviots, a superior grade of sheep. On these mountains many fierce battles were fought between the Scotch and English, the fame of which is commemorated in the Chevy Chase ballads.

**CHEVY CHASE** (chēv'ī chās), the name given to an edition of early English ballads written in the reign of Henry VI., or between 1420 and 1461, which purport to describe the Battle of Otterburn, fought in August, 1388. They contain an account of the chase of the Earl of Douglas among the Cheviot Hills for the Earl Percy of Northumberland. Portions of the old manuscript are preserved in the Bodleian library at Oxford. See **Ballads**.

**CHEYENNE** (shī-ēn'), the capital of Wyoming, county seat of Laramie County, on Crow Creek and on the Union Pacific, the Colorado and Northern, and the Chicago, Burlington and Quincy railroads. It is pleasantly located on the eastern slope of the Laramie Mountains, its altitude being 6,041 feet above sea level. The chief buildings include the State capitol, the Carnegie library, the post office, and the high school. It is the seat of the Soldiers' and Sailors' home and three miles south is Fort Russell, a United States military post. The industries include brickyards and railroad machine shops. It has gas and electric lighting, waterworks, sewerage, and a public park. The surrounding country produces coal, iron, and live stock, in which it has a large trade. It was



first settled in 1867, when the Union Pacific was completed to this point, and became the capital of Wyoming in 1869. Population, 1905, 13,656.

**CHEYENNE INDIANS** (shê-ên'), an Indian tribe belonging to the Algonquin family, who settled near the Black Hills before the beginning of the last century. They were first met with by Lewis and Clarke in 1803, and in 1825 a treaty of peace was made with them by General Atkinson. A portion of the tribe settled in Arkansas and here joined the Arapahoes, while the remainder carried on a war against the government in 1861. A battle was fought with them by Colonel Chevington on Nov. 29, 1864, at Sand Creek village, in which a hundred were slain. In 1867 their village was burned by General Hancock, and later General Custer engaged them in battle at Washita. The Indians remaining in the north were generally peaceful. At present they number 3,200, of which about 1,200 are in Arizona and 2,000 in Oklahoma.

**CHIAROSCURO** (kyä-rô-skôô'rô), the arrangement of light and dark colors in a work of art, such as a drawing or painting. It is important to distribute the lights and shadows of a picture in such a manner that the objects may be naturally and effectually relieved from one another, otherwise the product has the appearance of being unreal. Painters study this feature of art very carefully with the view of applying the force of colors so as to produce in art certain effects found in nature, especially in blending the lights and shadows. The term *chiaroscuro prints* is applied to the woodcuts or plates used in printing pictures of two or more colors, each cut or block being used with different-colored ink. The colored illustrations of books and magazines are printed generally with three sets of plates, the product being known as *tricolor work*.

**CHICA** (chê'kà), a dyestuff obtained in South America, used chiefly to give an orange-red color to cotton prints. It is obtained from the leaves of a species of begonia, native to the basin of the Orinoco and other sections. The dyestuff is obtained by boiling the leaves and was first used by the Indians for painting their bodies. The plant is a climber and has heart-shaped leaves and drooping clusters of flowers.

**CHICAGO** (shî-kä'gô), the largest interior city of North America, second in size on the Western Hemisphere, being surpassed in population only by New York City. It is located at the head of Lake Michigan, in Illinois, and is the county seat of Cook County. Through it flow the Chicago and Calumet Rivers, both of which originally discharged into Lake Michigan,

but the former is now a part of the Chicago Drainage Canal and carries a constant current out of the lake. The distance from Chicago to New Orleans is 914 miles; to Washington, 810 miles; to New York, 910 miles; and to the Pacific Coast, 2,415 miles.

**DESCRIPTION.** The city is located along the western shore of Lake Michigan, occupying territory from five to twelve miles wide and about twenty-five miles long. The area is about 190 square miles, all of which is remarkably level, elevated about 25 feet above the lake and 580 feet above the sea. It is separated by the Chicago River, which is formed within the city by the north and south branches, into three districts, known as the North Side, the West Side, and the South Side. The North Side is located north and east of the river, extending along the lake almost to Evanston; the South Side lies south and east of the river; and the West Side embraces all of the section west of the two principal branches of the river. Between Twelfth Street and the river, which embraces the northern part of the South Side, are the larger business establishments and within this area is located the chief business section. It has all of the great depots, except two, the Union and the Northwestern, the former of which is on the West Side and the latter on the North Side, and within it is the loop of the elevated railroad. Many factories and warehouses are in the southern part of the North Side, which also contains Lincoln Park and a large residence section. In the eastern part of the West Side are many warehouses and freight offices, and west of these are retail stores and shops, beyond which is an extensive section occupied by residences. Many bridges cross the rivers, including ample facilities for vehicles, street cars, and pedestrians.

The city is regularly platted and nearly all of the streets cross each other at right angles. Most of the streets are wide and some of the boulevards are exceptionally fine, having a width of 120 feet. Western Avenue and Halsted Street run north and south almost the entire length of the city. The streets aggregate about 2,450 miles, of which 1,500 miles are improved by paving, chiefly macadam and asphalt in the residence districts and brick and cobblestone in the business section. Rapid transit is almost entirely by electric lines, both surface and elevated, the former of which aggregate 1,500 miles of single track and the latter about 125 miles of double track. The elevated lines carry passengers north to Evanston, south to Sixty-third Street, and west to Oak Park, and the main lines have several branches, all of



which center in the loop, which encircles the chief business district. The surface lines pass to all parts of the city and connect with many interurban railways, furnishing direct electric

transportation to points in western Illinois, northern Indiana, and southern Wisconsin. Chicago is the focus of many railroads. In 1850 the Galena and Chicago Union Railroad Company, now the Chicago and Northwestern, constructed about thirty miles of railway westward, while, in 1852, the Lake Shore and Michigan Southern was the first railway to enter the city from the east. Since then about thirty different railway lines have entered the city, penetrating in all directions and representing more than 150,000 miles of railroads. These are all connected by a belt line, which enables freight to be passed through the city without local transfer by drayage. Within the city are more than 1,500 miles of trackage. These railroad systems connect the great West and North with the South and East, and make Chicago the greatest railroad and grain center in the world, while its merchant marine service is constantly increasing. Fully 10,000 vessels arrive and depart from the Chicago docks annually. These include liners that communicate directly with the chief ports on the Great Lakes and indirectly with European and other foreign commercial centers.

**SEWAGE AND WATER.** The site of the city is perfectly level, hence its drainage was long a question of much concern to the city authorities. The grade of the streets was raised from ten to fifteen feet, and the buildings were constructed in conformity with these grades in the principal portions of the city. In 1890 the Legislature of the State formed a drainage district in Chicago, which provided for the construction of the Chicago Drainage Canal, extending from Lake Michigan to a point near Lockport, a distance of twenty-eight miles, where it connects with the Illinois River and by it reaches the Mississippi. By means of this canal the fresh water flows from the lake through the city and carries the sewage entirely out of the municipality.

The city supply of water is obtained through tunnels from Lake Michigan. These tunnels extend from two to four miles from the shore, where the cribs, or intakes, secure uncontaminated water. The water is pumped through the tunnels, which are located at different points in the city, whence it is

forced through the mains that carry it direct to the consumers. Both the waterworks and the electric-light plant are operated by the municipality.

**PARKS.** The parks cover an area of about 2,250 acres and are connected by wide boulevards. Seven of the parks, which number about



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forty, are of considerable size, and in addition there are many playgrounds to accommodate the children who are not near the parks. Sheridan Road is one of the many boulevards and extends north beyond Evanston. Among other noted boulevards are Michigan Avenue, Jackson Boulevard, Diversey Avenue, and Lake Shore Drive. The entire system of boulevards includes 70 miles of thoroughfares, most of which are lined on both sides by splendid residences. Drexel and Garfield boulevards are beautified by flowers and ornamental shade trees. Washington Boulevard extends west and is one of the main thoroughfares of the West Side.

Lincoln Park includes 320 acres and is one of the attractions of the city. It has fine gardens, conservatories, fountains, and a zoölogical collection. The statues in this park include those of Lincoln, Grant, Schiller, Linnaeus, La Salle, Shakespeare, Franklin, and Hans Christian Andersen. Among the noted busts are those of Goethe, Beethoven, and Garibaldi. It has an equestrian statue of Grant. Near the western part of the park is located the Academy of Sciences. At Oakwoods Cemetery is a Confederate monument, in Humboldt Park is the Humboldt Monument, in Union Park is the Police Monument, and in Monument Square is the Douglas Monument. The site of Fort Dearborn is marked by a tablet at the end of Michigan Avenue.

Jackson Park, the site of the World's Columbian Exposition, is the chief park on the South Side. It has an area of 524 acres and extends along the lake front. It is beautified by many lagoons and driveways, and within it is the Field Columbian Museum. The Midway Plaisance, a tract of eighty acres, extends from Jackson Park westward past the grounds of the University of Chicago to Washington Park. The latter is noted for its many species of trees and flowers. Douglas Park, Humboldt Park, Grant Park, Marquette Park, and Garfield Park belong to the south park system. The system of parks is under the control of a board of commissioners appointed by the Governor of the State.

**BUILDINGS.** In the heart of the city, bounded by Clark, Adams, and Dearborn streets and Jackson Boulevard, is the Federal Building, which is sixteen stories high and was completed in 1903 at a cost of about \$5,000,000. Besides the post office, it contains the customhouse, the United States court, and a branch of the National treasury. The city hall and courthouse building covers an entire block and is used jointly for city and county purposes. The

Chamber of Commerce, a structure thirteen stories high, is in the French-Gothic style, and the Masonic Temple, twenty-one stories high, is one of the finest buildings of the kind in America. Among the many fine office buildings may be mentioned the Manhattan, the Monadnock, the First National Bank, the Old Colony Building, the Tribune Building, the Rand-McNally Building, the Rookery, the Fisher Building, and the Borland Building. Many of the retail stores are structures of much convenience and beauty, such as those of Marshall Field and Company, Mandel Brothers, and the Fair Store. The Auditorium, on Michigan Avenue and Congress Street, was erected at a cost of \$3,750,000. It has a tower 225 feet high, contains a theater with a seating capacity of 4,050, and within it is a large hotel, which, with two annexes south of Congress Street, furnishes the finest accommodations in the city.

Chicago is noted as a musical center and has many prominent places of amusement. Among the theaters are the Auditorium, the Garrick, the Studebaker, the Illinois, the Powers, the Great Northern, McVicker's and the Grand Opera House. The Majestic Theater Building, one of the highest in the city, contains the Majestic Vaudeville. Others of this class include the Olympic and the Haymarket. The Coliseum is used for political conventions and exhibitions, and the Orchestra Building is the seat of a noted musical society. Among the clubs are the Illinois, Chicago, Argo, Calumet, Athletic, Iroquois, La Salle, Standard, and Union League. The chief hotels include the Auditorium, Palmer House, Great Northern, Metropole, Wellington, Grand Pacific, Victoria, Stratford, Virginia, Lexington, Kaiserhof, Brevoort, and Sherman House. The Virginia, on the North Side, and the Chicago Beach, on the South Side, are family hotels.

Few cities are better supplied with fine churches than Chicago. The Cathedral of Saint Peter and Saint Paul is a fine Protestant Episcopal place of worship, and the Roman Catholics have the Cathedral of the Holy Name, which is their finest ecclesiastical edifice in the city. Other churches of note include the Plymouth (Congregational), Church of Christ (Christian Science), First Unitarian, Second Presbyterian, and Saint James (Methodist).

**EDUCATION.** The public schools furnish ample facilities for the instruction of youth and courses are maintained from the kindergarten to the high school, with which is affiliated the Chicago Normal School. Manual training is given to boys of the 7th and 8th grammar grades, and girls of the same classes receive



instruction in household arts, such as cooking and sewing. The city has eighteen high schools and about 250 graded schools, and in addition there are many private and parochial schools. Besides English, the courses offer instruction in Latin and German. Higher instruction is given in the University of Chicago, located near Jackson Park; the Northwestern University (Methodist), at Evanston, whose dental, law, and medical schools are within the city; Saint Ignatius's College (Roman Catholic); Lewis Institute; Armour Institute; Chicago Lutheran Seminary; Western Seminary; and McCormick Seminary. The Chicago Music College and the Art Institute are representative institutions. About 1,500 students are enrolled in the latter each year for the study of painting, sculpturing, and modeling.

The charitable institutions are very numerous. They include the Cook County Hospital, the largest in the city; the United States Marine Hospital, one of the largest of its kind in America; the Presbyterian Hospital; the Hospital of the Alexian Brothers; the Women's Hospital; and the Saint Luke's and Saint Joseph's hospitals. The Armour Institute of Technology, maintained as a memorial to Joseph Armour, affords excellent instruction in religious and industrial training. Hull House, modeled after Toyndee Hall, London, is a social settlement located in the Ghetto district on the West Side. Other settlements of this kind include the West Side, the Chicago Commons, the Northwestern University settlement, and the Chicago University settlement. The Bureau of Hebrew Charities, the Chicago Bureau of Justice, and other similar organizations do worthy work among the poor and for the protection of wage-workers. Many nurseries, asylums, reformatories; and relief societies are maintained by the city and by societies.

**LIBRARIES.** Three great libraries are maintained, including the public library, the John Crerar Library, and the Newberry Library. The public library was founded in 1872 and has about 310,000 volumes. It is located in the public building erected on Michigan Avenue, which is finished in Sienna and Carrara marble and is ornamented with glass mosaics and fine sculptures. The John Crerar Library, named from its founder, was endowed with a bequest of \$2,500,000 and has 150,000 volumes. It is located in temporary quarters and will eventually be housed in the south part of the city. The Newberry Library was endowed by Walter L. Newberry, who bequeathed about \$2,000,000 to establish it. It contains about 280,000 volumes, mostly works of general ref-

erence. Other libraries of note are those maintained by the University of Chicago, which has about 400,000 volumes; that of the Chicago Law Institute; that of the Chicago Historical Society; that of the Field Columbian Museum; and that of the Chicago Academy of Sciences.

**COMMERCE AND INDUSTRY.** Various causes contributed to the phenomenal development of Chicago, and promoted its speedy rise to the position of the greatest interior city and market of America. Its location on Lake Michigan and the construction of the Michigan and Illinois Canal caused the first material growth. This canal, constructed in 1836-48, is no longer an important link in transportation, having served its purpose until the great railways were built and the navigation of the Great Lakes was fully organized. Chicago ranks next to London, New York, and Antwerp as a commercial port, measured by the tonnage of vessels that carry trade. Lumber is the largest lake import, and corn represents about half of the value of the exports, while wheat is the next item. In live stock and grain Chicago takes precedence over all other markets. It is noted for its trade in coal, being a distributing center for the coal fields of Illinois, and it receives a large tonnage of iron ore, which is smelted within the city or in suburbs near by. Butter, cheese, machinery, merchandise, fruit, and hardware are handled in large quantities. Chicago is a center of wholesaling and jobbing, and supplies the retailers of many cities with wares and merchandise of different kinds.

In manufacturing enterprises Chicago takes high rank. The establishments of this kind employ about 300,000 workmen. Meat packing and slaughtering, confined largely to the South Side, represents an industry of vast proportions and gives employment to about 26,500 workmen. Associated with this enterprise are the manufacture of by-products, such as leather, candles, and soap. It has extensive machine shops and foundries, which turn out hardware and agricultural implements of various kinds. Among the large factories are the Deering Harvester Works and the McCormick Harvester Works, now controlled by the International Harvester Company. Other manufactures include textiles, furniture, brick, clothing, liquors, and tobacco. It has an enormous output of books and printed matter, including many daily, weekly, and monthly periodicals. The jobbing and wholesale trade is centered on Franklin and Market streets and Fifth Avenue.

**HISTORY.** Chicago is thought to have been named from an Indian word meaning wild



onion, a plant found abundantly in the locality. Marquette and Joliet stopped in the vicinity in 1673, and the region was afterward visited by La Salle and Hennepin. Jean Baptiste Point de Salle, a refugee from Haiti, is supposed to have built the first log hut on its site, in 1779. John H. Kinzie came across the lake from Saint Joseph in 1803 and was the first permanent settler. In 1804 the government erected a stockade fort near the mouth of the Chicago River and named it Fort Dearborn. At the beginning of the war with Great Britain, in 1812, the government ordered the fort abandoned. It was destroyed soon after by the Indians, but was rebuilt in 1816. In 1832 it contained a dozen families, and on August 10 of the next year twenty-eight voters organized the town. It was incorporated in 1837 with a population of 3,497.

In October, 1871, Chicago was visited by a great fire, which burned 17,500 buildings, covering 2,500 acres, and 100,000 persons were made homeless. The property destroyed represented a value of nearly \$200,000,000. The work of rebuilding began immediately after the fire, the new structures comprising some of the finest and most substantial buildings in the world. The frontage was made uniform and the streets were widened and improved in various localities. Many substantial fireproof buildings, from 10 to 20 stories high, the frames being of steel, were erected in place of those consumed by the flames. Railroad riots occurred in 1877, when United States troops were called to quash the disturbances, and in 1886 occurred the Haymarket riots in consequence of labor troubles. The World's Columbian Exposition was held in Chicago in 1893, and the Chicago Drainage Canal, begun in 1892, was completed in 1900.

The inhabitants of Chicago are largely of foreign birth. The Germans number more than 400,000 and exceed any other class. Next in numerical order are the Irish, Swedes, Norwegians, Bohemians, Poles, and Italians. Other nationalities more or less strongly represented include the Jews, Russians, Arabs, Turks, Armenians, and Negroes. The following census reports give an idea of the rapid growth of the city:

YEAR.	POPULATION.	YEAR.	POPULATION.
1840.....	4,470	1865.....	187,446
1845.....	12,080	1870.....	298,977
1848.....	20,035	1875.....	410,000
1850.....	28,260	1880.....	503,304
1852.....	38,733	1890.....	1,099,850
1853.....	60,652	1900.....	1,698,575
1855.....	83,509	1910.....	2,185,283
1860.....	150,000		

**CHICAGO DRAINAGE CANAL**, a canal in the State of Illinois, constructed primarily to furnish a means of disposing of the sewage of Chicago. It connects the south branch of the Chicago River with the Des Plaines River, a tributary of the Illinois River, at Lockport, Ill. The sewage was formerly discharged into Lake Michigan, but by the construction of this canal the flow of water was reversed, and a strong current now passes by means of the Chicago River and the canal to the Des Plaines, whence the water passes to the Illinois River and through it to the Mississippi.

Work was begun on the canal on Sept. 3, 1892, and it was formally opened on Jan. 28, 1900. It begins at the west fork of the south branch of the Chicago River, at Robey Street, and extends to Lockport, a distance of 28.05 miles. The controlling works are at Lockport, where a basin sufficiently wide permits vessels to turn, and below Lockport is a tailrace 6,500 feet long by which the water is carried to the Des Plaines River. A bear-trap dam and sluice gate control the flow of water, which has sufficient fall to be used profitably for power to propel electrical machinery. The canal is 160 feet wide at the bottom and from 175 to 300 feet at the top, and the minimum depth is 22 feet. Its capacity is 300,000 cubic feet per minute. The total cost to Jan. 1, 1908, was \$42,500,000. The canal is sufficient to carry large steamboats to the Des Plaines River, and it is designed to improve this stream and the Illinois River sufficiently to permit large boats to pass from Lake Michigan to the Gulf of Mexico, a project supported enthusiastically by all the states of the Mississippi valley. See illustration on following page.

**CHICAGO, University of**, an institution of higher learning in Chicago, Ill., located between Jackson and Washington parks. It was opened as a Baptist institution in 1857, but through lack of funds closed its doors in 1886, and its success is due to systematic efforts made by the American Baptist Educational Society, through whose influence several large endowments were obtained. The largest of these was given by John D. Rockefeller, who made a gift of \$600,000, and later added to this sum, the total of his bequests amounting to about \$10,000,000. Other benefactors include Marshall Field, Silas B. Cobb, S. A. Kent, Charles T. Yerkes, Helen Culver, Martin A. Ryerson, and Anne Hitchcock. Nearly all the buildings, about 25, were erected almost entirely from private donation and have a value of \$7,500,000, including the grounds and equipments. The investments aggregate \$9,250,000. At Geneva Lake, Wis.,



about 75 miles from Chicago, is the Yerkes Observatory, which is one of the buildings of the university. The library is the best in Chicago and has about 400,000 volumes.

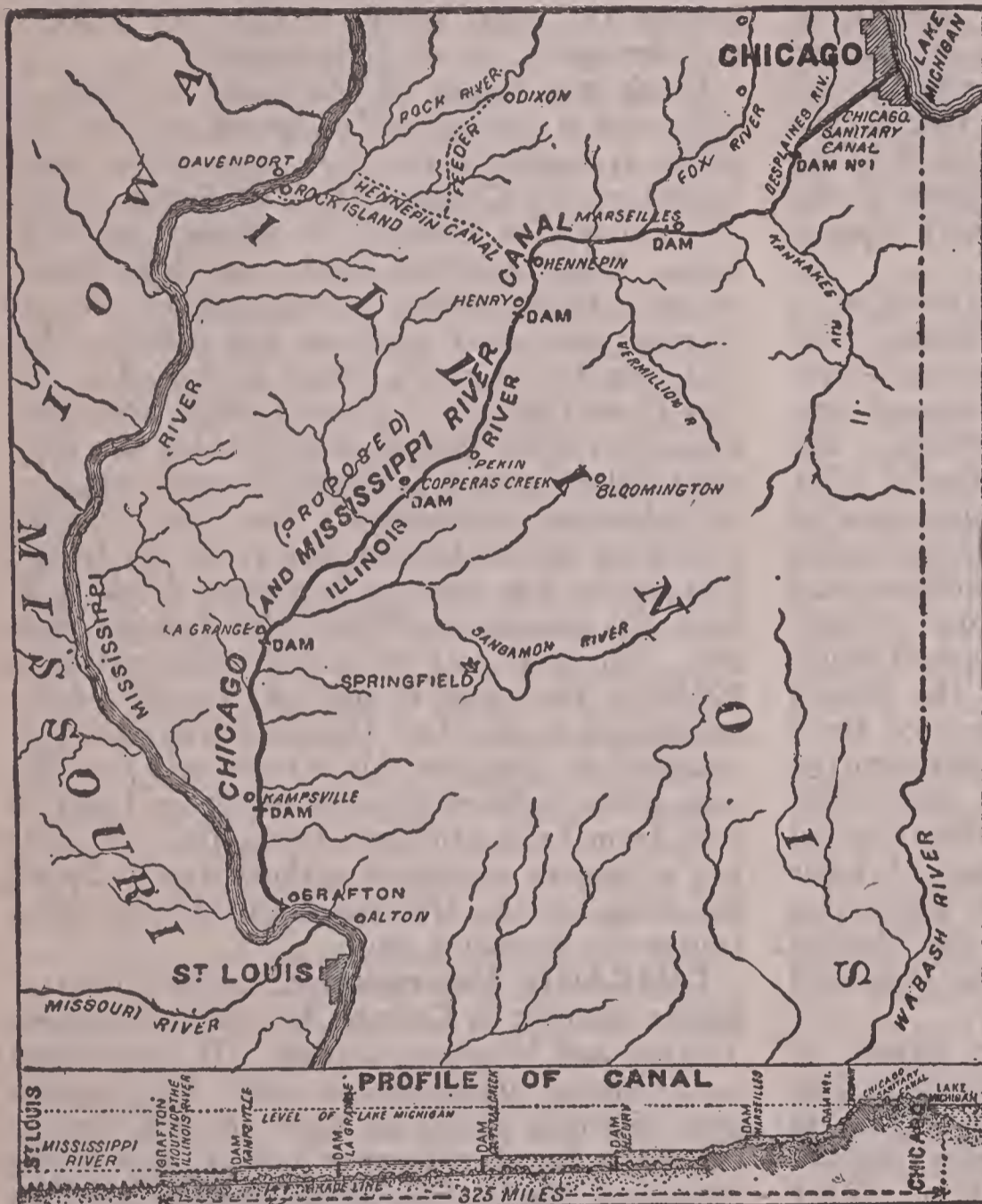
Five departments are embraced in the university, those of the university press; schools and colleges; libraries, laboratories, and museum; university extension; and the university affiliated schools. A term of 12 weeks is the unit, instead of the scholastic year as is the case in many institutions, and the year is divided

junior colleges receive the degree or title of *associates* in the arts, science, or philosophy. Lecture and study courses are given outside of Chicago, and a systematic line of work is done in correspondence courses, which are arranged according to the regular university schedule, and those who do the work receive credits toward degrees. Many publications and periodicals are issued by the university press, including the *Manual Training Magazine*, *Journal of Geology*, *Journal of Political Economy*, *American Journal of Theology*, *The Astrophysical Journal*, *The University Record*, *The Biblical World*, *American Journal of Semitic Language and Literature*, etc. About 250 professors and teachers give instruction to the students, who, including men and women, number about 4,000.

**CHICKAHOMINY** (chik-ä-höm'ĩ-nĩ), a river in Virginia, rises about twenty miles northeast of Richmond, and after a course of seventy-five miles flows into the James River. The marshy portions of its valley are often overflowed during extensive rainfalls. The river banks were the scene of severe conflicts during McClellan's campaigns in June, 1862, against Richmond. Among the battles of that year were those of Seven Pines, Fair Oaks, Mechanicsville, Savage's Station, Cold Harbor, and White Oak Swamp. In 1864 the second Battle of Cold Harbor occurred in its proximity.

**CHICKAMAUGA** (chik-ä-ma'gä), a small stream that rises in Georgia and flows into the Tennessee River, about six miles above Chattanooga, Tenn.

**CHICKAMAUGA, Battle of**, an important battle of the Civil War, fought on Sept. 19 and 20, 1863, on Chickamauga Creek, in Tennessee. The Union Army consisted of 55,000 men under command of Gen. Rosecrans and the Confederates, of 70,000 under Gen. Bragg. Chattanooga was the objective point, of which both armies were endeavoring to hold possession, owing to its location as the outlet to the fertile countries to the south and its railroad lines, which were valuable to both the contending parties. The Confederates made an effort to



Map and Profile of Proposed Chicago-Mississippi River Canal.

into four quarters of 12 weeks each. Students may take up or drop work at the beginning of any term, and a degree is given at the completion of the requisite number of courses, computed by units. University work is organized into the two departments known as *junior* and *senior*, the former corresponding to that done in most institutions by freshmen and sophomores, and the latter to that of the juniors and seniors. Degrees are granted to students who complete courses in the senior colleges of the university, and those who graduate from the



secure the road to Chattanooga and fell back to the Chickamauga, where they received reinforcements and were d eployed for battle. The left wing of the Union army was commanded by Thomas, the second by Crittenden, and the last by McCook.

The Confederates crossed the Chickamauga on Sept. 19 and struck Thomas's line. The latter speedily returned the assault, thereby confusing Bragg's plans. A second attack was made on Thomas the following day, but he held his position and was frequently reinforced. Owing to a misunderstanding of an order by Gen. Wood, the Confederates attacked a weak point in the Federal lines and the day was lost. The Union army retreated to Chattanooga and held that point, thus making the victory at Chickamauga of no particular value to the Confederates. The Union loss was 16,000, while the Confederates lost 18,000. Gen. Thomas distinguished himself by making a brave defense and covered the retreat, owing to which he was called the "Rock of Chickamauga."

**CHICKASAW BLUFFS** (chik' -sa), **Battle of**, a battle that occurred near Vicksburg, Miss., Dec. 29, 1862. While conducting the siege of Vicksburg, Gen. Sherman sent a strong force up the Yazoo River with the design of attacking the city on the rear, from the south. At Chickasaw Bluffs, located opposite the Chickasaw Bayou, the force was confronted by Confederate batteries and rifle pits. The Union force charged and reached the works, but was driven back by heavy fire, and the project was abandoned. The Confederate losses were slight, but the Union forces lost 1,800 men.

**CHICKASAW INDIANS**, an Indian tribe of America which inhabited a region between the Mississippi River and the Appalachian Mountains. They were friendly to the English in several wars against the French, and in 1739 made a treaty with Gen. Oglethorpe. By a treaty in 1786 their territory was fixed with a boundary including the Ohio River on the north and extending into the State of Mississippi. In the Indian wars of 1793 they aided the United States against the Creeks. Early in the last century a number located in Arkansas. In 1818 they ceded the lands east of the Mississippi and located in Indian Territory, now Oklahoma, while the last of the tribe ceded their lands in 1834. In the Civil War they sided with the Confederacy and lost several leaders and their slaves. They long lived under the same government with the Choctaws, who speak a common language, but separated from them in 1855. They are now governed locally by a senate, a house of representatives, and a governor.

Education has been beneficial to them, many showing much advancement in scholarship and the arts. Their lands are held in common. The number of Chickasaws in 1908 was about 6,000, but many are mixed with the blood of whites and Negroes.

**CHICKASHA** (chik' -sha), a city of Oklahoma, in the Chickasaw nation, 40 miles southwest of Oklahoma City, on the Saint Louis and San Francisco and the Chicago, Rock Island and Pacific railroads. It is surrounded by a fertile farming country. The manufactures include brick, cotton-seed oil, flour, furniture, machinery and artificial ice. It has a brisk retail and wholesale trade in merchandise and produce. The chief buildings include a number of fine schools and churches. It has modern utilities, such as electric lights and waterworks. Population, 1900, 3,209; in 1910, 10,320.

**CHICO** (ch -k ), a city in Butte County, California, about ninety-five miles north of Sacramento, on the Southern Pacific Railroad. It is surrounded by an agricultural and mining country and is an important shipping point. The chief buildings include the public library and a State normal school. Among the industries are lumber mills, iron works, and flouring mills. Gas, oil, and coal are produced in its vicinity. Population, 1900, 2,640.

**CHICOPEE** (chik' -p ), a city of Massachusetts, in Hampden County, four miles north of Springfield, on the Boston and Maine Railroad. It is centrally located in a fertile region, on the Connecticut River, and has extensive electric railway connections. Among the notable buildings are a public library of 25,000 volumes and a number of educational institutions. Among the manufactures are rifles, bicycles, cotton and woolen goods, carpets, and machinery. The streets are paved and improved by waterworks, sewerage, and parking. The early growth of Chicopee is due to an abundance of water power derived from the river. It was settled in 1675 and incorporated in 1848. Population, 1905, 20,187; in 1910, 25,401.

**CHICORY** (chik' -ry), or **Succory**, a plant cultivated in various parts of Eurasia and America. It thrives best in soil mixed with gravel and chalk. The roots are roasted and used as a substitute for coffee, and are often mixed with genuine coffee. The roasting is done in iron cylinders that are kept revolving as in the roasting of coffee. Butter or lard is added during the roasting process, from which it receives a luster and color similar to coffee. Its presence in coffee can be detected by a magnifying glass and by placing the mixture in cold water, the coffee floating on the surface



and the chickory becoming discolored and sinking.

**CHIHUAHUA** (chĕ-wă'wà), a city of Mexico, capital of a state of the same name, 225 miles south of El Paso, Tex., on the Mexican Central Railway. It is located on the Chihuahua River, at an elevation of about 4,650 feet, and is surrounded by mountains. The streets are regularly platted and many are paved with stone and macadam. Within the public park is a fine monument erected to Hidalgo and the revolutionists of 1810. The manufactures include carpets, brick, cotton goods, and machinery. It has fine gardens of roses and fruit trees and fruits thrive in the vicinity. The surrounding country has rich gold and silver mines. Population, 1907, 30,905.

**CHILBLAIN** (chĭ'blān), an inflammation of the skin and cellular tissue, caused by sudden alterations of temperature. The affection appears as a small patch of reddened skin, sometimes swelled and painful on pressure, and in extreme cases is accompanied by ulceration and superficial gangrene. It most frequently attacks the foot and sometimes the face, due chiefly to frostbites. Persons liable to chilblain should avoid the fire when their feet are cold and damp, and relief may be obtained by bathing the cold parts with alcoholic or other stimulating liquids.

**CHILDREN, Societies for the Prevention of Cruelty to**, an organization instituted by Henry Bergh in 1874. He established the first society of the kind in the world in the City of New York. It was incorporated in 1875, with John D. Wright as president. The enterprise was encouraged financially by Elbridge T. Gerry and G. Fellows Jenkins. From this organization originated 160 American and forty foreign societies, located in the principal cities of the world. The number of complaints received in a single year aggregates 8,500, of which a number are prosecuted and convicted, while more than 5,500 children are rescued and relieved from destitution annually. The work is a most beneficent one and is filling a valuable mission in the large cities, where children are often subjected to vicious treatment and surroundings. The most important foreign society is one organized by Benjamin Vaughan in London, Aug. 26, 1889.

**CHILD STUDY**, the study of children, a branch of educational work considered of importance to all who have charge of the training of infants and youth. It is a subject which, especially in recent years, has very greatly engaged the attention of practical educators, and those who have either written or spoken on

questions concerning the present condition and future prospects of society. Courses of study and rules of treatment are not prepared with the view of being fitted to serve the needs of the individual child, but rather to meet the general requirements of the average person. Hence, it is incumbent upon the instructor to so apply them that growth, both mental and physical, will be the most rational and best fitted to the individual to be trained. Child study embraces, not only an investigation of the physical capability and powers, but comprehends child psychology, one of the branches of general psychology. Attention to this department of learning was first given in Germany, where the teachers and psychologists studied it as a necessary department for those engaged in the training of children.

The educational movement to promote child study in America had its beginning in 1880, and it is now generally incorporated in the educational systems of the various states of the United States and the provinces of Canada. Much has been done by the educational associations and teachers' institutes along this line, since the topic has been made one for discussion and addresses on the program of these organizations. It is in the courses of many normal training schools, where young teachers are instructed in the care and treatment of children. In many of these institutions classes of children of different ages are organized, and those who study for the teachers' profession are thus furnished a practical opportunity to learn of the habits of children and the proper manner of disciplining them.

Child study is concerned with every phase of training youth. It embraces a study of all the elements of character,—physical, mental, and moral. There are propensities to restrain and subdue as well as powers to bring out and direct. The teacher must know what there is in character to repress or extinguish, and what tendencies toward good are to be cultivated and encouraged. It is necessary to know the dispositions, the likes and dislikes, both in play and work. During the period of adolescence, which begins at about 14 and continues in females until 22 and in males until 24, the youth passes through a critical period of life and requires more than ordinary sympathy and encouragement. At all times it is necessary to direct youth to self-control, patience, kindness, industry, and the many other virtues that make up a well-rounded character, and this is done by stimulation and direction rather than by the infliction of punishment or by severe reprimands. Above all, it must be observed that all



children can never properly be subjected to precisely the same processes of education, because their natures are very different, hence the need of pursuing the subject of child study in all of its phases.

**CHILE** (chē'lâ), a republic extending along the Pacific coast of South America, from south latitude 17° 57' to Cape Horn. It is from 68 to 250 miles wide, with an average width of 87 miles, and is about 2,700 miles long, including all the territory in the southern extremity of South America except the eastern half of Tierra del Fuego, which belongs to Argentina. The northern boundary is formed by Peru, the eastern by Bolivia and Argentina, and the southern and western by the Pacific Ocean. The area is given at 290,895 square miles.

**DESCRIPTION.** Chile has a very narrow coast plain, which is confined to certain localities, and the land rises in most places quite abruptly from the sea. Near the sea is an elevated region known as the Coast Cordillera and along the eastern boundary trend elevated chains of the Andes, pierced at many places by deep fiords that extend to the plains of Argentina. The Andes are highest in the northern section, where they reach altitudes of about 15,000 feet, and in the southern part the ranges vary from 3,500 to 6,000 feet in height. Aconcagua, located northeast of Valparaiso, chiefly in Argentina, has a summit of 23,080 feet. The loftiest summits wholly in Chile include Cerro del Mercedario, 22,000 feet, and Tupungato, 23,000 feet. Many of the summits are extinct volcanoes, whose peaks are covered with snow the entire year.

The Andes forming the continental divide, Chile has few rivers suitable for navigation. The Maule, which flows into the Pacific near south latitude 35°, is navigable for small craft. Other rivers located farther south include the Biblio, Imperial, and Bueno, all of which are navigable for small boats. In the northern part are a number of deserts where rainfall is very scant, sometimes at intervals of six months or a year. These include the deserts of Atacama and Tarapacá, both located north of south latitude 32°. A number of lakes are situated in the vicinity of south latitude 40°, of which Lake Llanquihue is the largest, and in the region south of these lakes are many islands. The coast in the northern section is very regular, but in the southern part are numerous inlets, including Gulf del Corcovado, Gulf de las Peñas, and Gulf de Trinidad.

The climate ranges from the tropical in the north to the cold region in the southern part. Much of the coast has a climate similar to

California, with average temperatures in low altitudes at 65° in the north and 40° in the extreme south. The warmest section is along the coast, whence the temperature falls toward the elevated inland. Rainfall is most abundant in the vicinity of the Strait of Magellan, where it reaches about 130 inches, and decreases toward the north, where the coast has less than eight inches and parts of the interior are practically destitute of precipitation.

**FLORA AND FAUNA.** Vegetation is most abundant in the vicinity of 40° south latitude, where the flora is always green and plants grow luxuriantly. Here thrive the cypress, beach, and palm, but plant life decreases toward the south on account of cold and toward the north as rainfall diminishes. The plateaus are well grassed and sage brush and cacti abound in the arid regions. Among the chief forest trees of Chile, besides those already mentioned, are the poplar, oak, chestnut, willow, and eucalyptus. The mammals include the puma, otter, fox, guanaco, pudu deer, and chinchilla. Birds of song, prey, and plumage are very abundant and are represented by the buzzard, parrot, owl, crane, condor, hawk, humming bird, and many varieties of water fowl. The reptiles include lizards, frogs, and snakes. The coastal waters are rich in marine life, such as fish, seal, whale, and dolphin.

**MINING.** Many useful minerals abound in Chile, which ranks as one of the chief mining countries of South America. Tacna, one of the provinces acquired from Peru, has an inexhaustible supply of nitrate deposits. They are worked chiefly by Europeans, employ about 25,000 men, and yield 1,500,000 tons annually. Copper is mined in the provinces of Atacama and Coquimbo, which yield about five per cent. of the world's production. Gold and silver ores are found in paying quantities, and bituminous coal is mined quite extensively in the southern part. Other minerals worked more or less include tin, borax, lead, and borate of lime. Iron, cobalt, mercury, zinc, and alabaster are found in small quantities.

**AGRICULTURE.** Farming is confined chiefly to the central valley, where the land is held in large estates by the wealthy classes. About half of the people are engaged in agricultural pursuits, but much of the work on the extensive estates is done by the natives. Modern farming machinery is imported and utilized in cultivating the soil and harvesting the crops, and the land not occupied is located in the section of country where the climate is unfavorable, or the rainfall is insufficient. Wheat, maize, and barley are the most important crops.



The vine is cultivated extensively for the manufacture of wine, and hemp and flax are grown for their seed and fibers. Apples and pears are exported. Other crops include potatoes, tobacco, alfalfa, and garden vegetables. All the domestic animals common to North America are grown in Chile, though special attention is given to cattle raising. Goats are reared in the mountains and sheep in the central valley. Oxen are used extensively for farm work.

**COMMERCE AND MANUFACTURE.** Commerce with foreign countries is chiefly with Great Britain, Germany, and the United States in the order named. The exports somewhat exceed the imports. The former include cereals, fruit, nitrate of soda, and live stock, and the imports consist chiefly of clothing and iron and steel manufactures. Comparatively unimportant as a manufacturing country, Chile is making advancement in building up industrial enterprises under the influence of Europeans, especially the large German settlement at Valdivia. Among the enterprises are sawmills, tanneries, breweries, shipyards, soap works, and shoe factories. The first railroad was built in 1852, when a short line was completed between Copiapó, the capital of Atacama, to the port of Caldera. Another line was built between Santiago and Valparaiso in 1858. The total railway mileage in 1908 was 3,100, of which about half was operated by the state. In that year the country had 12,500 miles of telegraph lines.

**EDUCATION.** Public instruction is provided by the state, but the schools are not in a progressive condition. The immigration of Germans has caused many teachers to be brought over from Germany, and many of the schools have been reorganized on a modern plan. The elementary and graded schools are supported by local districts, under the inspection of supervisors, and a state university is maintained at Santiago. This institution has departments of medicine and pharmacy, fine arts, political science, and physical and mathematical sciences. Other institutions maintained by the states or nation include the schools of agriculture and mining, normal schools, naval and military academies, and an academy of painting and sculpture.

**INHABITANTS.** The native races of Chile are classed with the Araucanian tribes. About one-fourth of the native-born inhabitants are of Spanish origin, and those of foreign birth, in the order named, are Spaniards, French, Germans, Italians, English, and Peruvians. The language is purely Spanish and Roman Catholic is the state religion, but other denom-

inations are respected and tolerated. Santiago, the capital, is the metropolis and chief commercial center. Other cities of importance include Valparaiso, Concepción, Talca, Iquique, Chillán, Serena, Antofogasta, and Quiron. The population is about twelve to the square mile, a ratio much greater than that of Brazil and Argentina. Population, 1908, 3,250,120.

**GOVERNMENT.** The government is a democratic republic, under a constitution adopted in 1833. It guarantees equal political rights to all citizens, freedom of instruction, inviolability of property, and the right of petition. The executive power is vested in a president, who is chosen by popular vote for a term of five years. He is assisted by a council of state of eleven members, of whom five are nominated by himself and six by congress, and by a cabinet of six ministers, who preside over the departments of the government. A national congress, consisting of a senate and a house of representatives, has general legislative authority. The senators are elected for six years and the representatives for three years, the former by the provinces on the basis of one senator for each three representatives, and both are chosen by popular vote. The supreme judicial power is vested in a high court of justice with its seat at Santiago, and the lower courts are distributed among the districts and provinces. It has a standing army of 9,000 men, and all male citizens between the ages of 20 and 40 constitute the national guard.

**HISTORY.** The country was first visited in 1520 by Magellan, the famous Portuguese explorer, after sailing through the strait that bears his name. Formerly the northern portion belonged to the Incas of Peru, from whom it was conquered by Pizarro and Almagro in 1535, while the southern portion was occupied by the Araucanian Indians, and was not conquered until a comparatively recent date. Santiago was founded in 1541 and has since been the most important center of European influence. Chile remained a Spanish colony until 1810, when a revolution was organized under the direction of Gen. San Martín, and after seven years it became independent, but Spain did not recognize the government until in 1844. Chile joined Peru in a war against Spain in 1865, which terminated in the blockade of the coast and the bombardment of Valparaiso, and peace was not concluded until 1871, when a provisional treaty was signed at Washington, D. C.

In 1879 Chile declared war on Bolivia and Peru on account of the mineral district of



Atacama, with the result that Chile was victorious and added to her territory the provinces of Tarapaca and Antofogasta. An insurrection took place in 1891, owing to a quarrel between President Balmaceda and the congressional government, which resulted in the defeat of the former and brought on several wholesome reforms in the government. In this military disturbance the United States took sides with the president, which caused much ill feeling, and when the steamship *Baltimore* landed her crew was attacked by a mob. This caused serious complications between the two governments, but the authorities apologized and paid \$75,000 damages for the benefit of the injured soldiers. Since then the country has had no revolutionary disturbances, but serious labor difficulties took place in the nitrate fields of Tacna in 1908, which were suppressed by the federal government, but not until several hundred of the strikers were shot.

**CHILLÁN** (chêl-yân'), a city of Chile, 120 miles northeast of Concepción. It is situated about 700 feet above sea level, near the Itata river, and has railway connection with the principal cities of Chile. The chief buildings include a normal school and a Franciscan missionary church. Southwest of the city are sulphur baths. The city was founded in 1579 and was destroyed by an earthquake, but was rebuilt in 1835. It has a growing trade and is in a prosperous condition. Population, 1908, 35,500.

**CHILLICOTHE** (chil-lî-kôth'è), county seat of Livingston County, Missouri, eighty miles northeast of Kansas City, on the Wabash, the Chicago, Burlington and Quincy, and the Chicago, Milwaukee and Saint Paul railroads. It occupies a gently undulating site and is surrounded by a fertile farming country. Among the chief buildings are the public library, the State industrial home for girls, the high school, and a normal school. It manufactures flour, clothing, cigars, and machinery. The streets are lighted with electricity and many are paved with brick. It was settled in 1835 and incorporated in 1845. Population, 1900, 6,905; in 1910, 6,265.

**CHILLICOTHE**, a city in Ohio, county seat of Ross County, on the Scioto River and the Ohio Canal. It is on the Norfolk and Western, the Baltimore and Ohio Southwestern, and the Cincinnati, Hamilton and Dayton railroads. The manufactures include carriages, cigars, machinery, implements, furniture, and paper. A public library, the courthouse, numerous churches, and fine schools

are among its many institutions. Gas and electric lighting, street railways, pavements, and waterworks are the chief public utilities. The city was incorporated in 1802. Population, 1900, 12,976.

**CHILLON** (shê-yôn'), a celebrated castle and fortress of Switzerland, in the canton of Vaud. It is situated on Lake Geneva and is remarkable for its scenic beauty. The castle was built by Amadeus of Savoy in 1238. Byron made "The Prisoner of Chillon" the subject of a celebrated poem.

**CHILOÉ** (chê-lô-â'), an island and province of Chile. The island and a number of others are included in the province. The area of the island, including about 100 islets, is 3,995 square miles. It has fertile soil and vast forests, which furnish large quantities of lumber for exportation. San Carlos, or Ancud, is the chief seaport. Chiloé was discovered in 1558. Population, 1906, 98,764.

**CHIMAERA** (kî-mê'râ), in Greek mythology, a three-headed, fire-breathing monster. The fore part of the body was that of a lion, the hind part that of a dragon, and the middle part that of a goat. Each of the three heads resembled that of one of the three animals. This monster was killed by Bellerophon. Sculptures of it have been discovered in Lycia, and it is said that the finest representation is the large bronze in Florence. The term *chimaera* is applied figuratively to unnatural or idle fancy.

**CHIMBORAZO** (chîm-bô-râ'zô), a mountain about ninety miles from Quito, in Ecuador. It has an altitude of 20,703 feet above sea level. Nearly 2,500 feet of the slope from its summit downward is covered with snow perpetually. E. Whymper was the first to ascend to the top, which he did in 1880.

**CHIME** (chîm), a number of bells attached to each other in a diatonic succession, and used to produce chimes by means of hammers, which are moved by a mechanism or by clockwork. They are used in church towers and elsewhere. The number of bells employed is not less than five, usually nine, but often much larger. The first chimes were made in 1487 at Alost, Belgium. Pianoforte music may be played on some of the chimes, but the fist instead of fingers is used to strike the keys. The Trinity Church, New York City, has one of the oldest chimes in America.

**CHIMNEY** (chîm'nÿ), an erection designed for the passage, from buildings and various structures, of the smoke of a furnace or fire to the open air. Chimneys were not built to any extent before the 13th century. The



smoke was emitted from the house or structure through an open hole in the roof, and this was covered with a board or some other protection in the evening. They are now constructed of brick or stone, and in the better classes of buildings extend from the basement through the floors and the roof. An opening in the basement serves for cleaning purposes, while openings in the various apartments permit the admission of pipes from stoves or furnaces. Many of the newer chimneys have a double passage, one for the smoke and the other for ventilation purposes. The tendency of the smoke to pass upward is due to the differences in the weight of the heated air in the chimney and an equal volume of cold air on the outside, the colder pressing the warmer upward. In early times stove-pipes constructed of sheet iron were in general use and similar pipes or smokestacks are now used in the larger factories and machine shops. The chimney in a residence usually passes from five to seven feet above the ridge of the roof. This arrangement serves as a protection against fire and increases the draft, which depends largely upon the height of the structure. The opening for smoke in the average chimney is about twelve inches square, and that for ventilation is about the same, but in general it varies with the number and size of the stoves or furnaces from which the smoke passes through the chimney into the open air.

**CHIMPANZEE** (chīm-păn'zê), a name formerly given to several large man-shaped apes, but more properly to the native ape of the equatorial portion of Western Africa. It is closely associated with the gorilla. The face is almost hairless, the skin is yellowish, the teeth are beautifully white, and the hair is long and black. The arms are longer than the hind limbs, and, when the animal stands erect, they reach below the knee. The height of a full grown chimpanzee is about five feet, and its structure is much like that of a human being. It moves about freely in an erect position, is gentle in habit and amiable in disposition, and easily makes friends. The brain is about half the size of a human brain. It lives in forests, where it feeds on fruits, though it also robs the gardens of the natives. Its habitation is largely in the branches of trees, in which it constructs a sort of nest and rears its young. The habits of the adult in the native state are not well known, but in captivity they have been thoroughly studied. The first accounts given of a chimpanzee were written by Hanno, who left Carthage in 470

B. C. to explore the northwestern part of Africa.



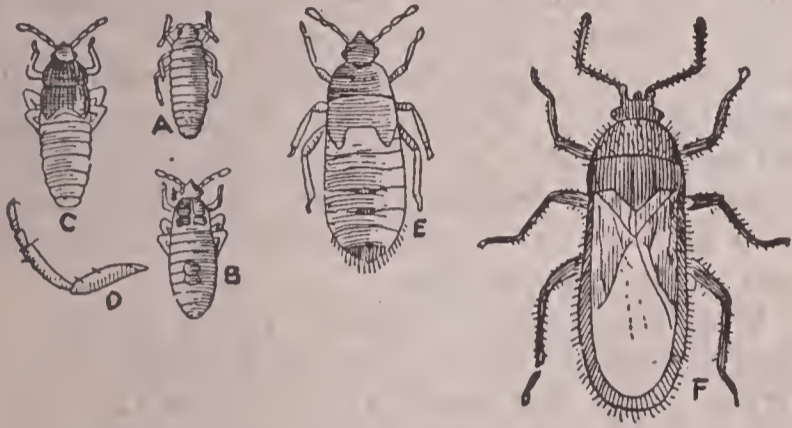
CHIMPANZEE.

**CHINA SEA**, an extension of the Pacific Ocean along the southeastern coast of Asia. It is divided by Formosa into the East China Sea and the South China Sea. The East China Sea is bounded on the north by the Yellow Sea and Korea, east by Japan and the Riu Kiu Islands, south by Formosa, and west by China. The South China Sea is bounded on the north by China and Formosa, east by the Philippine Islands and Borneo, south by Borneo and the Java Sea, and west by Anam and the Malay Peninsula. The China Sea is important in the commerce and the political questions of the East. Upon its waters ply some of the largest war and commercial ships of the world. Among the fortified cities on its coast are Bangkok, Canton, Hong Kong, and Singapore. The Mekong, the Menam, and the Si-Kiang rivers flow into it.

**CHINCH BUG** (chinch), a small pestiferous insect, about three-sixteenths of an inch long. The wing covers are white, with black spots, and the body is dark brown. Its eggs are deposited in the ground in the spring and



hatch about the first of June. The young insects are very destructive to wheat, barley, rye, and other cereals, and move from these grains into fields of growing corn, which they injure by sapping the juices from the stalk and roots. They produce two broods in a year, one in early summer and one in autumn. Their liability to take infectious diseases has led to a means of destroying them in wheat fields, and until this discovery was made their de-



A, Newly hatched larva; B, Larva after first molting; C, Larva after second molting; D, Leg of perfect insect; E, Pupa; F, Adult insect.

struction was almost impossible. The plan of destroying large swarms of them is to infect several insects artificially with a disease and place them among the swarms; thus the disease will spread very quickly and largely destroy them. Cinch bugs occur most commonly in the wheat fields of the Mississippi valley and the great plains of North America, and thrive best in dry seasons.

**CHINCHILLA** (*chīn-chīl'la*), a small squirrel-like animal, native to the higher regions of Chile and Peru and to the great plains of South America. These animals are rodent in habit, have long hind legs, soft gray hair, and a bushy tail, and the body is about a foot or fifteen inches in length. They feed on herbs and the roots of plants. The fur is used for muffs, tippets, and other articles of ornamental apparel.

**CHINESE EMPIRE**, or **China**, an extensive imperial domain of Eastern Asia, comprising China proper and the dependencies of Mongolia, Tibet, East Turkestan, Jungaria, and Manchuria. It comprises nearly one-fourth of Asia and one-twelfth of the land area of the globe, and is the third largest country in the world. The area is estimated at 4,277,170 square miles. It is irregular in outline and lies between latitudes 18° and 54° north and longitudes 74° and 135° east. The boundary on the north is formed by Siberia; on the east by Siberia, Korea, the Yellow Sea, East China Sea, and South China Sea; on the south by Indo-China and India; and on the west by

Russian Turkestan. Its southern shore is indented by the Gulf of Tonkin and its eastern by the Gulf of Pechili. South of it is the island of Hainan, separated from the mainland by the Strait of Hainan. The extent of the empire from east to west is about 3,000 miles and from north to south, 2,400 miles.

**DESCRIPTION.** The Chinese Empire consists mainly of highlands, characterized by plateaus and mountain ranges, except along the coast and in the valleys of its great rivers. It is separated from Siberia by lofty highlands, known as the Altai and Tian Shan mountains, from which ranges extend westward through Mongolia and finally disappear in the desert plateau of the Gobi. The Tibetan Plateau extends along the western part, and much of the southwestern boundary is formed by ranges of the Himalayas, which rise to heights of over 20,000 feet and are crossed by a number of difficult passes. All of the mountains of southeastern China belong to the Tibetan tableland, which is cut up by many great ridges and peaks. The Kuenlum Range occupies most of the western section. Many of the mountain systems are interspersed by extensive and fertile valleys, but the west central portion is largely of desert formation, embracing the Tarim Desert, with the Desert of Gobi stretching toward the northeast.

**DRAINAGE.** Much of the surface slopes from the west toward the east and southeast, and the drainage of the northern part is toward the northeast. A large part of Mongolia is drained by the Amur and its tributaries, and Manchuria is entirely in the Amur basin. The great Yangtse-Kiang River rises in the western part by a number of branches, flows toward the east, and discharges into the Yellow or North China Sea. Other important rivers flowing east include the Hoang-ho and the Si-Kiang. The Selenga River flows north and discharges into Lake Baikal, Siberia, while the extreme northwestern section is drained by a number of rivers that have no outlet to the sea. The southwestern portion is drained by the Salwin and the Mekong, which flow toward the south. Many of the rivers are important as avenues of transportation and the valleys are densely populated. China has few lakes and all are comparatively small. Near the east central part is Lake Tung-ting-hu, which is drained by the Yangtse-Kiang. In the northwestern part are a number of lakes that have no outlet to the sea, including Shara and Loo, both of which receive the discharge from several rivers.

**CLIMATE.** The climate of China is very similar to that of the central part of North Amer-



ica, being largely temperate. In the northern portion, bordering on Siberia, it is cold; throughout the interior it is temperate; and in the southern portion it is warm and tropical. At Peking the mean annual temperature is 51° and at Canton it is 69°, while the summer heat at the former ranges from 85° to 100° in the shade. At Canton the temperature is greatly modified by the monsoon winds, but in the interior the climate is continental and the range of temperature much greater. The rainfall is excessive on the southern coast, where it averages 100 inches annually. At Hongkong the rainfall is 90 inches and at Peking, 24 inches, and in the northwestern part is a vast extent of territory that has little rain. The southwest monsoons bring most of the rains, and local droughts occur in seasons when these winds do not blow to the average extent. Disastrous typhoons sweep across the country periodically and cause much loss of life and property in many sections of the southeastern part.

**FLORA AND FAUNA.** China has a vast variety of plants useful in the arts and trades. Above all, it is the home of the rice, tea, and bamboo plants. The first furnishes its most important article of food; the second, its drink; and the third, material useful in providing implements and constructing habitations. Fine forests abound in the mountains, but the populous regions have been cut over and the land has been improved for cultivation. Among the forest trees are the cypress, pine, cedar, banyan, camphor, palm, and a number of hard woods. The mulberry is cultivated to promote silk culture, and many varieties of fruits abound, including the orange, banana, mango, and pineapple.

Many wild animals are still abundant in vast tracts of country that are sparsely populated. Over 700 species of birds have been described. In the southern part many ferocious animals abound, including the panther, tiger, leopard, wildcat, rhinoceros, and black and brown bears. In the same section are many species of bats and monkeys, and tapirs and elephants are not uncommon. The northwestern part has the musk deer, muskrat, badger, weasel, and otter, and great swarms of locusts often migrate and do much damage. The coastal waters are rich in eels, porpoises, sharks, finwhales, and sturgeons. The reptiles are represented by snakes, frogs, turtles, and alligators.

**MINING.** All of the valuable minerals are found in the empire. Deposits of commercial coal are thought to extend over an area of 400,000 square miles, but it is mined only in a few localities. Bituminous coal is mined in

Pechili and several other eastern provinces, and beds of anthracite occur in eastern Shansi. Gold is obtained in the auriferous quartz veins of Pechili and Shantung, and is washed from the sands of the Amur and other rivers. Rich deposits of copper occur in Hunan and Yünnan and iron ore is mined in Shansi. Salt is obtained from artesian wells at a depth of 1,500 feet, the brine being evaporated over furnaces in which natural gas is used as fuel. Petroleum and natural gas are obtained in several fields. Other deposits worked more or less include tin, quicksilver, silver, kaolin, and building stone. The absence of adequate transportation facilities and Chinese prejudice against using modern implements are the chief causes of a lack of development in mining to the extent of its possibilities.

**MANUFACTURING.** China is noted for its extensive manufactures, but the products include rather fancy and small articles than the larger wares, such as are common to America and Europe. The Chinese train early in life to secure efficiency in labor and the manual arts. Their silk manufacture is the chief industry along the line of manufacturing, and in the production of silk they excel in varieties and quality all other nations in the world. A high degree of mechanical skill and artistic taste is displayed in the embroidering of silk. Cotton and woolen goods are beginning to meet with favor for wearing materials, and are, to some extent, displacing silk, which is the favorite fabric for clothing and is prescribed for officials and people of high rank. The Chinese knew of movable types in printing before the time of Gutenberg and Koster, and were the first to invent clocks, paper, porcelain, gunpowder, the magnetic needle, silk textiles, jade, and the art of printing. They are skilled in carving, engraving on wood, bronze-casting, lacquer work, and weaving. They support many factories for making matches, brick, powder, steel and iron ware, and munitions of war. Modern machinery has been introduced within the last few decades and all the industries are passing through a period of transition.

**AGRICULTURE.** China is distinctly an agricultural country, and has developed much skill in the care and cultivation of the soil. The art of fertilizing and securing the greatest possible productiveness has been a matter of special attention among the agricultural classes, and it is the policy of the government to promote and encourage this necessary department of husbandry. In theory the farmer ranks next to the scholar, and is looked upon as being



superior to the artisan and merchant. The farming season is inaugurated annually at the spring equinox by the emperor, who sows some seed in a newly turned furrow. The land is held in small estates, usually not over ten acres, and when a man ceases to cultivate his land it becomes the property of the emperor. Crops have been rotated since time immemorial, and the cultivation is done with the utmost skill and care, hence, a failure of crops is very rare. Lowlands are drained and protected from floods by embankments, while fertile soil is transported to the barren hills to render them productive. A network of canals and ditches is utilized in irrigating the land, even where rainfall is ordinarily sufficient, thus insuring abundant moisture at the critical time of plant development.

Farming is developed most extensively in the southeastern part of the empire, especially in the fertile valleys of the rivers. Rice is the staple crop and is grown in the southern and middle parts. Tea is cultivated in the southeastern section, where it yields three crops per year, in April, July, and August. Comparatively little rice is cultivated north of the Yangtse-Kiang River, except on the southern slopes of the hills. The cotton belt extends as far north as the Hoang-ho River, where it is grown chiefly in the low valleys, while farther south it receives more attention and produces a larger yield. Sugar cane is confined chiefly to the provinces bordering on the China Sea. Wheat, oats, corn, buckwheat, and rye are grown principally in the northern part. Tobacco is a staple crop in all parts of the empire, and the cultivation of the poppy is a commercial enterprise owing to the prevailing habit of opium smoking. The mulberry tree is cultivated more than any other on account of its value in silk culture, and ginseng, indigo, and vegetables receive careful attention. Stock raising is not an extensive enterprise, for the reason that butter, milk, and cheese are practically unknown. Fish and eggs are preferred to the flesh of domestic animals, and the horse is little used for driving, being considered less desirable than the men who pull the jinrikisha. Camels, elephants, and buffalo are reared to a considerable extent.

COMMERCE. The tendency to exclusion has caused China to be closed against the commerce of the world, hence its commercial relations with foreign countries is of comparatively recent date. A trading port was established by the Portuguese in China in 1522 and some trade was carried by the Dutch, the English, and the Americans, but the government re-

mained hostile to foreigners and trade continued to be of secondary importance. Special ports were opened to foreign commerce in 1842 by the Treaty of Nanking, which was made shortly after the Opium War with England, and up to 1908 forty-two ports were opened, including a number located on the rivers several hundred miles inland. The import trade greatly exceeds the exports. The former includes chiefly flour, ginseng, kerosene, cotton textiles, quicksilver, sago, rubber shoes, and machinery, while the exports consist principally of tea, hemp, essential oils, fans, mats, chinaware, silk products, bamboo ware, and hides. Foreign trade is principally with Great Britain, Japan, the United States, and Germany in the order named.

TRANSPORTATION. The rivers and canals of China still continue to be the chief highways of commerce, and these are peculiarly busy with boats and barges of all kinds. A vast volume of trade is carried inland by these means, whence it is distributed to remote sections by carts and other vehicles drawn by hand or by animals, such as the horse, elephant, and buffalo. The Grand Canal, a waterway 700 miles long, connects Tientsin with Hankau, and has been in use more than 800 years. Many railroads have been projected and surveyed by foreign corporations, but railway construction is slow on account of hostility of the government, and partly because of the impossibility to construct them without going through numerous burial grounds, which is precluded by the ancestor worship of the Chinese. The total railroad mileage in 1908 did not exceed 3,500 miles, including the lines built through Manchuria by the Russians. The projected lines are one from Kiauchau to Peking by a German corporation, one from Canton to Hankau by an American company, and several branches to extend from the lines at Port Arthur and from Peking to Canton.

SPHERES OF INFLUENCE. A number of nations have secured trade concessions in different parts of China. This was brought about from the fact that the Chinese support customs which are opposed to the methods employed in modern business enterprises, hence the establishment of spheres of influence permit intercourse on a commercial basis decidedly advantageous to the commerce of the world. The oldest European possession is that of the Portuguese, who leased the city and island of Macao, at the mouth of the Canton River, in 1586, subject to an annual payment, and it was ceded in sovereignty in 1863. Hongkong, the mountainous island at the mouth of the Canton River,



was ceded to Great Britain in 1842, and subsequently a number of other islands were added so the district has an area of 405 square miles. Germany acquired a district of 200 square miles on the Shangtung coast, known as Kiaochau, in 1898, and built railroads from this point inland to the Poshan coal mines, which are controlled by German capital. France secured a concession of 230 square miles on the east side of the peninsula of Lienchou, including the town of Lienchou-fu, in 1898. Russia had the largest sphere of influence in Manchuria prior to the Russo-Japanese War, after which it was ceded to Japan with certain limitations.

**RELIGION.** Five religions are well established in China. These include the Confucians, Buddhists, Taoists, Mohammedans, and Christians, represented numerically in the order named. Anciently the Chinese divided their worship between God and their ancestors, and this double worship is embodied in the religion of Confucius, who laid stress upon the material side of life rather than upon the spiritual. It has gone through many changes, is the religion of the educated classes, and is the basis of society and government. Buddhism is on a decline, its priests are illiterate, and its monks and nuns are mendicants. However, monasteries and Buddhist temples are common in all parts of China, though those who profess it are of the uneducated class. Taoism is a system of rationalism, which makes an impersonal first principle the parent of all things, and it teaches that man must aspire to realize this principle through an escape from all mental distraction. Its worship is intermixed with incantation and alchemy, and partakes of a kind of spirit worship. The Arabs introduced Mohammedanism and their religion received state recognition. It is estimated that fully 20,000,000 Chinese profess the Moslem faith, and the mosques are numerous and usually in good condition. It is thought that Christianity was introduced in the 6th century by the Nestorians, but little progress has been made by either the Protestant or Roman Catholic missions. Those who profess Christianity are largely pupils of the missionaries or their descendants, and the total body of Christians does not exceed 1,500,000.

**EDUCATION.** The Chinese hold education and literary attainment in high repute, and among them illiteracy is looked upon almost as a vice. While these people differ in their religion and personal likes and dislikes, they make education the element that binds them together as a nation, and with their educational skill they have been able to endure through history longer

than any of the nations of the world. The ability to obtain and hold an office is looked upon as a great personal attainment, and fitness for public positions is determined by competitive literary examinations, a system which has been in force nearly seventeen centuries. All the villages and towns have elementary schools, and the teachers are made up largely of a class who were rejected in the examinations for public positions. Technical education is provided for at the naval and military schools and at Peking is located the Tung-wen College, in which science, literature, and modern languages are taught. Chinese newspapers are published chiefly in the ports within the sphere of foreign influence. The Chinese language contains only words of one syllable, and each word in print is represented by a character, hence there are as many characters as there are words in the language. It is thought that these symbols originated from the hieroglyphic characters of very ancient times. These characters are represented or printed in vertical columns to be read from top to bottom.

**INHABITANTS.** The Chinese have a yellow complexion and belong to the Mongolian race, which embraces more than one-third of the population of the earth. Their eyes and eyebrows turn upward at the outer extremities, the hair is straight and black, and the forehead is wide. In stature they are low and have small feet and hands. Beginning in the 6th century A. D., the feet of the women of the higher classes were bandaged so as to prevent them from developing to the normal size. The men wear a braid or *queue* on the crown of the head, with the rest of the head shaved closely. They are accustomed to hard work, are free from most vices, and live at a small expense. Opium smoking, gambling, and the consumption of intoxicating beverages are national vices. They are strongly attached to their home, support their families by hard toil, and respect old age and their parents. Remarkable simplicity of manners is exhibited by the inhabitants of the interior who have not come in contact with foreigners, but those acquainted with the customs of foreigners are treacherous and untruthful in dealing with strangers.

China has a style of architecture distinctively her own, the best types of which are found in her temples and public buildings. The culture of the silk worm is left almost entirely to the women, while the men pursue agriculture, the arts, the professions, and laundry work. Death is regarded the most important event and marriage has precedence as of second importance. Both sexes marry young under contracts made



by parents or professional matchmakers, and frequently the future bride and groom do not become acquainted until immediately before the wedding ceremony. Women are not accorded the same social or educational advantages given to men, and in the scale of society are considered of less importance. People in destitute circumstances are permitted to put their female children to death, but child murder is practiced very little, though millions of children die each year from a peculiar treatment of the sick, which prescribes that a child that does not respond to remedies is to be regarded as unhuman and for that reason is passed through an ordeal of neglect or starvation. The board of rites is a department of the government at Peking, and interprets the Li-King or Book of Rites, which has been the basis of all rules of etiquette and conduct for more than 3,000 years, and any action that departs from it is looked upon as treason or impiety.

The great mass of Chinese live in houses built one story, and in the construction use brick, thatch, or bamboo, with the roof made of wood or tiling. Chambers are set aside for the worship of ancestors in all of the better class of dwellings, in which religious ceremonies take place regularly. They have many festivals and holidays, but regard New Year's Day as the greatest of all, for which they make preparation by paying their debts and purchasing new clothing, and it is considered the birthday of everybody, no matter on what day of the year birth took place. The dress has many advantages, since it is graded according to the season, and both sexes aim to have garments of the same kind, the only differences being in the footwear. They do not shake hands or kiss each other, but are free in congratulating and saluting. Every Chinaman has an ambition to be buried properly, hence a handsome coffin is looked upon as a very desirable present, and very often caskets are kept in the home for years so as to have them ready when needed. White is the color put on by mourners.

**POPULATION.** Few foreigners make their home in China. The total number of foreign birth, in 1908, was 16,850, and they resided chiefly in the treaty ports. They included principally British, Japanese, Russians, Americans, Germans, French, and Portuguese. However, the Chinese are widely distributed in every civilized and uncivilized country, and emigration would undoubtedly be much larger, if these people were welcome in the countries of America. Though China has many great cities in a general sense, they are not centers of pop-

ulation like those known to Europeans, since they resemble aggregations of people in a locality rather than cities of social and commercial enterprise. Peking, the capital, is located in the east central part. Other cities are Nanking, Canton, Tientsin, Hankau, Shanghai, Hoang-ho, and Fuchau. The population of the empire is not accurately known and the most recent careful estimates place it at 409,775,000.

**GOVERNMENT.** The government is not centralized like those of Europe, but the Chinese are held together by social, religious, and educational systems rather than by political force. It has a constitution which holds the provinces together as a confederation, under which the emperor is the chief executive and has supreme direction of affairs, with the assistance of a cabinet of ministers of state. Six ministers comprise the cabinet, two of whom are Chinese, two are Manchu, and two are chosen from the great college. The cabinet has control of seven government boards or administrative departments, as follows: the board of civil appointment, of revenues, of military, of public work, of admiralty, of rites and ceremonies, and the high tribunal of criminal jurisdiction. Each province has a governor and each district a magistrate, and between the emperor and the provincial governors is the viceroy. A number of the provinces are united to form vice-royalties, of which there are ten or twelve, and communication between the capital and the province is solely through the viceroy and the governor. The laws are an outgrowth of custom through many centuries rather than direct legislation, and are repromulgated with various modifications when the dynasty is changed. In theory the emperor is the son of Heaven, but he may be deposed by the people if his reign is unwise or wicked, and if such a change is brought about by a rebellion it is said to have been willed by Heaven. The present Manchu dynasty belongs to a clan of conquerors numbering about six million people, and in this class there are nine orders of nobility. Patents of nobility and honorary titles are conferred by the government, and the only permanent noble class is confined to the descendants of Confucius.

Manchu generals have charge of the military forces, which consist of 170,000 men quartered in the larger cities. The war footing is 600,000. Modern rifles and cannons have been imported from Europe and are manufactured in China, but the army still uses the bow and arrow to some extent, and the firearms in use by the cavalry consist of many different kinds of weapons. The navy has little strength com-



pared to those of European nations, but the empire has forty forts and batteries that are armed with high-power guns. The government maintains a system of mail service, though this is inadequate to the needs, and telephone and telegraph lines are used extensively.

**LITERATURE.** The literature of China is the most extensive national literature of the world, its collection of writings extending over an epoch of 2,000 consecutive years. Among the early writings are those of Confucius, the most eminent of early moralists, but there are fragmentary writings that date from about the same time, these being counted among the Chinese classics. The histories are reckoned the most elaborate Chinese works, these being divided into dynasties, each containing an elaborate account of a dynasty. Chinese literature embraces a large collection of biographies of noted statesmen and scholars, a feature quite important in a country where ancestry worship prevails. In connection with each history are elaborate chronologies giving the lineage of important personages, many of which are of little interest and are seldom consulted. However, there are important treatises on law, music, the rights of property, food, and clothing, astronomy, geography, language, and various arts and sciences. One of the most elaborate works is a record entitled "General Examination of Records and Scholars," in which are recorded important details relating to official service and tests of scholarship.

Though the historians and general writers of China are largely men, the poets include numerous women writers. "The Book of Poetry," a classic coming down from Confucius, is a work on poetry held of very high importance, and those desiring official preference are required to be acquainted with its contents. Chinese poetry as a whole is made up of elegies, ballads, and songs, some of them possessing real intrinsic value, though others are of minor importance. The Chinese writings of greatest utility are those relating to the culture of the tea plant and the mulberry tree, those treating of engraving, pottery, medicine, and horticulture, and those bearing on the subject of legislation and the industries. Other writings include essays, elegies, orations, legends, and works relating to Buddhism, alchemy, mechanics, and the drama, and numerous treatises of an encyclopaedic nature. Many libraries were destroyed at different times, particularly by the Tsin dynasty, and at the time of the conflict between the Boxers and the allied armies in 1901. It is to be observed that the Chinese used paper as early as the 1st

century of our era, and that they were the first to employ movable types, which they invented about the 8th century A. D.

**HISTORY.** The early history of China is wrapped in fable, beginning in 2635 B. C., though it is reasonably certain that the country was densely populated even before that time. It is thought that Fu-hi, who lived about that period, founded the social order of the Chinese. Confucius begins his record of Chinese history with the reign of Yao, in 2357 B. C., and praises him as the founder of civilization and prosperity. The Chow dynasty organized the government in 1122 and reigned by a succession of kings until 255 B. C., a period of about 900 years, during which the fine arts and literature flourished. Confucius was born in 551 B. C., at a time when the nation was depressed by misrule and civil war. The Chow dynasty was overthrown by the Tsin or Chin dynasty, in 255 B. C., from which China was named, and its rulers expelled the Tartars, abolished the feudal system, and built the great wall to protect China against invasion. Prince Cheng, one of the Tsin rulers, regarded a national hero of the Chinese, assumed the title of emperor, calling himself Che-Hoang-ti. He beheaded hundreds of scholars who supported feudalism and claimed sovereignty over all the nations of Eastern Asia.

The Han line of rulers reigned from 206 B. C. until 190 A. D. Within this period many Jews settled in China, Buddhism was introduced and competitive examinations as a qualification for office became established. Genghis Khan and the Mongols overran China in the early part of the 13th century. They established a Mongol dynasty in 1259, but this was displaced by the Ming dynasty in 1368, when Hung-wu became the reigning sovereign. The latter dynasty was succeeded by the Manchu-Tartar dynasty in 1618, and through a line of descent still holds the throne. The first accounts published in Europe of the Chinese and their industries were from the pen of Marco Polo, who traveled in that country in the 13th century. Queen Elizabeth attempted to establish trade relations through the East India Company in 1596, but commercial intercourse of noteworthy extent did not take place until 1792. China declared the opium traffic illegal in 1796, but the decree was not enforced until 1837, when the government decided to suppress this traffic and sent commissioners to Canton to confiscate the opium in the possession of merchants. These officials seized the stores of opium and published an edict that vessels engaged in the traffic would be subject to confis-



cation and the persons who engaged in it were declared punishable by death. This brought on the Opium War of 1840, which terminated favorable to the British, and they compelled the opening of the five ports at Amoy, Canton, Ningpo, Fuchau, and Shanghai and the payment of an indemnity of \$21,000,000. Four years later commercial treaties were made with France and the United States.

A formidable insurrection occurred in southern China in 1850, known as the Tai-ping rebellion, which was finally put down by an army raised at the expense of the merchants at Shanghai. This army was first commanded by an American named Ward and later by Charles George Gordon. In the meantime additional trade privileges were obtained by the European nations, and in 1874 the Chinese became complicated with the Mohammedans in Turkestan, which was followed by internal changes and the widening of Chinese influence in East Turkestan. China became involved in a war with Japan in 1894, as an outgrowth of rival interests in Korea. The Japanese army and navy promptly invaded Chinese territory and succeeded in winning every combat, both on land and sea. Through this war China lost the island of Formosa and was required to pay an indemnity of about \$150,000,000. Japan had demanded the cession of the Liaotung peninsula, including Port Arthur, but Russia was unwilling to lose the foothold she had gained, and in conjunction with France and Germany protested until Japan gave up her claim and Russia secured a lease of the harbor of Port Arthur. A large reform party in China sought to bring the country into closer commercial relations with other nations, who demanded an "open door" market, and this led to serious opposition through the organization known as the Boxers.

The Boxers were centered largely in Shantung and through the assistance of several other organizations promoted an agitation against foreign aggression. These revolutionists advocated the extermination of all foreigners, threatened the legations in Peking, and on June 20, 1900, murdered Baron von Ketteler, the German ambassador, on the streets of Peking. This caused the diplomatic corps and those associated with them to fortify themselves in the British legation, which was besieged for nearly two months. To relieve the situation, the allied powers, including the United States, Germany, France, Russia, England, Japan, and Italy, dispatched a large army to China, which was placed under the general command of Count Waldersee. The allied army captured the Taku forts

on June 17, and later took possession of Tientsin and Peking. The royal family of China escaped to the interior and the allied army marched through the forbidden city. Prince Ching and Li Hung Chang were commissioned to conclude a treaty with the powers, and it was submitted and approved by the imperial government in 1901. This treaty required China to pay an indemnity for the damage done to the different foreign interests, granted greater trade privileges, provided protection against members of anti-foreign societies, and gave enlarged advantages to invest foreign capital in constructing public utilities and developing the natural resources.

Little is known of the inner life of Chinese royalty, and the chief executive lives a most retired life under the etiquette of the court. The late ruler, Emperor Kwangsu, was born in 1872 and is thought to have reigned from 1901, but was deprived of all real share in government by the dowager empress. Both he and the dowager died in 1908, when Hsuen Tung, an infant of three years, became emperor under the regency of his father, Prince Chun. Li Hung Chang, often called the Bismarck of China, attained to the highest reputation in modern Chinese statesmanship. He introduced many methods and ideas of western civilization. However, the sentiment "China for the Chinese" has had a permanent growth throughout the empire since the Boxer insurrection.

**CHINESE EXCLUSION**, a term applied to legislation in the United States against the permanent settlement of Chinese in the country. The vast density of the population of China has led to a tendency to emigrate, especially to the Pacific coast in the United States, British Columbia, and Australia. The first treaty between China and the United States regarding residence and travel was effected in 1868. Owing to the cheapness of Chinese labor, many American laborers were injuriously affected, which led to the treaty of 1880, whereby it was sought to absolutely prohibit immigration. The act of Congress passed in 1884 suspended immigration for ten years. Later, in 1892, the Geary law extended the exclusion provision for a further period of ten years, and required Chinese to register and file photographs in order to keep a complete record of those already in the country. This act was reaffirmed in 1902, when Congress further limited immigration and provided certain restrictions upon visiting and traveling. The Chinese population in the United States in 1900 was 119,050.



**CHINESE WALL**, a great artificial structure extending about 1,500 miles between China proper and Mongolia. It was commenced in the year 214 B. C., and was intended to protect the country against the marauding raids of the Tartars. The construction is of brick, rising from granite foundations, and the two outer walls inclose great masses of stone and earth. It is about twenty-five feet wide at the bottom and fifteen at the top, and is from twelve to fifty feet high. It is strengthened by towers at regular distances. The great wall winds through valleys and over hills, the greatest height above the sea at one of the elevations being 5,000 feet. Several million men were engaged in its construction for a period of ten years.

**CHINGTU** (chǐng-tōō'), a city of China, on the Min River, capital of the province of Szechuan. It is inclosed by a wall, has fine streets, several libraries, and a number of beautiful edifices. It is the seat of several public buildings and the residence of the viceroy. Population, 800,000.

**CHINOOK** (chǐ-nōōk'), a family of American Indians, now nearly extinct. They formerly inhabited the region along the Columbia River, and extended from Oregon to the southern part of British Columbia. They were expert fishermen, kept slaves, and manufactured clothing from skins. From them originated the Chinook dialect, a mixture of Indian, French and English. The Chinook wind was named from this Indian tribe. It is a remarkably pleasant wind common to sections of Washington and British Columbia, coming inland from the Pacific as a direct result of the Japan current. In winter it has a warming influence, melting the snow and ice, while in summer it acts as a cooling and tempering agency.

**CHIPMUNK** (chǐp'mũnk), the name of a class of American squirrels. The body is about six inches long and the color is gray or



CHIPMUNK.

reddish-brown, with black and white stripes on the back. These animals are active and cheery and issue a shrill note when alarmed. They burrow habitations underground, subsist on nuts and cereals, and multiply rapidly. In many localities they are a pest in cornfields.

**CHIPPEWA** (chǐp'pě-wä), Battle of, a military engagement between the British and Americans at Chippewa, a village of Ontario, in Welland County. This village is a port of entry on the Niagara River, three miles above Niagara Falls. The British under Gen. Riall were attacked by the Americans under Gen. Brown on July 5, 1814. The first charge was led by Gen. Porter. He pursued the enemy within a few yards of the entire force of British, who made a gallant bayonet charge, and the Americans were routed, but Gen. Scott was ordered forward and saved the day to the Americans. The latter lost 355 men, while the British loss was 604.

**CHIPPEWA FALLS**, a city in Wisconsin, county seat of Chippewa County, on the Chippewa River, ninety-eight miles east of Saint Paul, Minn. It is on the Wisconsin Central, the Chicago and Northwestern, and the Chicago, Milwaukee and Saint Paul railroads. The chief buildings include the county courthouse, a State institution for the feeble-minded, the public library, and the high school. It has gas and electric lights, city waterworks, and other municipal improvements. The manufactures include machinery, cigars, furniture, and implements. It has a considerable trade in farm produce and merchandise. It was settled in 1838 and incorporated in 1870. Population, 1905, 9,009.

**CHIPPEWAS** (chǐp'pě-wāz), a tribe of North American Indians. See **Ojibways**.

**CHISEL** (chǐz'ěl), an edged tool for cutting iron, stone, or wood. It is worked by pressure or by striking the upper end with a mallet or hammer. A carpenter's chisel has a wooden handle attached to the shank of the blade, but those used for cutting metal are entirely of steel.

**CHITON** (kī'tōn), a class of mollusks whose shell is composed of many calcareous pieces, eight in number. The parts are transverse and overlap each other, and are so formed that the animal can roll itself into a ball much like the armadillo. In doing so it exposes only the hard shell, hence defends itself in this way when attacked. Locomotion is by an oval foot, which enables the chiton to cling to rocks like the limpet. About 200 species have been described. They are from eight to ten inches long in the coastal waters of California, but in the North Atlantic rarely exceed in length more than one or two inches. Fossil chitons are abundant in the lower silurian rocks.

**CHIVALRY** (shǐv'al-rĭ), the knightly system of feudal times, especially the system distinguished by the championship of women and



of knightly honor. It had its beginning prior to the time of the Crusades, and during their greatest strength it attained to its advanced stage of development. The principal characteristics of the age of chivalry included the thirst for glory, the love of adventure, a war-like spirit, and a lofty devotion to the female sex. From the 9th to the 12th century a knight was one who held land in fee from a superior and was bound to render him military services. During the height of chivalry, it was customary to place a young knight in the court of a baron or noble knight, under whom he acquired skill in arms and in riding. Later he accompanied his lord in battle, when he was known as a squire or an esquire. A young man attaining the age of responsibility, who inherited estates, was pledged to discharge them honorably in a ceremony of great splendor. The church added solemnity and made the investiture of a youthful knight an imposing religious event, placing before him a high moral and religious ideal to which he was exhorted to aspire. He was implored to have mercy for vanquished foes, purity in youthful relations, and high regard for the Christian Church. Notwithstanding these instructions, knighthood was often accompanied by cruelty and impurity, although the poet celebrated and the church counseled the moral elevation of the true knight. The feudal system was a normal growth from chivalry, when that state of society declined. The most interesting developments of chivalry were the Knights Templar, the Teutonic Knights, and the Knights of Saint John, military orders instituted under its direction. It may be said that the age of chivalry served a useful purpose in making society braver, more pure and compassionate, and that it gave to these virtues high rank, the effects of which are still manifested in modern society.

**CHLORAL** (klō'ral), a colorless, odorous, oily liquid obtained by passing chlorine gas through absolute alcohol to saturation. It is decomposed into chloroform and formate of potassium by the action of caustic potash. It changes into a white solid by keeping, but is reconverted into a liquid by heating. A crystalline compound called *hydrate of chloral* is formed by adding water. This compound is used in medicine in the form of a syrup, as in cases of acute mania, delirium tremens, and severe chorea. If taken in proper quantities, the effects are restful sleep and nerve quietness, in large doses it tends to paralyze the heart and is otherwise harmful, and should never be taken except under medical advice. In medicine it serves both as a hypnotic and an anaesthetic.

**CHLORATE** (klō'rât), a compound formed by replacing the hydrogen of chloric acid by a metallic base. Chlorate of potash is the most important of these salts, which, when mixed with combustibles, such as sulphur and charcoal, forms explosive compounds. It is used in the manufacture of fireworks, matches, and percussion caps. The chlorates of potassium and sodium are used in medicine, especially in cases of inflammation and scarlet fever.

**CHLORINE** (klō'rīn), a yellow-green combustible gas discovered by Scheele in 1774. It has a strong, irritating odor, and affects the bronchial tubes and lungs. In nature it occurs in the form of metallic chlorides, and is artificially obtained by heating sodium chloride (common salt) with black oxide of manganese and sulphuric acid. It is used as a powerful bleaching agent, and is of value for destroying certain forms of animal and vegetable matter. Its property as a disinfectant has given it a wide use, and it is applied for this purpose much the same as chloride of lime.

**CHLOROFORM** (klō'rō-fōrm), a colorless liquid of an agreeable odor, having a sweetish taste and smell. It owes its discovery to Liebig in 1832. The process of preparing chloroform consists of distilling water and alcohol with bleaching powders or chloride of lime. In sunlight it is formed by the direct action of chlorine and methane, or marsh gas. The vapor of chloroform is four times denser than air, boils at 62°, is nearly insoluble in water, and may be dissolved readily in alcohol. It decomposes by exposing to the light, by which means the acid and chlorine are set free. It is used in medicine by dissolving in alcohol. In that state it is known as chloric ether and used as a stimulant. Taken internally, it acts as a sedative narcotic and antispasmodic, and is used in cases of colic, asthma, cholera, and neuralgia. Applied externally, it allays irritation, pain in neuralgia, and itching. It is considered one of the safest anaesthetics, when administered by skillful practitioners, but in the hands of one uneducated in medicine it may produce lasting injury or death. Its use in surgical operations and painful diseases is quite common. Chloroform is also used to dissolve iodine, wax, resins, strychnine, and other alkaloids.

**CHLOROPHYLL** (klō'rō-fīl), the substance which gives the green color to leaves and herbage. It is produced by the protoplasm of plants, and separates into two elements the carbonic acid gas taken in by the leaves—oxygen and carbon. The oxygen is returned to the air and the carbon is converted into starch in the presence of light, hence the green of the



leaves is absent from plants that are deprived of light.

**CHOCOLATE** (chök'ò-lât). See **Cocoa**.

**CHOCTAW INDIANS** (chök'tà), a large tribe formerly occupying lands along the Gulf of Mexico, and extending from the Mississippi to the Atlantic. They were friendly to the French, but later formed an alliance with the English. De Soto engaged them in battle in 1540. In 1784 they acknowledged the sovereignty of the United States. At the beginning of the last century they began to emigrate toward the west. In 1820 they ceded a part of their territory to the government for lands west of the Arkansas, in Indian Territory, now Oklahoma. Their lands in the South came under the control of Georgia, where many Choctaws were granted the right of citizenship. In 1830 they ceded the remainder of their lands and moved with the Chickasaws to Indian Territory. In the Civil War they sided with the Confederates and lost their slaves, about 5,000 in number. Schools are supported among them by the government under a treaty made in 1866, and they are taught in the arts, industries, and sciences, many having made much educational advancement.

**CHOIR** (kwîr), an organized body of singers. The name is applied to the choral singers in churches, cathedrals, and other Christian edifices for worship. In many of the churches, both old and new, the choir occupies a particular place constructed for its use at one side of the altar or chancel, near which is a screen for the organ. See **Church**.

**CHOKÉ DÁMP**, the name given to a fire damp resulting from an explosion of gas in mines. It is also called black damp and after damp, and constitutes an irrespirable gas. See **Carbonic Acid**.

**CHOLERA** (köl'ër-à), the name applied to several diseases more or less similar to each other. *Cholera morbus* is characterized by vomiting and purgative effects with pain in the abdomen and lower intestines, and is accompanied by a loss of strength. It is caused largely by deleterious food or drink taken in the summer season. *Cholera infantum* is a similar disease in children. It is common to hot climates and to the hot seasons in the temperate regions, and in many instances proves fatal. A remedy of much merit consists of equal parts of tincture of rhubarb, tincture of opium, tincture of cayenne, essence of peppermint, and spirits of camphor. This preparation, thoroughly mixed and taken in doses of from fifteen to thirty drops every thirty minutes, is quite certain to give relief.

**CHOLERA**, Malignant, or Asiatic Cholera, a much dreaded disease, the germs of which are conveyed by means of the air or by water, and often proves fatal. It is epidemic in various regions of Asia, and is often spread to different parts of the earth. In 1829 it appeared in Europe and reached Britain two years later, when thousands of people died. It appeared again in 1848, 1854, 1865, 1873, 1875, and 1885. In 1892-93 it appeared in New York, but was prevented from spreading by prompt methods of isolation and sanitation. In 1848 the disease caused the death of 53,293 persons in England and 20,097 in 1854, while in 1855 not less than 55,000 persons died of it in Egypt.

The first stage of the disease is a severe form of diarrhoea with cramps in the abdomen and legs, usually accompanied by marked muscular weakness. In the second stage the patient suffers from intense prostration, feebleness, loss of voice, blueness of skin, and coldness of breath. The third stage is marked by a state of high fevers, with a tendency to suffer a congestion of the brain, kidneys, lungs, or other vital internal organs. In this and the second stage death often results. The best remedies against cholera are preventive medicines. It is favored and spread by conditions of filth and want of sanitation. The disease is primarily caused by a germ of a fungus or minute form of life propagating itself in the food of the alimentary canal. It is thought that the germ is conveyed into the system by unwholesome foods or impure water. Dr. Koch gave the opinion that the disease is due to the common bacillus, and that this organism is multiplied in the small intestines. Some physicians doubt whether these organisms actually produce the disease, but it is known that large numbers of them are found in persons suffering from it.

**CHOLULA** (chò-lōō'là), a city of Mexico, in the state of Puebla, sixty miles southeast of Mexico. It is situated on a plateau 700 feet high, has railroad facilities, and is surrounded by a farming and mining country. At the outskirts of the city is a brick pyramid about 170 feet high which covers over twenty acres, supposed to have been erected by the aborigines in honor of the deity Quetzalcohuatl. Among the manufactures are fireworks, textiles, pottery, and machinery. It has considerable trade, a fine public park, and several schools and churches. Cholula is an ancient city and when visited by Cortez in 1519 it had many temples and 20,000 houses. The Spaniards massacred many of the inhabitants on account of their hostility to Spanish influence. Population, 1908, 10,240.



**CHOPSTICK** (chöp'stĭk), one of two small sticks used by the Chinese in conveying food to the mouth. Chopsticks are made of wood, ivory, or bamboo, and are a substitute for a knife and fork. They are used with much dexterity even in eating food of a liquid character.

**CHORAGUS** (kō-rā'gūs), a music director among the ancient Athenians, appointed by the state to be the leader and trainer of a chorus in dramatic contests. It was an office of high dignity and the choragus who was adjudged to have exhibited the best entertainment received a crown and tripod as a prize. He was permitted to build a monument and on it expose his tripod. A street in Athens was formed almost entirely by these monuments, known as the Street of the Tripods. The monument of Lysicrates, erected in 334 B. C., still stands intact.

**CHORD** (kôrd), in music, a combination of sounds, the frequency of whose vibrations has a simple arithmetical ratio; that is, of sounds whose combination is in accordance with the laws of harmony. The common chord consists of a bass or fundamental tone and is the basis of all harmony.

**CHORUS** (kō'rūs), a term applied to a company of singers and musical recitationists, who perform with appropriate gesticulation. The term originated from the Grecian and ancient tragedy, when choruses were made up of troupes of males and females. They appeared on an elevated stage and engaged in singing and dancing as a means of heightening the pomp and solemnity at festivals. In comedy the number in the chorus was twenty-four consisting of one-half males and one-half females. The chorus in music is that part of a composite vocal performance which is executed by the singers of a body, or company, and in which all take part. It is distinguished from the solo airs in that they are rendered by select voices. In song it is applied to the stanza in which the singer is joined by the company.

**CHOUANS** (shōō'anz), a party of French royalists, who rose in arms against the revolutionary government in 1791. They were largely peasants of Maine and Brittany and carried on a warfare against the republicans during the French Revolution. Napoleon sent an army of 30,000 men to suppress them in 1799, but they continued more or less aggressive until 1815.

**CHRISTCHURCH** (krĭst'chŭrch), a city in New Zealand, capital of the province of Canterbury, on the Avon River, about eight miles from the sea. The surrounding country is fertile. It is connected by a railway with Lyttelton, its port. The chief buildings include

Christ College, the high school, the city hall, and a number of churches. Many of the streets are paved with stone and asphalt. A street railway system, waterworks, electric lights, and sewerage are among the utilities. The manufactures include clothing, furniture, packed meat, and machinery. It has a large interior and foreign trade, especially in grain, minerals, and live stock. The city was founded in 1849. Population, 1906, 49,928.

**CHRISTIAN CATHOLIC CHURCH**, a religious denomination organized by John Alexander Dowie in 1896, and whose principal seat of influence is at Zion City, Ill. The founder of this sect was a minister in Australia and came to the Pacific coast of the United States to preach and practice faith healing, and subsequently settled in Chicago, where many became converted to his teaching. He founded Zion City on a tract of 6,600 acres, which was purchased for the avowed purpose of building a model Christian city. The land was not sold in fee simple, but instead was leased on contracts that expire in the year 3,000, running for the period of about 1,100 years. This arrangement was agreed upon for the purpose of providing a guarantee against any part of the city being used for purposes not sanctioned by the church, such as conducting a drug store or doctor's office, establishing saloons and playhouses, raising swine, or keeping for sale and selling liquors, oysters, and tobacco in any form.

The Christian Catholic Church carries on educational and commercial work as well as religious teaching. At Zion City are a number of primary and grammar schools, and industrial and general educational work is done at Zion College, all of which institutions are maintained in common with church work. The industries are managed by a board of control. They include publishing and printing, the selling of general merchandise, and the manufacture of soap, candy, lace, clothing, harness, and crackers. The denomination numbers about 100,000 souls, distributed more or less in the United States and Canada, and has adherents in Australia, England, China, South Africa, and other regions visited by missionaries. The teaching is confined generally to the principles of the Christian religion and the sacraments are observed. Special prominence is given to divine healing, and the dogma that diseases are cured in answer to prayer is given marked prominence. Trine immersion is practiced in the sacrament of baptism, and at the close of meetings is a united consecration service. Among the official publications are *Leaves*



of *Healing*, "Voices from Zion," "Elijah, the Restorer," and "Zion's Conflict with Methodist Apostasy."

In 1906 the society became involved in financial difficulties and contentions arose among the members. Dowie was deposed by a faction, while he was on a trip to found a colony in Mexico, and Wilbur Glen Voliva was made the official head of the organization. General nervousness and the mental strain caused by financial reverses hastened Dowie's death, on March 9, 1907. The property of Zion City, at the time of his death, was worth about \$10,000,000.

**CHRISTIAN ENDEAVOR, United Society of**, an association founded by Francis E. Clark at Portland, Me., in 1881, for training the young for the duties of Christian membership. It has societies in the United States, Canada, Great Britain, Australia, China, India, Japan, and other countries. In 1908 the number of societies affiliated with the main body numbered 67,342, with a membership of 4,212,500. The membership is distributed among all evangelical denominations. No taxes are levied and the main bodies assume no authority over the societies in the different churches. These are regulated and managed locally. The purpose of each local society is to encourage an earnest and useful Christian life on the part of each member, to increase mutual acquaintance, and to develop in all the practical duties of Christianity. Annual gatherings are held under the auspices of the united societies. *The Christian Endeavor World* is the official organ.

**CHRISTIAN ERA**, the epoch or era introduced by the birth of Christ. The beginning of the epoch was calculated about the year 532 by Dionysius, a Syrian monk. It is certain that he fixed the event too late by four years and that Christ was born, according to his calculations, in the year 4 B. C. Hence the year 1908 should have been written 1912. The Christian era is sometimes called the Dionysian era. Time before the birth of Christ is marked B. C., after Christ, A. D. This did not become general in Christian countries until about the middle of the 15th century.

**CHRISTIANIA** (krīs-tē-ä'nē-ä), or **Kristiania**, the capital of Norway, located in the province of Christiania. It is situated on an inlet from Skager Rack, known as Christiania Fiord, about sixty miles from the Skager Rack. It was named in honor of Christian IV., who laid the foundation of the city in 1624. The architecture is usually plain and without much ornamentation, and the buildings are constructed mostly of brick and stone. Among the

most important structures are the university, an observatory, the palace of the King of Norway, the legislative house, or Storting, and several cathedrals. The Aggershuus is an old castle which stands on a point of land projecting into the fiord. In connection with the university is a museum of antiquities and an excellent library. Several lines of railroads connect it with the interior of Norway and with Sweden. The manufactures include glass, soap, ironware, woolen goods, tobacco, leather, paper, spirits, machinery, liquors, clothing, and textiles. Its exports consist largely of iron, machinery, and lumber. It has a beautiful location, electric street railway connections, gas and electric lights, several parks, and numerous statues and monuments. The city is one of the cleanest and most healthful in Europe. Nearly all the inhabitants are Protestants. Population, 1906, 235,783.

**CHRISTIANITY** (krīs-chăn'ī-tŷ), the doctrines and precepts taught by Christ; the Christian religion. The Christians are separated into many sects, but nearly all agree with respect to certain fundamental doctrines. They embrace the belief in a Supreme Being, the one living and true God. The great majority hold to the tenet that in the Divine Unity there is a Trinity—the Father, the Son, and the Holy Spirit—to all of whom worship of the highest kind is given. The Father is assigned as the first person of the Godhead; Jesus Christ as the second person is held as God and man; and the Holy Spirit is assigned as the third of the Trinity. The Scriptures of the Old and New Testaments are held to be inspired in a sense in which no other book is inspired, and are, therefore, in the highest degree fitted to enlighten the minds of inquirers as to religious duties.

The first followers of Jesus formed a community or society at Jerusalem shortly after the crucifixion of their Master. In the year 65 an organization was founded at Antioch, in Syria, which assumed the name of *Christians*, and the doctrine of Christianity was soon spread through the provinces of the Roman Empire by traveling apostles. Christian societies were organized in the 1st century in Palestine, Asia Minor, Syria, Greece, Italy, Northern Africa, and the islands of the Mediterranean Sea. Fully one-third of the inhabitants of the Roman Empire embraced this belief by the beginning of the 4th century.

Branches existed early in Christendom; the Gnostics date from the time of the apostles, while the Nestorians originated in the 5th century. Among the important events of the Chris-



tian era are the separation of the Greek Catholic and the Roman Catholic churches in the 8th century, the Crusades of the 12th century, and the establishment and rise of Protestantism in the 16th century. At present there are 478,000,000 Christians in the world, of which number 215,000,000 are Roman Catholics, 160,000,000 Protestants, and 130,000,000 Greek Catholics. The most numerous of the Protestant sects are the Lutherans, Calvinists, and Anglicans, in the order named.

**CHRISTIANS**, a religious sect, comprising the Christian Connection and the Christian Church. These Protestant denominations were organized under the leadership of Abner Jones, at Lyndon, Vt., in 1800, and are now largely represented in Canada and the United States. The Bible is accepted as the only rule of faith, and it is interpreted by the individual rather than under the direction of creeds. Members are admitted on a simple profession of belief in Christianity and Christian character is the only test of membership. They support Sunday schools, prayer meetings, and missionary enterprises. The majority are trinitarians and teach baptism of believers by immersion. In 1908 they had 1,350 churches and an estimated membership of about 1,195,000. They support 150 institutions of instruction with more than 5,500 students.

**CHRISTIAN SCIENCE**, a form of Christian religion based upon the Bible, discovered in 1866 by Mary Baker G. Eddy, who founded the denomination and is the author of its text-book, "Science and Health, with Key to the Scriptures." The basic teaching is that God, the infinite Person, is Love; that He is the only Creator, hence that He has made all that really exists, and has pronounced all creation "very good," according to Scripture. From these premises, Christian Science deduces the temporal and unreal nature of sin, disease, evil, all the phenomena of mortal existence, and declares that these abnormal and unspiritual conditions can be overcome by divine power. Christian Science is organized in nearly all countries. It is estimated that over a million persons have been healed by it and are interested in it. There are 957 churches and societies throughout the world. Among the denominational publications issued by the Christian Science Publishing Society are *Christian Science Journal*, a monthly periodical; *Christian Science Sentinel*, a weekly paper; *Der Christian Science Herold*, *Christian Science Quarterly*, and *Christian Science Monitor* (daily).

**CHRISTMAS** (kris'mas), the festival observed by the Christian Church on the 25th day of December in commemoration of the birth of

Jesus Christ. No certain knowledge of the birthday of Jesus Christ existed, and its observance was not established until some time after the organization of the first churches. Augustine regarded Good Friday, Easter Sunday, Ascension Day, and Whitsuntide as the only festivals established by the apostles and sanctioned by the general council. He declared Christmas to be of later origin and of lesser authority. Clement of Alexandria mentioned Christmas in the beginning of the 3d century and Chrysostom speaks of it in the 4th century as having been observed for some time. The early Christians of the Orient thought that both the birth and baptism took place on the 6th of January, while Clement of Alexandria held that the 20th of May or the 20th or 21st of April should be observed.

The 25th day of December was advocated by Julius I., Bishop of Rome from 337 to 352, as the most suitable time to commemorate the birth of Christ. This claim was strengthened by the church of the East, which held to the view that the baptism took place on the 6th of January. The day was finally placed on December 25th, which made it possible for all nations to observe a festival of rejoicing that the shortest day of the year has passed. This selection was approved by many prominent Christians because it placed a festival between Whitsuntide and Good Friday. Christmas festivities with their songs, trees, toys, and religious ceremonies are always favorites. A special religious service for Christmas day is held by the Greek, Lutheran, Roman, and Anglican churches. Catholic priests may celebrate three masses on Christmas day. A large number of churches hold no celebration on the two days immediately following Christmas, but nearly all of them have special services.

**CHRISTMAS ISLAND**, an island in the Indian Ocean, about 250 miles south of the western end of Java. It has valuable beds of phosphate of lime, which are worked quite extensively. The island is a British possession and is a dependency of the Straits Settlements. Another island of the same name is located in the Pacific Ocean, with an area of 234 square miles and a population of 115. It was discovered by Cook in 1777, and is governed from the British administration of the Fiji Colony.

**CHRISTMAS ROSE**. See *Hellebore*.

**CHRISTOPHER'S, Saint**, or **Saint Kitts**, an island in the West Indies, one of the Leeward Islands, about five miles wide and twenty-five miles long. It has an area of 65 square miles. The surface is mountainous, the highest peak being Mount Misery, 4,150 feet. Basseterre is a seaport and the chief city. Local gov-



ernment is administered by a legislature, and is subordinate to the government of the Leeward Islands, under the direction of the British. The island was discovered in 1493 by Columbus and was settled by the English in 1623. Population, 1906, 30,176.

**CHRIST'S HOSPITAL**, a celebrated orphan's school at London, founded in 1553 by Edward IV., as a hospital for poor orphans and foundlings. It is popularly known as the Blue-Coat School, from the picturesque dress of the boys who attend the institution. It has a boys' and girls' preparatory school at Hertford, founded in 1682. Two day schools were opened in 1890 for 600 boys and 400 girls. King Charles II. enlarged the original endowment, and the annual income now amounts to \$300,000 per year. The education is classical, but modern literature and languages are taught. The institution, including the departments at Hertford and Hortham, has accommodations for 2,500 students. A fire destroyed the first building in 1666, but it was rebuilt by Sir Christopher Wren. The present building was erected in 1825 by Shaw. At this institution the following well-known men received their education: Camden, Richardson, Stillingfleet, Coleridge, Charles Lamb, Leigh Hunt, and Sir Henry Maine.

**CHROMATIC** (krō-măt'ík), a term in music. A chromatic chord is one which contains a note or notes foreign to diatonic progression. The eight diatonic tones and five intermediate tones make the *chromatic scale*.—Chromatics is the science of colors.

**CHROMIUM** (krō'mī-ŭm), one of the metallic elements, discovered in 1797 by Vanquelin. It was so named from the number of colored compounds which it forms. It is found in combination with iron and chromite, never in a free state. The latter is a brownish-black ore and is the principal source of chromium. Chrome green, or ultramarine green, is a pigment obtained from chromium. Chromium steel is a kind of steel which contains about one per cent. of this metal, and is valuable for its great hardness and tenacity. Deposits of chromite are found in Asia Minor, Bohemia, Norway, and the Rocky Mountains of Canada and the United States.

**CHRONICLES** (krōn'ī-k'ls), a portion of the Bible. It forms but one book in the Hebrew, but was divided into two books by the Septuagint translators and was placed directly after I and II Kings. The Hebrew name means *words of day*; thus, has the same significance as our diaries or journals. The Chronicles are among the latest compositions of the Old Testament, and show evidences that the writer knew of

many of the earlier books. In the first nine chapters is a line of genealogies which covers a period from the creation to the middle period of the Persians. The work contains valuable contributions to our knowledge of the history of the Israelites.

**CHRONOGRAPH** (krōn'ō-gráf), an instrument used to measure and record minute portions of time. It is intended specially for measurements in astronomy, where a record is desired of the exact instant of the occurrence of an event, such as the transit of a star. The so-called recording chronograph is designed to mark the instant of observation in hours, minutes, seconds, and hundredths of a second, in printed characters, and in a form suitable for preservation and reduction. Another form of the chronograph is used at horse races and other occasions where a seconds watch is not exactly suited. It has an ordinary quick-train lever movement, carrying hands which move over a dial. One of these is a seconds hand, which is usually double, consisting of two distinct hands, one superposed over the other. Chronographs used in astronomical observation are usually moved by electricity.

**CHRONOLOGY** (krō-nōl'ō-gŷ), the science of computing and adjusting dates and epochs of time by divisions and periods to facilitate in assigning events to their proper times. The system of chronology differs among the nations of the world. The motions of the heavenly bodies produce the natural divisions of time into days, months, years, and cycles. Exact computation can be made only from a point or *epoch*, which is taken to mark the beginning of an *era*. The Jews compute from the creation of the world; the Christians, from the birth of Christ; the Greeks, from the Olympiads; the Romans, from the building of Rome; and the Mohammedans, from the *Hegira* or flight of Mohammed. Besides these, there are various other epochs and data on which to base the assignment of historical facts, scientific discoveries, or notable events occurring in the history of the world. In the Christian chronology, the years before Christ are marked B. C. and those after, A. D. (*Anno Domini*, in the year of our Lord).

**CHRONOMETER** (krō-nōm'ē-tēr), an instrument for the exact measurement of time. The term does not especially include clocks, watches, hour glasses, and other similar devices for the measurement of time, but is restricted more particularly to the instruments having compensations and adjustments to render them independent of the fluctuations of temperature. Their chief use is for making astronomical ob-



servations and in measuring longitude at sea. The capacity of these instruments to keep accurate time under great variations of temperature determines their value. Those used at observatories are carefully tested by exposure to heat and cold varying from about  $-60^{\circ}$  to  $+120^{\circ}$ , the extremes within which they are expected to keep exact time. Chronometers used on ships are suspended in gimbals, so the instruments will always maintain the same position.

**CHRYsalis** (kris'á-lis), the last stage through which moths and butterflies pass when going from the larva or caterpillar state to the perfect or winged state. In this stage the insect takes no food, is inactive, and is inclosed in a transparent case composed of fibers spun by the larva. Many species, while in this stage, have a metallic luster. The length of this period depends upon the species and the season. It is attended by changes that take effect in the interior of the insect, its organs securing proper development for the support of the future being.

**CHRYsANTHEMUM** (kris-án'thē-mūm), a flowering plant common to the temperate parts of America and Europe. It belongs to the Compositae order and includes about 150 species. Many are cultivated in gardens and parks for their flowers. The common species include the *golden feather*, *corn marigold*, *marguerites*, and *ox-eye daisy*. Various species have been cultivated in China many years and several were brought to Europe in 1764, where they have been developed by cultivation into many colors and forms. They bloom in gardens late in the fall, in some localities in October, November, and December. In shape they range from the plain to the double and semidouble species, and the flowers are either erect or reflexed. They are propagated by the seeds and by cuttings.

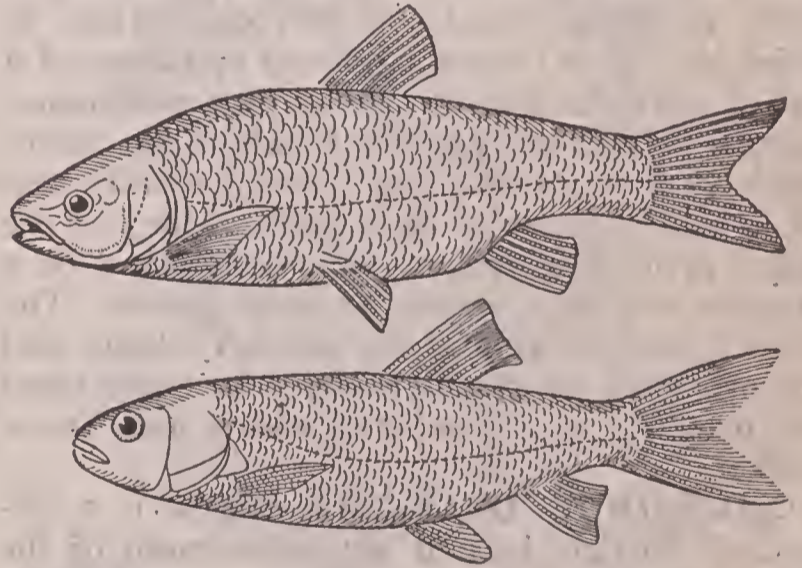
**CHRYsolite** (kris'ō-lit), a mineral composed chiefly of iron, silica, and magnesia. It occurs in transparent crystals and is usually of a greenish color, but sometimes black, and is used as a cheap kind of ornamental stone by jewelers. Chrysolite is found in basalt near Montreal and other parts of Canada, in the Hawaiian Islands, in Arizona, and in New Mexico. The species found in New Mexico closely resemble garnet and are called *Job's tears* from their peculiar appearance.

**CHRYsOPRASE** (kris'ō-prāz), a greenish variety of chalcedony, valued as an ornamental stone. It is found in the mountains of Oregon, especially at Riddles, and in several places of Germany. Jewelers use it to some extent for mountings in rings, and the inferior specimens are employed in making necklaces, brooches, and seals. Some grades lose their color with

age, especially if kept in a light and warm place.

**CHRYSLER'S FIELD**, a locality in Dundas County, Ontario, and the site of a battle in the War of 1812. The American army was commanded by Gen. Wilkinson and the British and Canadian troops were under command of Lieutenants Pearson and Morrison. On Nov. 13, 1813, the Americans made the attack in the open fields of John Chrysler, a British military captain then in service. The battle lasted five hours, victory alternately favoring one and then the other. Night ended the conflict with the British in possession of the field. The American loss was 339 and the British lost 187 men.

**CHUB**, a fish of the carp family, found chiefly in the rivers of Europe. The upper parts are bluish-black, passing into silvery white beneath, and the cheeks are yellow. It weighs about five pounds at maturity and is esteemed for the table. Anglers find it good game, and use worms, cheese, and cured meat for bait. The chub spawns in April and May and bites best in June and July. Several allied species are found in America, including the *chub* of the Columbia River and the *river chub* of the Alleghenies.



AMERICAN CHUB.  
RIVER CHUB.

**CHUQUISACA** (chōō-kē-sā'kà), the name formerly given to the capital of Bolivia. It is now commonly called Sucre, which see.

**CHURCH**, a term first used by the New Testament writers to denote the whole community of Christians, and now applied to the whole body of Christians collectively. It is employed in a more restricted sense to designate a distinct denomination of Christians, as Lutheran, Roman Catholic, Greek Church, Methodist, etc. It is also applied to a building set apart and consecrated for Christian worship. Many public halls or basilicas, courts of adjudication, and heathen temples were consecrated



as Christian churches after the conversion of Constantine. Later special edifices of wood, brick, or stone were built in various styles of architecture. These are designated as chapels, churches, collegiates, conventionals, or cathedrals, this depending upon the style of architecture and the purpose they serve. Many of the ancient churches have the semicircular *apse*, in front of which is the *altar*, and near the latter is the *choir*. This arrangement is maintained in some of the newer edifices, but many modern churches have neither the *apse* nor the *altar*, and in some buildings the *choir* occupies one entire upper end of the church.

**CHURCHILL** (chûrch'il), an important river of Canada, rises between the Athabasca and the north branch of the Saskatchewan. It has a northeasterly course and flows into Hudson Bay. Its entire length is about 850. It receives the Beaver River, which rises in Alberta, and drains a large number of lakes, including Reindeer and South Indian lakes. Missinippi and English are other names of the Churchill River.

**CHURN**, a vessel in which cream or milk is agitated to effect the separation of the butter from the fluid portions. The churn of the pioneers is usually made of a conelike tub, in which the churn dasher is moved by means of a rod or stalk fixed to it. Those of newer manufacture have an inner device by which the churning is effected, or, in other cases, the entire vessel is made to revolve on a shaft. Many of the larger farms have churns that are worked by a gasoline engine or steam or horse power. The churns used in creameries are very large and are propelled by steam power. In some cases the machine is a combined churn and butter worker.

**CHURUBUSCO** (chōo-rōō-bōōs'kō), a village of Mexico, located six miles south of the City of Mexico. It was the scene of a battle between the Americans under Gen. Winfield Scott and the Mexicans under Gen. Santa Anna on Aug. 20, 1847. The Mexican army was guarding the approach to the city and was entirely defeated. Gen. Scott captured 3,000 prisoners and thirty-seven fieldpieces, and gained the battle at Contreras on the same day. The American loss was 1,053 men, while the Mexicans lost in killed and wounded about 4,000.

**CHUSAN ISLANDS** (chōo-sān'), an island group on the east coast of China, the largest of which is called Chusan. This island is from six to twelve miles wide and about twenty-two miles long. Much of the surface is mountainous, with fertile valleys penetrating among the hills. Rice, cotton, tea, tobacco, camphor, and bamboo

are the leading products. The mountain districts contain valuable minerals. These islands were in the possession of the British in 1840, 1841, and 1860. The group contains several monasteries and Buddhist temples. Tinghai, a fortified town, is the chief settlement. For the purpose of administration the islands belong to the province of Chekiang. Population, 1908, 345,540.

**CHYLE** (kīl), a milky fluid found in the lymphatic vessels of the bowels during digestion. It is opaque and under certain circumstances assumes a yellowish or slightly reddish color. After the food is digested in the stomach, it is converted into a yellowish liquid known as *chyme*, which passes into the duodenum, where it is acted upon by the pancreatic secretion and bile. The result is the *chyle*, which, in the thoracic duct, is an oily liquid of considerable turbidity, and is carried into the veins and mingled with the blood. The nutritive portion of the food is contained in the chyle.

**CICADA** (sī-kā'dā), the name applied to a genus of hemipterous insects common to many regions of both hemispheres. They are well known by their peculiar notes, which are made by drumlike appendages attached to the sides of the body, called the *timbal*. The eggs are deposited in the twigs of trees or shrubs by the adult female insects. The larvae fall to the ground and burrow, and during the larval state feed on the juices of roots. Several species occur in North America, among them the *seventeen-year*



SEVENTEEN-YEAR LOCUST.

A, Adult; B, Larva.

*locust*, which lies beneath the ground seventeen years, after which it emerges to become a perfect insect. However, the development is hastened by heat; hence, in the warmer localities, the broods come out in about thirteen years. Some cicadas require much less time in developing, while different areas are frequented by these insects in different stages of development; thus, cicadas develop almost every year. In the United States a record has been kept of about fifteen different broods that appear at definite places and times.

**CIDER** (sī'dēr), a liquor made from the juice of any fruit, but most commonly from apples. In making apple cider the juice is pressed from the crushed apples by a cider



press and allowed to flow into casks. It ferments in the open air and a clear liquor results. The fruit used should be ripe, as the per cent. of sugar in ripe apples is much greater than in partially ripe or green, and therefore yields a larger proportion of alcohol. Fresh cider is a sweet, pleasant beverage. Cider brandy, or *applejack*, is obtained by distilling fermented cider.

**CIENFUEGOS** (sē-ĕn-fwă'gōs), a seaport city of Cuba, capital of the province of Santa Clara, on the Bay of Jagua, an inlet on the southern coast of the island. The city is one of the finest in Cuba. It is connected with other cities by a number of railroad lines. The exports include sugar, wax, tobacco, rum, and molasses. A large number of trading vessels visit it annually and connect it with the leading seaports of the world. It has many fine public buildings and churches. There are regularly established public schools of instruction for free attendance in all parts of the city. Electric lights and street car lines were built shortly after the war with Spain. The city was founded by refugees from Santo Domingo in 1819. Population, 1907, 60,142.

**CIGAR** (sī-gār'), a small roll of tobacco made of tobacco leaves and designed for smoking by lighting one end and drawing smoke through it. The choicest brands are imported from Cuba, or are manufactured from tobacco grown in the vicinity of Havana. *Cigarettes* are small cigars made of a small quantity of fine tobacco and used for smoking. *Cheroots* are thicker at one end than at the other, and are smoked the same as cigars.

**CILIA** (sil'ī-à), the common name of hair-like processes that cover the surface of certain cells, and line the trachea and bronchia. They are in constant motion to sweep out secretions and dust. Their arrangement is in rows. The size ranges from  $1.1000$  to  $12.1000$  of an inch in length. Cilia occur upon the mucous membrane of various organs of the vertebrate animals, especially upon the epithelium, and in certain invertebrates they serve by the rapid vibration as organs of locomotion. In the cells of plants the cilia are exceedingly delicate protoplasmic fibrils.

**CILICIA** (sī-lish'ī-à), an ancient country of Asia Minor, bounded on the north by the Taurus Range, east by the Amanus Mountains, south by the Mediterranean, and west by Pamphylia. It included much of the fertile plain near the sea, the valley of the Cydnus River, and a mountainous region in the western part. Tarsus, the chief city, was long important as a center of education and commerce. The Cili-

cians were distinguished for maritime enterprise. Their country was invaded by the Assyrians, but remained independent until it was conquered by the Persians. A Roman army under Pompeius subdued the Cilician pirates in 67 B. C., who had fortified themselves in the mountains.

**CIMBRI** (sĭm'brī), the name by which a people were known who fought with the Teutons of northern Germany against the Romans in the year 113 B. C. In several great battles they were victorious, but were defeated by Marcus in the Battle of Verona, in the year 101 B. C. Their horsemen were armed with helmets, spears, shields, and coats of mail. In the early battles with the Romans they displayed much courage and bravery, even the women showing many marks of daring. They are mentioned by Greek writers in connection with the Scythian Cimmerii of the Crimea, but modern writers regard them as Celtic, and connect them with the Cymri of Britain. Plutarch and Tacitus regarded them as Germans.



CINCHONA.

A, Flower; B, Fruit.

**CINCHONA** (sĭn-kō'nà), a genus of trees found in the Andes of Peru and adjacent coun-



tries, and subsequently introduced into India, Java, and Ceylon. It produces a medical bark of much value, known as *cinchona bark*, from which alkaloids, cinchonine, quinine, and other valuable drugs are extracted. The bark is taken off in strips and is renewed by natural growth. In the market the product is known as *Peruvian bark*. The trees are evergreen and have opposite leaves, and the flowers resemble lilacs in appearance. The bark is carefully dried when peeled off, and afterward is baled in packages weighing about 150 pounds. Gathering cinchona bark is a growing industry in Peru and Bolivia. See **Quinine**.

**CINCINNATI** (sĭn-sĭn-nă'tĭ), the second largest city in Ohio, county seat of Hamilton County, located on the north side of the Ohio River, opposite the mouth of the Licking River. It is 115 miles southwest of Columbus, 270 miles southeast of Chicago, 765 miles from New York, and the focus of a network of important steam railroads and electric railway lines. The Miami and Erie Canal connects the navigation of the Ohio River with that of the Great Lakes, hence it has transportation facilities that are rarely excelled.

**DESCRIPTION.** The city has an area of thirty-eight square miles, with a river frontage of nearly fourteen miles. It is built upon two picturesque plateaus, the first of which is near the river and is sixty-five feet above low water mark, while toward the north it rises in abrupt steps to a height of 400 feet above the Ohio. The elevated portions are surrounded by a series of semicircular bluffs, affording a fine view of the city and the surrounding country. Improved highways and inclined plane railways make the summits of the hills as well as the plateaus easily accessible, including the beautiful localities known as Mount Auburn, Price's Hill, Mount Adams, Fairview Heights, and College Hill. The city has a number of popular residence districts and suburban places, such as Avondale, Clifton, Winston Place, and East Walnut Hills, these being specially noteworthy for their fine homes and scenic beauty. Across the river, in Kentucky, are Newport, Covington, Bellevue, and a number of other towns and villages. Five bridges cross the river, affording ample facilities for passage by trains, vehicles, and pedestrians. The mean temperature is 55°, while the average in winter is 34° and in summer 75°.

Cincinnati is platted regularly and most of the streets cross each other at right angles. Many large business and office buildings are located in the central business section, which is substantially and compactly built. The Federal

building contains the customhouse, post office, and Federal court, and was erected at a cost of \$5,000,000. It is three stories high, in the Roman-Corinthian style, and is built of a durable quality of freestone. The Masonic Temple, Chamber of Commerce, city hospital, city hall, county courthouse, Odd Fellows' Hall, and several banks and department stores are among the chief buildings, many of which have from ten to twenty stories. Many fine churches are located in different parts of the city. The First Presbyterian Church has a tower 285 feet high. Saint Peter's Cathedral, a Roman Catholic place of worship, is in the Grecian style and has a stone spire 224 feet high. Saint Paul's Protestant Episcopal Cathedral, the First and Second Presbyterian churches, Saint Paul's Methodist Episcopal Church, the Jewish Synagogue, and Saint Francis de Sales Catholic Church are splendid examples of ecclesiastical architecture. All of the Protestant denominations are well represented and have commodious and substantial places of worship. The total number of churches exceeds 200. Cincinnati is the seat of a Protestant Episcopal bishop and of a Roman Catholic archbishop.

**PARKS.** The parks are a feature of the city and cover an area of 575 acres. A collection of wild animals is the chief feature of the Zoölogical Garden, which contains sixty acres, and is beautiful on account of its fine walks and picturesque ravines. Eden Park, or Garden of Eden, located on Mount Adams, incloses 216 acres and is the seat of the Art Museum and Art School. Burnet Wood embraces sixty acres and is located in the northern part of the city. An avenue 100 feet wide has been constructed to Spring Grove Cemetery, the largest and best known, which contains 600 acres. Besides it, there are about twenty-five other burial places. Fountain Square, on Fifth Street, contains the Tyler-Davidson Fountain and is beautified by many rare flowers and vines. This fountain was cast of bronze at Munich, Germany, and cost \$200,000. At Race and Eighth streets is a statue of Garfield, and at Vine and Eighth is an equestrian statue of President William Henry Harrison. Other statues include those of Lincoln and a bronze statue commemorating the soldiers who died in the Civil War, the latter being located in Spring Grove Cemetery.

**INSTITUTIONS.** The public schools range from the kindergarten to the high schools, which fit for entrance into colleges and universities, and have departments of manual training. Among the higher institutions is the University of Cincinnati, with an observatory at Mount Lookout. It is the seat of the Wesleyan Fe-



male College, Lane Theological Seminary, Ohio Mechanics' Institute, Saint Joseph's and Saint Xavier's Jesuit College, and a Hebrew college. The art and professional schools include musical and medical colleges and institutions for instruction in law, commerce, pharmacy, and dentistry. The Museum and Art School, located in Eden Park, has a fine collection of statues and paintings. The public library, with 325,000 volumes, is located in a commodious building on Vine Street. Other libraries include those of the Young Men's Mercantile Association, of the Cuvier Club, of the Ohio Mechanics' Institute, and a number of others. Public charities are numerous.

**INDUSTRIES.** Important as a railroad center and located on the Ohio River, Cincinnati has extensive commercial intercourse with the leading cities of America. The Union Depot on Third Street and Central Avenue is the converging point of most of its railways, but separate stations are maintained by the Pennsylvania and a number of other lines. About 8,000 manufacturing establishments of different kinds are located in the city. These include chiefly slaughterhouses, packing establishments, carriage and wagon works, foundries, breweries, brickyards, machine shops, and boot and shoe factories. In pork packing it takes rank next to Chicago. On Mount Adams is the Rookwood Pottery, which has a wide reputation for the manufacture of artistic and meritorious wares. The city has a large trade in cotton and woolen textiles, furniture, butter and cheese, grains of different kinds, fruits, and merchandise. It is noted as a center of wholesaling.

**HOTELS AND THEATERS.** The chief hotels include the Emery, Grand, Saint Nicholas, Palace, Dennison, Honing, Burnet, and Gibson. Among the chief places of amusement are the Grand Opera House, Columbia Theater, Arbiter Hall, Walnut Street Theater, and the Lyceum. The Music Hall, endowed by Reuben Springer, has a seating capacity for 5,400 persons and contains one of the largest organs in America. Musical societies are very numerous, owing to the large number of German residents. When Charles Dickens visited America for the first time he found more to commend in the social refinement and art advancement of Cincinnati than in any other city of the United States.

**HISTORY.** George Rogers Clark erected two small blockhouses on the site of Cincinnati in 1780, which was probably the first time the locality was visited by white men. The first settlement was made in 1788, when a company from Kentucky and New Jersey settled on a tract of land purchased from the government by

John Cleves Symes. Fort Washington was built in 1789, and the following year the place was named Cincinnati by Gen. Saint Clair, in honor of the Society of the Cincinnati. It was made the county seat of Hamilton County at this time, was incorporated in 1802, and became a city in 1819. Its prosperity dates with the opening of steamboat navigation on the Ohio in 1815. The Miami Canal was completed in 1830 and the first railroad was built in 1843. The citizens of Cincinnati generally opposed antislavery agitation, owing to their close social and commercial relations with the South, but sided with the Federal government during the Civil War. It was threatened by a Confederate force under Gen. Kirby Smith in 1862 and for a time was under martial law. In 1883 a large part of the lower city was submerged by a flood which destroyed many business houses. The famous Cincinnati Riot, incited by the light sentences imposed upon a number of murderers, resulted in burning the courthouse and caused the death of forty-five persons. Population, 1910, 364,463.

**CINCINNATI, Society of,** an organization formed in 1783 by the American and foreign officers in the Revolutionary War. The original purposes included the care for widows and orphans of soldiers who had lost their lives, but later it partook more and more of the nature of perpetuating mutual friendships and remembrances of the noted revolutionary events. It was named from Cincinnatus, the great Roman hero, because he, like many of the members, had been called from the farm in defense of the country. The society now consists of a central organization with branches in the states of Virginia, Maryland, South Carolina, New York, New Jersey, Pennsylvania, Massachusetts, and Rhode Island. Meetings are held triennially, occurring in 1899, 1902, etc.

**CINCINNATI, University of,** a coeducational institution of higher learning at Cincinnati, Ohio. It was founded on bequests made in 1868 by Charles McMicken, and a number of grants were added subsequently by the city. In 1873 the university was opened for instruction; the academic department was added the following year, the medical department was organized in 1896, and the law department was consolidated in the following year with the law school of the Cincinnati College, founded in 1833. The university as now organized includes the academic, law, medical, and graduate departments; the college of engineering; and the summer school. Affiliated with it are the Ohio College of Dental Surgery and the clinical and pathological school of the Cincinnati Hospital. It has a library of 95,000 volumes, a faculty of



175 professors and instructors, and an attendance of about 1,250 students. The endowments and buildings, including equipments, have a value of \$3,500,000.

**CINERARIA** (sĭn-ĕ-rā'rĭ-à), a genus of plants native to South America, including about twenty-five species. They include the garden cineraria, which is an annual with simple leaves and is popular as a greenhouse plant. It is easily cultivated and blooms freely, the flowers being asterlike and include red, white, and purple colors. Most plants of this class have lower leaves with an ashy appearance, hence the name.

**CINNABAR.** (sĭn'nā-bār), the name applied to the sulphide of mercury. It is blood-red in color, crystallizes in the hexagonal system, and is found both massive and crystallized. The *vermilion* of commerce is a valuable pigment and is an artificial mercuric sulphide, while the native cinnabar is mixed with impurities that prevent it from being used directly as a pigment. Cinnabar is found in several localities of the Rocky Mountains, in New South Wales, in Austria, and in South Africa.

**CINNAMON** (sĭn'nā-mŭn), an aromatic bark taken from the under branches of several species of the cinnamon tree, a plant of the



1. CINNAMON. 2. BARK. laurel order. Several species are found in Ceylon, Malabar, and various portions of the East Indies. The trees have yellow flowers, a corn-shaped fruit, and oval leaves, and attain a height of from fifteen to thirty feet. The bark is a staple article of commerce. It is used in the culinary arts and for manufacturing an essential oil. Oil of cinnamon is prescribed in doses of from one to five drops as a stimulant and in the treatment of stomach ailments. See **Spices**.

**CIPHER** (sĭ'fĕr), in mathematics, a character which of itself possesses no value, but when placed after a number increases it tenfold. In decimal fractions a cipher before a number decreases its value tenfold. See **Cryptography**.

**CIRCASSIA** (sĕr-kāsh'ĭ-à), a region in the northwestern part of the Caucasus, in Russia. It is bounded on the north by the Kuban River, on the east by the country of the Lesghians, on the south by Mingrelia, and on the west by the Black Sea. The region is mountainous and is inhabited by the Circassians, a class of warlike

mountaineers. Circassia has been a part of Russia since 1829.

**CIRCASSIANS** (sĕr-kāsh'anz), the name applied to a tribe inhabiting Circassia, a mountainous region in the southeastern part of Russia, in Europe, and including largely the northern slopes of the Caucasus. The inhabitants are divided into a number of tribes with different languages. In religion they are nominally Moslems, but their worship is mixed somewhat with Jewish, Christian, and heathen ceremonies and traditions. They were an independent people in the early part of the 15th century and carried on wars against the Tartars, to whom they afterward became tributary. With the enlargement of Russian territory, they were absorbed after much resistance, and showed further hostilities by leaving Russian possessions and emigrating to the provinces of Turkey. The men are prized as soldiers, while the women are chosen as mistresses by the Turks and are among the handsomest in the harems. The total number of Circassians is estimated at about 150,000.

**CIRCLE** (sĕr'k'l), a plane figure bounded by a curved line called its *circumference*, every part of which is equally distant from a certain point within called the *center*. The *radius* of a circle is a straight line drawn from the center to its circumference, and a straight line drawn through the center and terminated both ways by the circumference is called the *diameter* of a circle. The space inclosed *within* the circumference is called the *area* of a circle. The circumference of a circle is to its diameter about as twenty-two to seven or as 3.1416 to one. In astronomy the circle is divided into 360 equal parts called *degrees*, each degree containing sixty *minutes*, and each minute sixty *seconds*. In geography a circle upon the surface of the earth is called a *great circle* when its plane passes through the center of the sphere, dividing the earth into two equal parts; all others are called *small circles*.

**CIRCLEVILLE**, a city of Ohio, county seat of Pickaway County, thirty miles south of Columbus, on the Norfolk and Western and the Cincinnati and Muskingum Valley railroads. It is nicely situated on the Scioto River and the Ohio and Erie Canal. The manufacturing enterprises include flouring mills, a packing establishment, a canning factory, and machine shops. It has a brisk trade in farm produce and merchandise. Among the chief buildings are several schools, the county and city buildings, and numerous churches. The public utilities include electric lighting, a public library, and a waterworks system. Circleville was settled in 1806



and incorporated in 1814. Population, 1900, 6,991.

**CIRCULATION** (sēr-kū-lā'shūn), in economics, a term used to designate the circulating coin and notes that constitute the currency of a country. In early times articles were exchanged under a system of barter. In the great commercial activity of modern times a monetary system is needed to facilitate convenience in

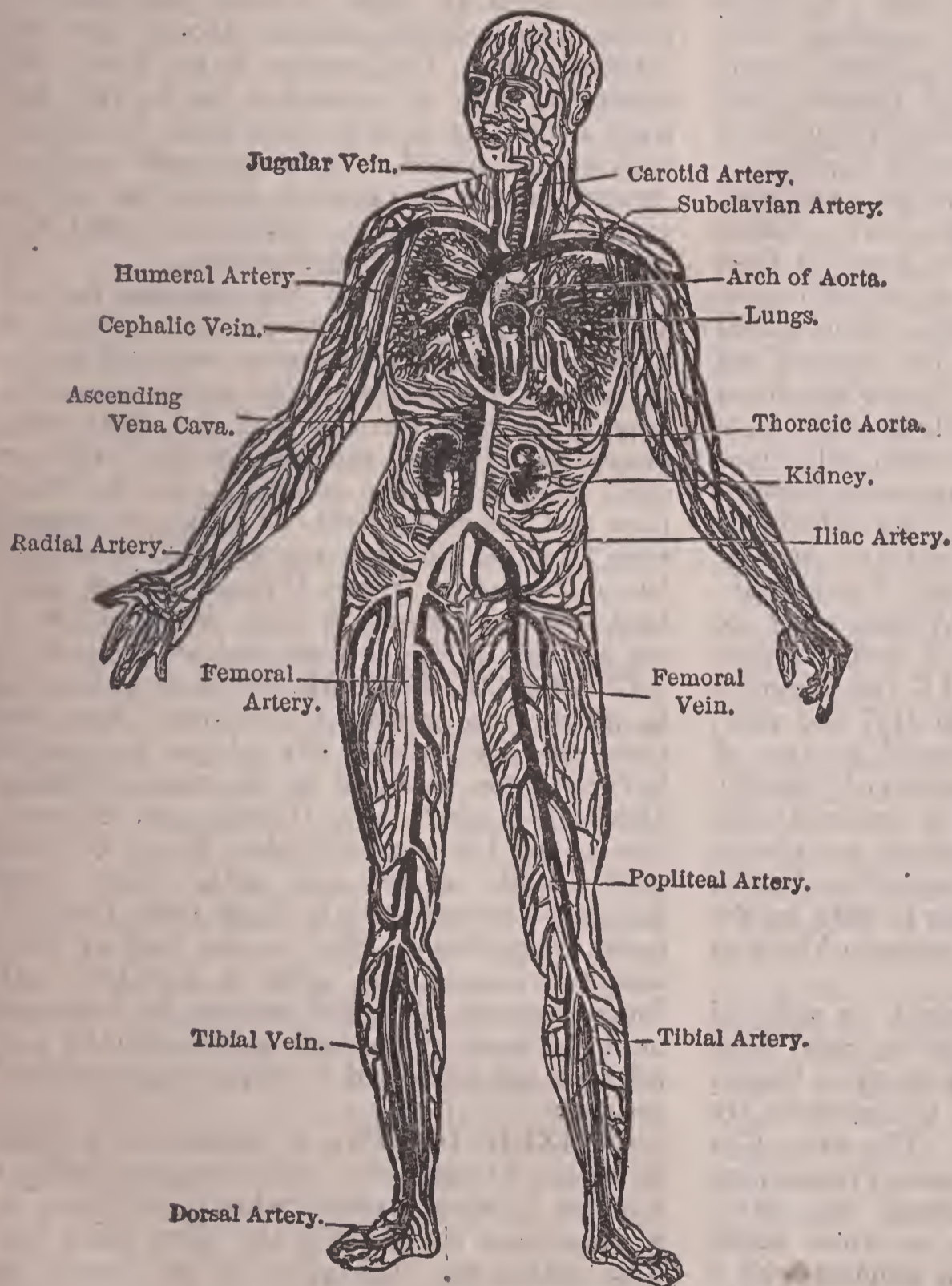
the circulation of the sap in plants. There is no close analogy between the circulation of plants and that in animals. It was thought formerly that sap ascends in the spring and descends in autumn, these two movements constituting the whole circulation. However, it is now known that ascending and descending currents coexist, and that horizontal currents pass between the tissues. The current of sap in ascending enters

the leaves, where it is modified by certain influences which fit it for the nutrition of the plant. It is carried back to the roots by a descending circulation in an elaborated condition. The circulation in plants is not carried on by a central organ as in animals, but rotates within the interior of cells, the fluid of the cell not communicating with the adjacent cells. In the lower forms of animal life, as in the entozoa, there appears to be no circulation, the vital fluid in which they live seeming to be imbibed by their textures.

In *animal physiology* the circulation consists of the blood, which is propelled by the heart, penetrating the arteries, capillaries, and veins of the entire system. Although Galen had observed that the blood flows in opposite directions in the arteries and veins, the circulation was not discovered until 1628 when Harvey demonstrated the connection of the heart with the circulatory system. Malpighi used a microscope, in 1661, to demonstrate the passage of the blood in a frog's foot from the arteries to the veins by the capillaries. The accompanying illustration shows the principal organs of circulation, including the heart

as the center of the system. See **Artery**; **Blood**; **Heart**.

**CIRCUS** (sēr'kūs), an inclosure of space in which sports, games, and various feats of horsemanship are exhibited. The Roman circus was a narrow, long building without a roof in which chariot races, athletic exercises, horse races,



CIRCULATION OF THE BLOOD.

conducting commercial enterprises on a vast scale. The circulation is regulated by the government, restricted to the needs of trade, and guaranteed to remain stable in the exchange for commodities and the payment of public and private obligations.

In *vegetable physiology* the term is applied to



and animal fights were exhibited. It was originated by Romulus, and was made popular by subsequent rulers. The largest of the Roman circuses was the Maximus, capable of holding from 250,000 to 385,000 spectators. Among the few remains of these structures are those of the circus of Caracalla. They were usually oblong and from three to five times longer than wide. The largest in the time of Julius Caesar was 625 feet wide and 1,875 feet long. In these buildings were exhibited games, wrestling, boxing, and sea fights; for the latter purpose canals were dug. The conquerors usually brought large herds of wild animals from foreign countries to exhibit in games for the enthusiastic populace.

When Pompey returned from his expedition he gave a circus occupying five days, during which twenty elephants and five hundred lions were killed. The Roman voters expected candidates for office to give extensive circus games and to contribute otherwise to the comfort and amusement of the partisans. In modern times the circus became largely an exhibition of acrobatic displays, feats of horsemanship, collections of wild animals, and hippodrome performances. Associated with modern circuses are exhibitions of gymnastics, legerdemain, statuary, strange and foreign people, and bold feats of equestrianism. Phineas P. Barnum and William Cody are among the greatest showmen of modern times.

**CISALPINE REPUBLIC** (sĭs-ăl'pĭn), a state organized by Napoleon in 1797 and reorganized by Germany. It contained an area of 16,337 square miles and a population of 3,500,000. However, it received the name of Italian Republic on Jan. 25, 1802, when Napoleon was chosen its president. It was a part of Italy from 1805 to 1814, and was given to Austria in 1815 by the congress of Vienna as the Lombardo-Venetian kingdom.

**CISTERCIANS** (sĭs-tĕr'shanz), an order of monks and nuns founded in 1098 by Saint Robert, abbot of Molesme. It is properly a branch of the Benedictine order and its members are sometimes called Bernardines. The name Cistercians was derived from Citeaux, France, near Dijon, where the first monastery was established. Originally they wore a brown habit, but later adopted a white one supplied with a black scapular. Their monasteries were established chiefly in lonely valleys. They refrained from eating meat, worked hard and slept little, and cultivated an interest in art and literature. This order was well organized in England when Henry VIII. dissolved the monasteries, but at present it is represented by only a few monasteries in Austria and Belgium, and by one in England and two in Ireland.

**CISTERN** (sĭs'tĕrn), a reservoir for water, usually constructed underground, and frequently supplied with a filter to purify the inflow. A cistern receives its water by an artificial channel, which is generally connected with the roof of a house or barn by means of spouting. The construction is chiefly of brick laid in cement and plastered on the inside to prevent the escape of water through the pores of the brick, but cheaper kinds are made by using wood or plastering with hydraulic cement directly upon the earthen walls. The purpose is to obtain soft water and store it as needed, but in arid districts cisterns serve to provide water for household use. Artificial reservoirs or tanks are constructed above the ground where the soil is extremely wet. Large cisterns are used for storage of water in manufacturing.

**CITADEL** (sĭt'ă-del), the strongest part of a fortification, intended as the last defense of a garrison against a besieging army. Citadels are usually supplied with two gates, one communicating with the city and the other with places that furnish supplies for the army in case of siege. They command the fortifications and frequently hold out against an enemy even after the city they are intended to protect has surrendered. When William III. of England besieged Namur in 1695, the citadel held out a month after the town had surrendered.

**CITIES OF REFUGE**, the cities of Canaan in which those guilty of involuntary homicide could flee for safety. Six of the forty-eight Levitical cities belonged to this class, including Shechem, Kedesh, and Hebron, on the west side of the Jordan; and Golan, Bezer, and Ramoth-Gilead, on the east side. They were located so refugees could reach them from all parts of Palestine. Once in the City of Refuge, the accused was given a fair trial. If found innocent of willful murder, he remained until the death of the high priest, when he was released and permitted to return to his former residence.

**CITIZEN** (sĭt'ĭ-z'n), a member of a state or political community. An alien may become a citizen by naturalization, when he is known as a *naturalized* citizen. On the other hand, one born within the jurisdiction of the country is termed a *natural-born* citizen. In most monarchies it is customary to limit the term *citizen* to the residents of a municipality, while the word *subject* expresses the relation of citizenship to the state or country. A citizen of the United States is a citizen of the State in which he resides. A person may be and usually is a citizen both of the nation and of the State, but his rights under the two are legally different.



A resident of a Territory is not a citizen of a State, but is subject to the Federal law. In some states residents are admitted to citizenship in the State, while not eligible to citizenship in the nation. Minors and women are citizens, but the right to vote is withheld from them, though in some states women are granted full privileges, as in Colorado, Wyoming, Utah, and Idaho.

**CITIZENSHIP**, the state of being vested with the rights and privileges of a citizen. In the United States citizenship is extended to all individuals born in the United States, and not subject to any foreign power, except untaxed Indians. Children born elsewhere, but whose fathers were citizens at the time of their birth, are citizens. Women, not citizens, become citizens by marriage to citizens. All persons naturalized are citizens. The Indians who withdraw from tribal relations and enroll as taxpayers become citizens. All classes of foreigners, except Chinese, who prove good behavior and moral character, may be naturalized after five years' residence within the United States. The laws expressly prohibit Chinese from becoming citizens.

**CITRIC ACID** (sīt'rik), an acid obtained from the fruit, roots, and leaves of a number of plants. It is derived largely from the juice of lemons. In preparing it the juice is allowed to ferment, after which it is neutralized with lime, then filtered, and afterward decomposed with sulphuric acid. About five pounds of citric acid are obtained from one hundred pounds of lemons. Among the common plants that yield citric acid are gooseberries, huckleberries, tobacco, grapevines, and sugar beets. The crystalline salts known as nitrates are obtained by combining metals with citric acid. Citric acid is used in treating rheumatism, for effervescent drinks, and in calico printing to prevent the formation of colors not wanted.

**CITRON** (sīt'rūn), a tree common to the warm, temperate, and tropical climates, where it is cultivated for its fruit. It has short and stiff branches, purple flowers, oblong leaves, and large warted fruit. The citron tree was brought from Media by the Romans. It furnishes oil of citron, which is used in confectionery and for culinary purposes. The name *citron* is applied to a variety of watermelon, the rind of which is used for pickles and preserves. It is very hard and inedible, and thrives in most parts of North America.

**CITRUS** (sīt'rūs), a genus of evergreen shrubs and trees native to warm climates, where they are cultivated for their fruit. These plants include the lime, orange, citron, lemon,

and grape fruit, or shaddock. In most species the leaves are pointed and have jointed petioles. A volatile oil is obtained from all the species, used largely in the manufacture of medicine and perfumery. The flowers are peculiarly fragrant and yield a volatile oil, and the fruit is pulpy with smooth seeds and spongy rind.

**CITY**, the name usually applied to a large aggregation of population, the term generally denoting a more populous place than a town. In some states the name is applied to any incorporated town, but in others it is limited to a town having not less than 10,000 inhabitants, and some apply it to a town having at least 2,000 inhabitants. A city in Canada is a municipality of the highest class and is separated from the jurisdiction of the county council. In Great Britain the term is generally applied to all towns that are incorporated and which either are or have been sees of bishops. The larger cities of Greece more nearly resembled a *state* than a *city*, as was the case in Athens and Sparta, and this form of organization is perpetuated in the free cities of Germany.

**CIUDAD REAL** (rā-äl'), a town in Spain, capital of the province of Ciudad Real, about one hundred miles south of Madrid. It is surrounded by a fertile plain, five miles south of the Guadiana, and has railroad conveniences. Among the chief buildings is a hospital founded by Cardinal Lorenzand. It has several monasteries and churches and is the headquarters of the Hermandad, or Holy Brotherhood. The manufactures include leather, woolens, flour, and olive oil. It was founded in the 13th century by Alfonso X., who fortified it as a strategic point. Population, 1906, 15,568.

**CIUDAD VICTORIA** (vĕk-tō'rĕ-ä), a city in Mexico, capital of the state of Tamaulipas, 160 miles southeast of Monterey. It is surrounded by a sugar-growing district, has railroad facilities, and is a market for fruit and sugar. It is the seat of a bishop and the residence of several consular agents. The manufactures include cigars, sugar, clothing, and machinery. It was founded in 1750 and received its present name in 1825. Population, 1906, 16,810.

**CIVET** (siv'ĕt), a carnivorous mammal of Asia and Africa, resembling somewhat the fox and the weasel. The head is long, the ears are short and rounded, and the color is grayish with a tinge of yellow. The body is from three to four feet in length, including the tail, and about twelve inches high. Several species have been described, but the African civet is the best known. It feeds on birds, reptiles, and small quadrupeds, and is regarded a bene-



factor in the valley of the Nile for its ability to devour the eggs of the crocodiles. From it is obtained a fatty substance known as civet. It is a pale-yellow or brownish substance, about the consistency of honey, and is secreted by the



AFRICAN CIVET.

anal glands of this animal. It is removed from the bag about twice a week with a small spoon, and after being cleaned has a value of \$10 or \$12 per ounce. It is used in making perfume. In many sections of Africa civets are kept for this product.

**CIVILIZATION** (siv-ĭ-lĭ-zā'shŭn), a term applied broadly to the culture of a people in contradistinction to those classed as barbaric or savage. A nation is considered civilized when a large proportion of its inhabitants have a high state of intellectual and moral development, and show evidences of increase with the advance of years. Civilization is the outgrowth of material prosperity, between which and the higher state there are frequent actions and reactions. The state of the society of the world exists at the present time with regard to form as barbarous, semicivilized, and civilized. Many scholars and writers believe that the present population of the earth sprung from Noah's family, and that he and all that constituted his household were far advanced in civilization. Others hold a contrary view, thinking that man has shown a systematic growth and development to higher conditions through the ages. This class assert that man originally occupied a barbarous state and that he has advanced from century to century until the present time, although it is admitted that there are some people and nations who have shown no advance, or have fallen back into the state of barbarism, if they ever possessed any degree of civilization.

The first stage of society seems to be a highly barbarous one, in which the food consists of fruits, roots, and fishes. In the second stage man is represented as a hunter, but passes into the state of a shepherd in the third, in which state wild animals are domesticated to avoid the uncertainty of the result in hunting. In the

fourth stage man becomes an agriculturist, and finally, in the last and highest stage, engages in manufacture and commerce. The possibility of civilizing all nations, abolishing wars, and inaugurating peace has long been a question of serious discussion.

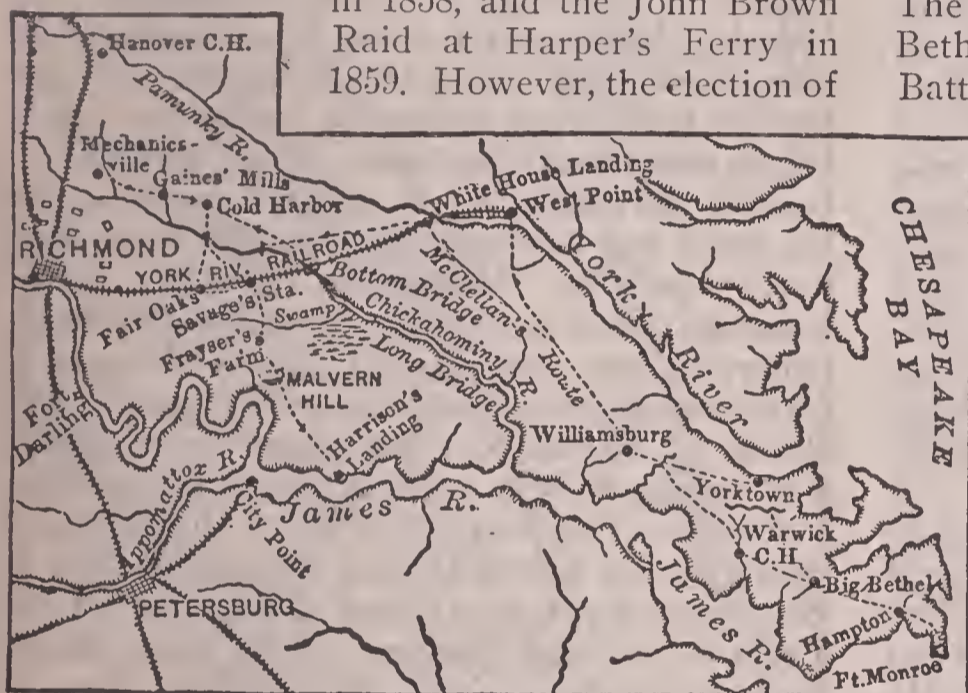
The tendency to higher development seems equal only to the spirit of retrogression, and a nation once civilized may remain in that state only a few decades or centuries. If civilization had been a permanent institution, it would have matured into world-wide achievements from the stages attained in Assyria, Babylonia, Egypt, and the other ancient nations, and by this time have spread to every country. With the rise of civilization in Western Europe there came a period of retrogression in the East, and this, and other examples which might be cited, are evidence conclusive that the work of great physical, mental, and moral effort to make mankind better and wiser must be pursued with ever increasing intensity. However, climate, food, soil, and the aspects of nature are the principal causes of intellectual progress. Viewed from this standpoint, it is assumed that religion, literature, and governments are the products, not the cause, of civilization.

**CIVIL SERVICE**, the service of government which is distinguished from the military and the naval affairs. Government is separated into three branches—*legislative*, *judicial*, and *executive*. The legislative branch is representative of the people, and in it is vested the law-making power. The judicial branch interprets and gives meaning to the law, and establishes and administers justice. The executive branch is the law-enforcing power. Each of the three departments of government is more or less concerned with the civil service. Owing to much responsibility resting upon the different departments, the reform and improvement of this service in many countries has been long a question seriously considered. In the United States partisans often biased appointments to office, which led to inefficiencies and public criticism. Owing to this fact, a system has been established by which competitive examinations are provided for candidates, and the fitness of applicants is tested without regard to politics. Appointments are given to those showing the highest degree of fitness, and these are to remain in office during good behavior. By these means party politics are removed and the efficiency of public service is increased materially. The number of government offices which are now in the civil service list is about 100,000. Within recent years the appointment to office in many cities has been established upon this plan,



which is generally called the *merit* or *competitive* system.

**CIVIL WAR IN AMERICA**, the armed conflict of 1861-65, between the Northern and Southern sections of the United States. Sectional differences had existed from the beginning of the Union, but after the time of the Missouri Compromise of 1820 the differences were based largely upon the economic and social divergence between the North and the South caused by the existence of slavery. Frequent tendencies to disrupt the government prevailed from time to time, but they increased materially after 1850, chiefly on account of the passage of the Fugitive Slave Law and the incidents connected with its enforcement. Other causes of dissatisfaction were the repeal of the Missouri Compromise in 1854, the Dred Scott Decision of the United States Supreme Court in 1858, the Lecompton Constitution for Kansas in 1858, and the John Brown Raid at Harper's Ferry in 1859. However, the election of



SCENE OF THE PENINSULAR CAMPAIGN.

Lincoln in 1860 brought disunion to a head. Seven states seceded between Dec. 20, 1860, and Feb. 1, 1861. These were Alabama, Florida, Georgia, Louisiana, Mississippi, South Carolina, and Texas. The Confederate States of America were organized on Feb. 4, 1861, at Montgomery, Ala., and the four states of Arkansas, North Carolina, Tennessee, and Virginia joined the Confederate States by July of the same year. Kentucky, Maryland, and Missouri were divided and were represented in both armies, while the western counties of Virginia remained loyal to the Union and later were organized as the State of West Virginia.

It was at first expected by many citizens of both sections that there would be a peaceable separation. Buchanan temporized and was succeeded by Lincoln, who at first could not see his

course clearly, but when the Confederates fired upon Fort Sumter, in the harbor of Charleston, S. C., on April 12, 1861, it precipitated the conflict. President Lincoln immediately called for 75,000 volunteers to enforce the authority of the Union and declared a blockade on the coast of the Southern States. The Confederate States likewise called for volunteers and issued letters of marque and reprisal. The North was rich and had a greater variety of industries than the South, where agriculture was the only large industry. However, the people of the South were better united and were pervaded with a more enthusiastic military spirit.

The first blood was shed in Baltimore on April 19th in a street attack on the Sixth Massachusetts Regiment, which was on its way to Washington. It was followed by active operations in the western part of Virginia, which each of the contending parties tried to hold. The Federals were defeated on June 10 at Big Bethel, Va., and on July 21 occurred the first Battle of Bull Run, when the Federals under Gen. McDowell were completely defeated by the Confederates under Generals Johnston and Beauregard. The effect of the Confederate success at Bull Run was to encourage the South and raise a determined spirit in the North, and to unify both sections in support of their respective policies.

Though the experiences of the first year were decidedly against the Federals, their cause was greatly strengthened in 1862. Gen. Thomas succeeded in expelling a large part of the Confederate soldiers from Kentucky, while Pope, Buell, and Grant cleared the upper Mississippi and the lower Cumberland and Tennessee, with battles at Shiloh and Corinth, while Farragut captured New Orleans. Gen. Pope and Commodore Foote captured Island No. 10, in the Mississippi, and Maj. Gilmore bombarded and took possession of Fort Pulaski, near Savannah, Ga. In March of the same year the Confederate ironclad, *Virginia*, formerly the *Merrimac*, was defeated in Hampton Roads by the newly constructed *Monitor*.

Richmond, the Confederate capital, was an objective point in 1862, and Gen. McClellan undertook its capture with the Army of the Potomac. This army was carefully organized and disciplined and took a position on the peninsula formed by the York and James rivers, and in May gained a success at Williamsburgh, Va. It advanced to the Chickahominy and in June won the Battle of Seven Pines, or Fair Oaks, but the Federals were compelled to abandon



the project after a hard-fought campaign of about four months, which included the Seven Days' Battles, known separately as those of Oak Grove, Mechanicsville, Gaines's Mill, Savage's Station, Frazier's Farm, and Malvern Hill. McClellan was superseded by Halleck in July and the contest was shifted to northern Virginia, where occurred the second Battle of Bull Run between the Federals under Pope and the Confederates under Lee, Longstreet, and Jackson, in which the Federals were defeated and driven back upon Washington. Lee now concluded to strike a master blow by crossing the Potomac into Maryland, but he was met at South Mountain by McClellan, who defeated him in the severe Battle of Antietam and compelled him to fall back into Virginia. In September Stonewall Jackson recaptured Harper's Ferry, where the Confederates took about 12,000 prisoners and valuable stores. The latter made an heroic effort to drive the Federals out of Kentucky and Tennessee, and Gen. Bragg with an army of 45,000 men entrenched himself at Perryville, where he was defeated by Rosecrans and Van Dorn was repulsed at Corinth. Buell, who had been commander of the Army of the Cumberland, was succeeded by Rosecrans, who engaged Bragg's army in a battle lasting three days at Murfreesboro, after which the Confederates retreated. Among the severe losses of the Confederates during the year was the death of Gen. Johnston, who fell at Shiloh, or Pittsburg Landing, on the Tennessee, in April.

The proclamation emancipating the slaves in the rebellious states, which had been decreed by President Lincoln in September, took effect Jan. 1, 1863. During the year the campaigns turned the tide in favor of the Federals. Hooker succeeded Burnside as commander of the Army of the Potomac, but was defeated in a great battle at Chancellorsville, where the Confederates lost Stonewall Jackson, and Lee undertook the second invasion of Maryland. Meade succeeded Hooker as commander of the Army of the Potomac and immediately pursued the Confederates. The armies met at Gettysburg in July and fought desperately for three days with the result that the Federals gained a complete victory. Lee crossed the Potomac into Virginia and took a stand at the Rapidan. Meanwhile Gen. Grant undertook the capture of Vicksburg, which the Confederates had fortified, and Pemberton was compelled to surrender his army of 30,000 men almost the same time that the victory of Gettysburg was won. Port Hudson fell in July and gave the Federals complete control of the Mississippi, thus dividing the Confederacy into two sections. How-

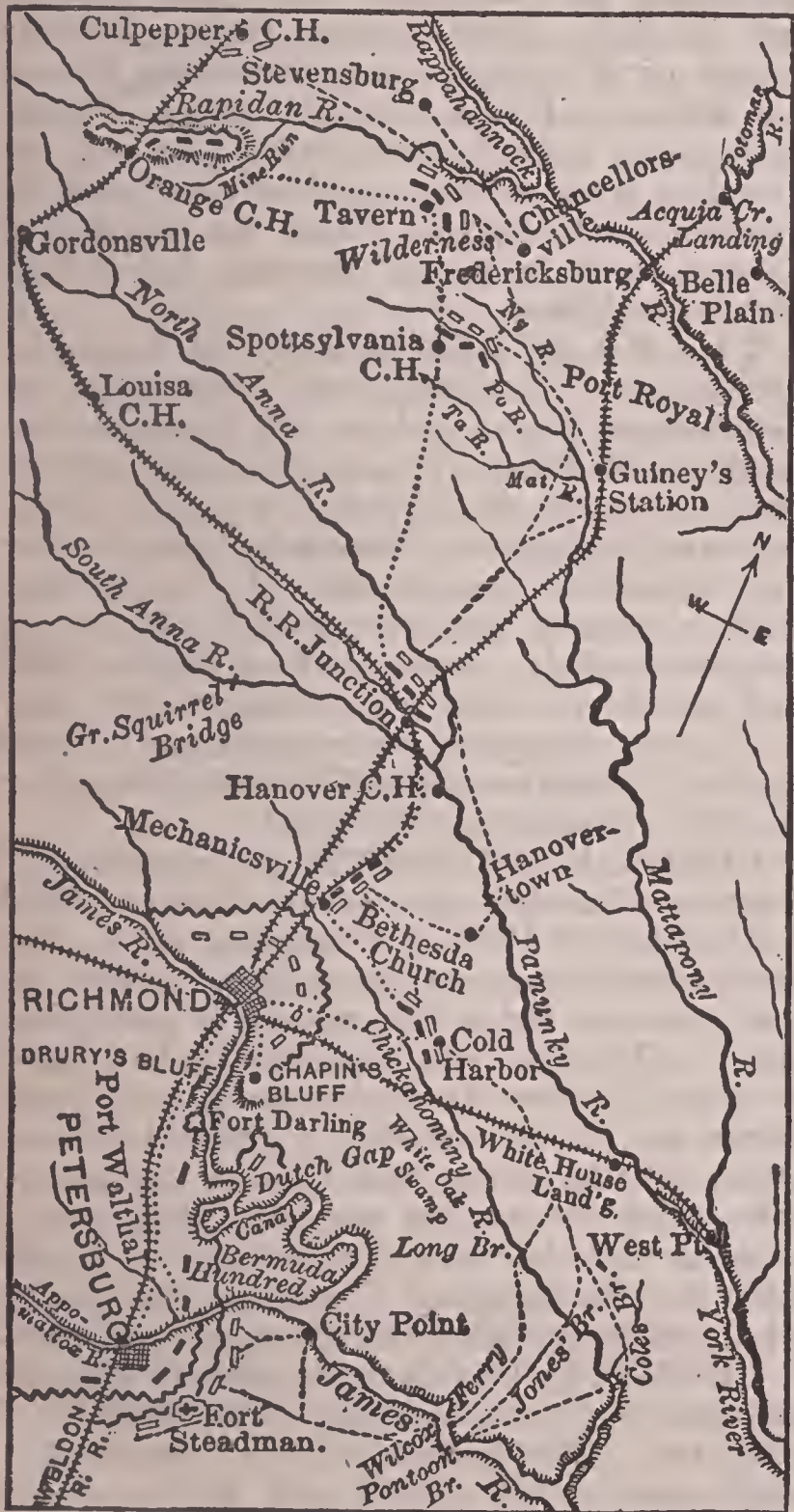
ever, the Army of the Cumberland under Rosecrans was severely defeated by Bragg in the Battle of Chickamauga. Grant was now made commander of the Department of the Mississippi, which included all the armies of the West, and in November defeated Bragg at Chattanooga, in the battles of Lookout Mountain and Missionary Ridge. The year closed with the Federals in control of the Mississippi and in possession of the states of Arkansas, Florida, Kentucky, Louisiana, Mississippi, and Tennessee.

The ability of Grant in his remarkable campaigns in the West brought about his appointment as commander in chief of all the armies. In March, 1864, he took personal command of the armies in the East and placed Sherman in charge of the West and South. Sherman, with an army of 100,000 men, defeated the Confederates at Dalton, Rome, and Resaca, but was himself defeated at Kenesaw Mountain. He occupied Atlanta after it had been evacuated by Hood, who had succeeded Johnston, and two months later began his march to the sea, reaching Savannah on Christmas. Hood had made a counter movement by invading Tennessee, but his army was destroyed by Thomas in the Battle of Nashville. Meanwhile, the Army of the Potomac, under immediate command of Meade, undertook the campaign of the Wilderness to force the ultimate evacuation of Richmond. The Battle of the Wilderness, near the Rapidan, was fought in May without either side gaining a victory. This was followed by the Battle of Spottsylvania Court House, the engagement at the North Anna River, and the repulse of the Federals at Cold Harbor. Grant now crossed the Chickahominy and was met by Lee at Petersburg, where he conducted a protracted siege. Gen. Early moved rapidly across the Potomac and won several successes, including that of the Monocacy, and then withdrew into the Shenandoah Valley, where he was defeated near Winchester by Sheridan and later was routed at Cedar Creek. In June of the same year the Confederate cruiser *Alabama* was sunk off Cherbourg, France, by the *Kearsarge* and Farragut defeated the Confederate squadron in Mobile Bay.

In February, 1865, Sherman left Savannah and marched through South Carolina, where he took possession of Columbia and Charleston, and pushed northward into North Carolina. Johnston undertook to check Sherman at Bentonville, though met with defeat in this design. Lee made an attempt on March 25th to break through the Federal line at the Appomattox River and captured Fort Stedman, but this was



retaken by the Federals. Sheridan defeated the Confederates at Five Forks on March 31, thus exposing the connection of Lee with Richmond, and on April 2 Grant made an attack on the whole line at Petersburg. Richmond was immediately abandoned and Lee retreated to Lynchburg, where he was intercepted by Sheridan and surrendered his army to Grant at Appomattox Court House on April 9, while



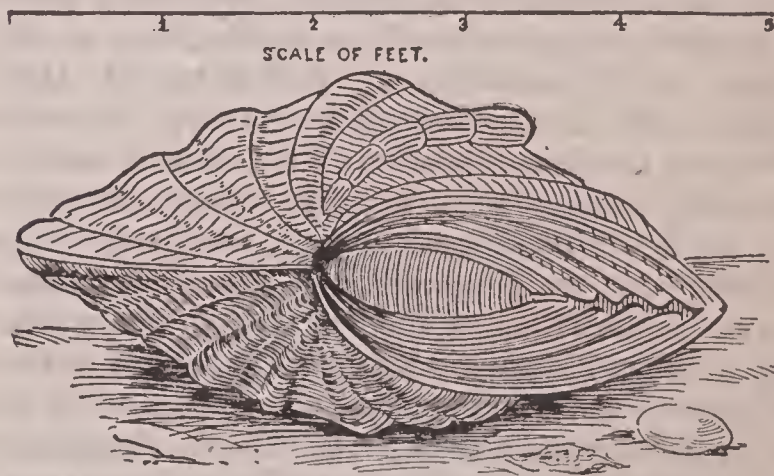
SCENE OF THE CAMPAIGNS AROUND RICHMOND.

Johnston surrendered on the 25th. The last fight took place on the Rio Grande, May 13, 1865, and the last armed forces were surrendered by Kirby Smith on May 26. Jefferson Davis, President of the Confederate States, was captured on May 10 and confined at Fortress Monroe. At the time of the final victory, on April 14, President Lincoln was assassinated.

The Civil War, from April 12, 1861, when Fort Sumter was bombarded, to May 26, 1865, when the Trans-Mississippi army surrendered, covered a period of about four years. The Confederates had about 500,000 men and lost 95,000 in killed and wounded, while the Federals had 2,666,999 men and lost 359,258. It is not certain what number of Confederates were killed by accident or disease, but it is estimated that the total is nearly 200,000. The war cost the Confederate States about two billion dollars and the United States about three and one-half billion, and the latter has paid in pension to Union soldiers about as much as the sum spent by it to maintain the Union. It is estimated that the total cost, counting both sections of the country, aggregates nine billion dollars. See **Confederate States**.

**CLAIRVOYANCE** (klâr-voi'ans), an alleged faculty or power claimed to be possessed by some persons while under the influence of mesmerism. By means of it the clairvoyant claims to be able to see mentally things concealed from sight or at a great distance, to discover things hidden from sight, and to describe clearly events happening at a distance. The claim that clairvoyance is a reality is not admitted by scientists. See **Mesmerism**.

**CLAM**, the name applied to various bivalve mollusks, which are most numerous in the sand and gravel between the high and low water mark. The best known species are the sea, or hen, of the Atlantic; the soft-shelled clam, called the cob in England; the edible giant clam



GIANT CLAM.

of the South Sea; and the fresh-water clam, which is properly a mussel. The clam is a favorite food, while the shells are used in many cities to make ornaments, buttons, snuff boxes, knife handles, and beads. Off the East Indian coast the *giant clam*, weighing 500 pounds, is found.

**CLAN**, meaning offspring or children, the name applied to a tribe or number of families bearing the same surname, claiming descent



from common ancestors, and united under a chieftain who represents that ancestor. The clan system still exists among the Arabs, Tartars, and other tribes of Asia and Africa, and among a number of other peoples, particularly among Indians. A clan system was instituted among the people of Scotland in the reign of Malcolm II., about the year 1008, but it was of much greater antiquity in other countries. The members of a clan were kin by birth and were united by other ties under a chieftain, who was the supreme ruler. Each clan occupied a certain portion of the country, and wars among clans were both frequent and severe. The legal authority of clannish chiefs was abolished by a law passed in 1747, and the government became merged into a system more nearly subject to the central authority. During the period that clans flourished, they were divided into two general classes—those of the Highlands and the clans of the Borders.

**CLAREMONT** (klâr'mönt), a town in Sullivan County, New Hampshire, forty-eight miles northwest of Concord, on the Boston and Maine Railroad. It is surrounded by a productive farming country and is a center of manufactures. The chief buildings include the Fiske Library, the high school, and a number of churches. Among its industries are cotton, woolen, and paper mills, printing, machine works, and marble yards. An abundance of water power is obtained from the Sugar River. Population, 1900, 6,498.

**CLARENDON** (klâr'en-dün), **Constitutions of**, a series of ordinances made by a council of the nobles and prelates in England, at the village of Clarendon, in Wiltshire, in 1164. These laws were favored by Henry II. as a means to check the power of the church and to limit the clergy in exercising secular jurisdiction. They limited and defined the jurisdiction of the Pope in England, and gave the crown power to interfere in the election to fill vacancies in offices and dignitaries. By their terms it became necessary to secure the consent of the king to make appeals to Rome, clergymen were forbidden to leave the realm without royal sanction, and clergymen accused of crime were taken for trial before ecclesiastical courts, after which the law courts were empowered to inflict further punishment.

**CLARINET** (klâr'ĩ-nět), or **Clarionet**, a wind instrument with a reed, first made by John Christopher Denner of Leipzig, Germany, in 1690, but since modified by various improvements. Its principal parts include a mouth-piece, furnished with a single beating reed, and a round tube enlarged at the end in the form of

a bell. The tube is provided with eighteen openings in the sides, half of which are closed by the fingers and half by the keys. It is used extensively in military bands and orchestras. Its compass is much greater than that of the flute and its music is held in higher favor.

**CLARKE'S FORK**, a river of the United States, rises in the Rocky Mountains, in the western part of Montana. It flows toward the northwest in Montana, crosses the northern part of Idaho, flows through the northeastern corner of Washington, and enters the Columbia River in British Columbia, near Waneta. It is about seven hundred miles long and has abundant water power. Its headwaters are the Flathead and Missoula rivers, by which it is formed, and it passes through Lake Pend Oreille, in Idaho.

**CLARKSVILLE**, a city in Tennessee, county seat of Montgomery County, on the Cumberland River, and on the Louisville and Nashville Railroad. The chief buildings include the courthouse, the city hall, and the Southwestern Presbyterian University. Iron mines are worked in the vicinity. It has a large trade in tobacco and merchandise. The manufactures include cigars, clothing, earthenware, and machinery. The city is improved by electric lights, pavements, waterworks, and a sewer system. It was settled in 1780 and incorporated in 1785. Population, 1900, 9,431.

**CLARK UNIVERSITY**, an institution of learning founded by Jonas Gilman Clark (1815-1900) in 1887, at Worcester, Mass. The institution is nonsectarian and has courses for postgraduates and a department for undergraduates. The latter was organized in 1902 under a special bequest of its benefactor. It has a library of 25,000 volumes, a carefully chosen corps of instructors, and modern equipments. The chief publications are the *Mathematical Review*, the *American Journal of Psychology*, and the *Paedagogical Seminary*. G. Stanley Hall was its president for a long term of years.

**CLASSICS** (kläs'siks), the writers and productions of acknowledged excellence and authority. The highest class of Roman citizens were called *classici* and a man of the highest rank was termed a *classicus*. The term *classic* was applied to writers and productions as early as the 2d century after Christ. At present it refers to the best writers and productions of Greece and Rome and to the modern works that conform to the best and most perfect standards. The classical period of Greece extends from Homer to the time of the Roman emperor Antoninus and the Latin, from Plautus to about 200 A. D.



**CLAY**, a term applied to any form of earth which possesses sufficient plasticity to be fashioned like paste by the hand or the potter's lathe, when moistened with water. It is produced by the disintegration of rocks. Streams carry silt, which forms clays when deposited. When currents pass into still waters, the heavier stones drop first, next the pebbles, and then the gravel and sand, and finally the fine silt settles to the bottom and forms clay or mud. The mud, hardened by drying, becomes shale. The purest grade of clay is known as *kaolin*, of which porcelain and white earthenware are made. *Pipe clay* is a plastic and smooth clay and *flint clay* is hard and dense. *Fire clay* is found in coal measures immediately beneath the several veins of coal. It constitutes the soil of the ancient forests, the remains of which have been transformed into coal. It is used to make infusible brick. Other clays are used for making drain and sewer tile, brick, earthenware, tobacco pipes, and many other products. *Loam* is a mixture of sand and clay, *marl* contains clay and shell remains, and *shale* is a rock clay. Calcareous clay lands produce the best wheat and rye, while the rosaceous produce the best fruits. Clay is an important constituent of good soil. The manufactured products of clay produced annually are very extensive.

**CLAYTON-BULWER TREATY** (bul'-wēr), a treaty between the United States and Great Britain, relating to the construction of a ship canal between the Atlantic and Pacific oceans, across the Isthmus of Panama. It received its name from the commissioners, John Middleton Clayton, on behalf of the United States, and Bulwer-Lytton (later Lord Dal-ling), on the part of Great Britain. It was ratified in 1860. The terms include that neither nation is to erect fortifications at or near the canal, and that these nations will not assume dominion over any part of Central America. However, the treaty was abrogated in 1901, when the Hay-Pauncefote Treaty was concluded between the two nations.

**CLEARFIELD**, a borough of Pennsylvania, county seat of Clearfield County, 170 miles northeast of Pittsburg. It is conveniently located on the west branch of the Susquehanna River and on the Pennsylvania and other railroads, and is surrounded by a fertile agricultural country, which contains deposits of coal, fire clay, and limestone. The manufactures include flour, leather, and machinery. It has electric lights, waterworks, and other municipal utilities. The first settlement in its vicinity was made in 1805 and it was incorporated in 1840. Population, 1900, 5,081.

**CLEARING HOUSE**, a banking institution which serves to make mutual payments between bankers on drafts and checks. Clearing houses are organized by an association of banks. The different drafts and checks received by the associated banks are brought to the clearing houses and offset one another, and only the balances are paid in money. Each bank represented has a desk at the clearing house, at which the settling clerk or clerks receive in bundles the checks and drafts payable by the bank they represent, and in return draw a statement of the demand against other banks. All the checks and other evidences of credit are noted carefully by an inspector and the separate items are examined and approved, after which the checks are returned to the respective banks by their clerks, and at a stated time the debtor banks pay to the creditor banks the balances. Clearings are made every business day, usually about 11 A. M., and the transactions are subject to revision or rectification, not at the clearing house, but in the form of verified claims filed on the succeeding day or some time later.

Clearing houses were established in France as early as 1667, the first at Lyons, but the present system did not originate until the latter part of the 18th century. The London Clearing House, established about 1775, is one of the oldest. New York City has the most important clearing house in America, established in 1853, and its average daily clearings aggregate about \$22,500,000 and the average daily payments approximate one million dollars. Chicago has the second largest clearing house in the United States, its annual clearings amounting to twelve billion dollars, while the annual clearings in New York City aggregate ninety billion dollars. Other important clearing centers are located at Boston, Saint Louis, Philadelphia, Cincinnati, San Francisco, and Kansas City. The chief clearing houses of Canada are at Montreal, Toronto, Quebec, and Vancouver.

**CLEAVAGE** (klēv'āj), in geology, the direction or manner in which rocks may be split into parallel layers. The direction of planes or cleavage is frequently in the line of stratification, but differs from it in many instances. It is not difficult to determine the structure of crystallized bodies when they are broken, and on examination it is found that small polyhedrons make up the individual fragments. The phenomenon of rock cleavage is not easily determined. Some writers consider that it is due to the pressure of mechanical forces to the planes of cleavage, while others look upon it as the result of crystalline agency. Nearly all species of rock are subject to cleavage, but those of the finer grains



show it to the best advantage. Slate and schist are names applied to rocks which possess the property of cleavage.

**CLEBURNE** (klē'bûrn), a city in Texas, county seat of Johnson County, forty-eight miles southwest of Dallas, on the Missouri, Kansas and Texas, the Gulf, Colorado and Santa Fé, and other railroads. The chief buildings include the county courthouse, the city hall, and a public library. It is the seat of a college and has a fine high school. The manufactures include ice, farming utensils, and machinery. It has electric lighting, waterworks, and sewerage systems. Population, 1900, 7,493.

**CLEMATIS** (klēm'â-tis), a genus of plants either herbs or shrubs, usually having climbing stems. They are widely distributed throughout the different climates, but are most numerous in the Temperate zones. Many of the species now cultivated have been obtained from plants native to Europe and have large flowers of various colors, often six inches across. The root of a clematis is used by the American Indians as a stimulant to revive horses that are overcome at races. A number of different kinds are cultivated in gardens and greenhouses of Europe and America as ornamental flowering plants.

**CLEOPATRA'S NEEDLES**, the name of two obelisks formerly at Alexandria, but one is now located in New York and the other is in London. They were erected by King Thothmes III., of Egypt, at the entrance of the great temple of Heliopolis, mentioned as On in the Scriptures, and near which Moses was born. After the death of Cleopatra, shortly before the Christian era, they were removed to Alexandria. The obelisk at New York was placed in Central Park in 1881. It was presented to America by the Khedive of Egypt.

**CLEPSYDRA** (klēp-sī-drâ), or **Water Clock**, an instrument devised by the ancient Greeks for measuring time. It consisted of one or more pipes with orifices at the bottom, and a scale of hours at the outside indicated the time in which the water flowed through the orifices. Another form consisted of a uniform flow of water through a pipe into a receptacle, which had a scale of hours to indicate the rise of the water.

**CLERGY RESERVES**, the allotments of land set apart for the support of the Protestant religion in Canada. It was provided by law that every seventh lot in the township of the two divisions known as Upper and Lower Canada be included in the reserves, and the government held that the benefits were to apply to the Church of England, though other Protestant churches received some of the grants. Roman

Catholics regarded the reserves as unfavorable to their religion and the Baptists and Methodists generally opposed the policy of maintaining them. Opposition grew until 1854, when the church and state were formally separated by the laws of Canada, and the lands and moneys obtained from the sales of these reserves were divided equally among the townships according to the number of their inhabitants. Upper Canada had the largest number of reserves, a total of about 2,500,000 acres.

**CLEVELAND** (klēv'land), a city in Ohio, county seat of Cuyahoga County, on the southern shore of Lake Erie, at the mouth of the Cuyahoga River. It is the largest city of Ohio and the second largest port of the Great Lakes, being exceeded only by Chicago. Cleveland is 250 miles northeast of Cincinnati, 356 miles east of Chicago, and 525 miles northwest of Washington. It is the focus of many important trunk and branch railroad and numerous electric railway lines.

**DESCRIPTION.** The city has a lake frontage of ten miles, extends inland five miles, and has an area of thirty-five square miles. The site is more or less undulating, rises gradually from the lake front, and is about 115 feet above the surface of Lake Erie. It is divided into two unequal parts by the Cuyahoga River, known as Eastern and Western, and the portion lying west of the river is known as West Cleveland. Along the river is a low valley, in which are located many factories, coal yards, freight depots, ore docks, and other industrial establishments. Several great viaducts and many bridges cross the river, one of which, completed in 1878, is 3,210 feet long and cost \$2,250,000.

The streets are wide, from 40 to 130 feet, and are beautified by elms and maples, hence Cleveland is known as the *Forest City*. Much of the paving is constructed of brick and asphalt, and in the business center a substantial grade of stone and cement blocks has been used in constructing the pavements. Superior Street, the principal business thoroughfare, is 132 feet wide and on either side has many substantial structures. Monumental Park, which is in fact the public square, is a tract of about ten acres, and from it the streets diverge in all directions. Euclid Avenue, the most beautiful street, begins at Monumental Park and extends east beyond Lake View Cemetery, whence it merges into Euclid Road. This avenue has a number of business houses at the western end, but is mainly a residence street and contains some of the finest homes and most tasteful lawns in the city. Just south of Euclid Avenue is Prospect Street, which is a noted residential thoroughfare. Case,



Wilson, Jennings, Ingleside, and East Madison streets are noted for their fine lawns and beautiful homes.

**PARKS AND CEMETERIES.** Rockefeller Park, a tract of 800 acres, is situated in the eastern part of the city, and near it are Gordon Park and Wade Park. The latter has a zoölogical garden and a statue of Commodore Perry, which was formerly in Monumental Park. Lake View Park extends along the lake shore, and Brookside, Garfield, Riverside, and Shaker-Heights are worthy of mention. The chief drives, besides Euclid Avenue, include Ambler, Parkway, Ridge Road, Gordon Boulevard, and Grand Public Boulevard. Lake View Cemetery is in the eastern part of the city and contains the Garfield Memorial, which is 165 feet high and cost \$130,000, and in the crypt beneath are the remains of President Garfield. Monumental Park contains the statue of Gen. Moses Cleaveland and the monument dedicated to the soldiers and sailors. Woodland and Riverside cemeteries are beautifully improved and contain many fine statues and monuments.

**BUILDINGS.** The county courthouse, the city hall, and the post office and customhouse are the most prominent public buildings. Others of note include the Chamber of Commerce; the Union Depot, the Sheriff Street Market, the Arcade, the New England, the Lennox, the Ross, and the Colonial Arcade. Among the most prominent churches are the First Presbyterian, Plymouth Congregational, Saint Paul's Protestant Episcopal, and the Roman Catholic cathedral. The Euclid Avenue Baptist and the First Methodist churches are fine buildings and are centrally located. Among the principal hotels may be named the Colonial, Forest City, Hollenden, Weddell, Stillman, Kennard, and American. The places of amusement include the opera house, the Lyceum Theater, and the Academy of Music.

**EDUCATION.** The city maintains an adequate number of public schools, including all of the elementary departments, as well as a number of high and manual training schools. Many private and parochial institutions are within the city. Higher and professional education is provided for by the Western Reserve University, Baldwin University Law School, Saint Ignatius College, Case School of Applied Science, Cleveland College of Physicians and Surgeons, and Cleveland School of Pharmacy. The public library has 175,000 volumes, the Case library has 50,000 volumes, and other valuable collections are contained in many of the schools and colleges. All of the charities are well represented and many of the leading educational and

scientific associations have a large membership.

**INDUSTRIES.** Cleveland has a large trade in coal and iron ore, being a distributing point for the coal of Ohio and the product of the iron mines of Michigan and Minnesota. It has a vast trade in grain and lumber and is the largest fresh-water fish market in America. As a manufacturing city it ranks second among the centers on the Great Lakes. The petroleum refineries, shipyards, machine shops, slaughterhouses, planing mills, paint works, and clothing factories are the chief enterprises. Transportation is facilitated by railroads that reach the principal commercial centers of the central parts of the United States and Canada. A breakwater protects the harbor, inclosing about 300 acres, and the Cuyahoga River has been improved by dredging so lake steamers have convenient wharfage on this stream as well as on the lake. The wholesale trade is an important feature of Cleveland, which supplies through its jobbing houses many points on the lake and inland.

**HISTORY.** The city is located in the Western Reserve, a tract of land formerly belonging to the State of Connecticut, and a part of this was purchased in 1795 by the Connecticut Land Company. Gen. Moses Cleaveland, from whom the city received its name, platted a village at the mouth of the Cuyahoga in 1796. It was organized as a town and made the county seat of Cuyahoga County in 1810, and five years later was incorporated. The Ohio Canal was opened between Cleveland and Akron in 1827, and from that time dates its prosperous growth. A number of adjacent villages and towns were united with it at different times, including Ohio City in 1853, East Cleveland in 1872, Newburg in 1873, and Brooklyn and West Cleveland in 1893. It has had a constant and steady growth and since 1900 it has had a larger population than Cincinnati. Population, 1910, 560,663.

**CLICK BEETLE**, the name of a family of beetles which are peculiar for their movements. Some of the species are known as skipjacks, elaters, and springing beetles. About 500 species are distributed more or less widely in North America and the family is well represented in all the continents. The *eyed elater* is a grayish-black beetle characterized by two large black spots on the thorax. The *wireworm* is a larva of the click beetle and lives at the roots of plants and under the bark of trees, frequently in rotten wood. It is so named from the sound it makes when it regains its feet by a spring, after being laid on its back on any hard substance.



**CLIFF** (klĭf), a slope or descent in the surface of the earth. Cliffs are formed by a dislocation of the earth's crust, or by the erosive action of water, or by volcanic disturbances. Waves carve the rocky coast cliffs by beating against the shore line, and their action is enhanced by the weathering of the rock that extends above the reach of the waves. The cliffs of canyons, gorges, and ravines are formed through the erosion of running water. Cliffs due to volcanic action are formed when the crust of the earth is fractured, a portion being elevated so as to form an abrupt cliff. Examples of this class are seen in many parts of the Rocky Mountains, where broken lava cliffs resulted from exposing the abrupt faces of fractures.

**CLIFF-DWELLERS**, a class of people long since extinct, though there are a number of races still dwelling in cliffs. The ancient cliff-dwellers inhabited portions of Mexico, Arizona, New Mexico, California, and Central America. Their dwellings were made in the rocky cliffs of mountains, and divers traces of them still remain. The valley of the San Juan River, in Utah and New Mexico, has many traces of these people, such as rude carvings and habitations in elevated cliffs. In many of them human skeletons, tools, utensils, and ornaments have been found. It is evident that they cultivated maize, cotton, and tobacco, and raised domestic animals. Some writers assume that they suffered by prolonged droughts and that they were finally extinguished by the Apache Indians. See **Pueblos**.

**CLIMATE** (klĭmât), the character of the atmosphere in regard to moisture and heat, together with meteorological conditions so far as they exert an influence on vegetable and animal life. Climate is affected by latitude north and south of the Equator and by elevations above the sea. High latitudes have perpetual snow and ice, as around the North and South poles, while a similar effect is common to the elevations on the summit of mountain chains, as the Andes, Himalayas, and Alps. Isothermal lines indicate the condition of the climate, and, owing to modifying influences, are irregular when compared to the Equator, owing to variations in altitude. Besides these, there are many other modifying influences upon climate, such as the direction and position of the coast lines of continents and islands, the depth and position of the seas, and the source and direction of winds and oceanic currents.

The climate that exists on continents is called *excessive* or *severe* when it is marked by great differences between the temperature of the win-

ter and summer, or by extremes in heat and cold that characterize the day and the night. The interior regions of Asia and North America are the best examples of excessive climates. A good illustration of *modified* climates is that of Great Britain, which is greatly influenced by the winds of the continent and the breezes and currents of the sea. The east wind passing over the frozen steppes of Russia, in the winter, renders its climate cold and dry, while a south wind coming over the continent of Europe, in summer, is hot and dry, and a wind from the southwest brings moisture and heat. Even the effects of spent cyclones from the surface of the Atlantic is manifest in the form of rain, heat, and storm. Similar remarkable effects may be noticed in the northwestern part of North America, where the warm currents of the Pacific Ocean greatly modify the climate of Alaska and the Aleutian Islands, and the warm Chinook winds modify the greater part of British Columbia, Washington, and Oregon. A similar effect is seen in Northern Africa, where the Atlas Mountains of Algeria shut out the rainfall from the northern part of the Siberian Desert. Similar and other effects are noticed in many localities of the earth on account of the prominent modifying conditions of climate.

It is certain that the climate has undergone many distinct and marked changes in the geological ages, evidences of which abound in the fossils of rocks, and in the various formations in the different ages or periods. For instance, during the carboniferous age both animal and vegetable life seems to have been quite uniform from the Equator to the Arctic zone, hence there must have been only a moderate difference in temperature in the various latitudes, and the summer and winter seasons appear to have been very much alike. Some geologists think that the poles were once centers of great heat, which have been modified from time to time until the present state of excessive cold was reached, with conditions more favorable to animal and vegetable growth at the Equator. Others think that the slight alterations in the earth's orbit tend to produce changes in one direction for a long period of time, and then in the other for an equal period. The effects of these changes, which are quite clearly shown in geological formations, are well known.

**CLINTON** (klĭn'tŭn), a city in Iowa, county seat of Clinton County, on the Mississippi River, 136 miles west of Chicago. It is on the Chicago and Northwestern, the Chicago, Milwaukee and Saint Paul, the Chicago, Burlington and Quincy, and other railroads. The chief buildings include



the Wartburg College (Lutheran), the city hall, the county courthouse, and the public library. It is noted as a distributing point of timber rafted down the river, which is prepared for the market in vast saw and planing mills. Other industries include flouring mills, canning works, iron foundries, furniture works, and machine shops. Three immense iron bridges, about four thousand feet long, cross the river. Electric street railway lines connect all parts of the city. It has gas and electric lighting, pavements, waterworks, sewerage, and many fine residences. Lyons, located a short distance north of the main part of the city, was annexed to Clinton in 1895. Population, 1905, 22,756; 1910, 25,577.

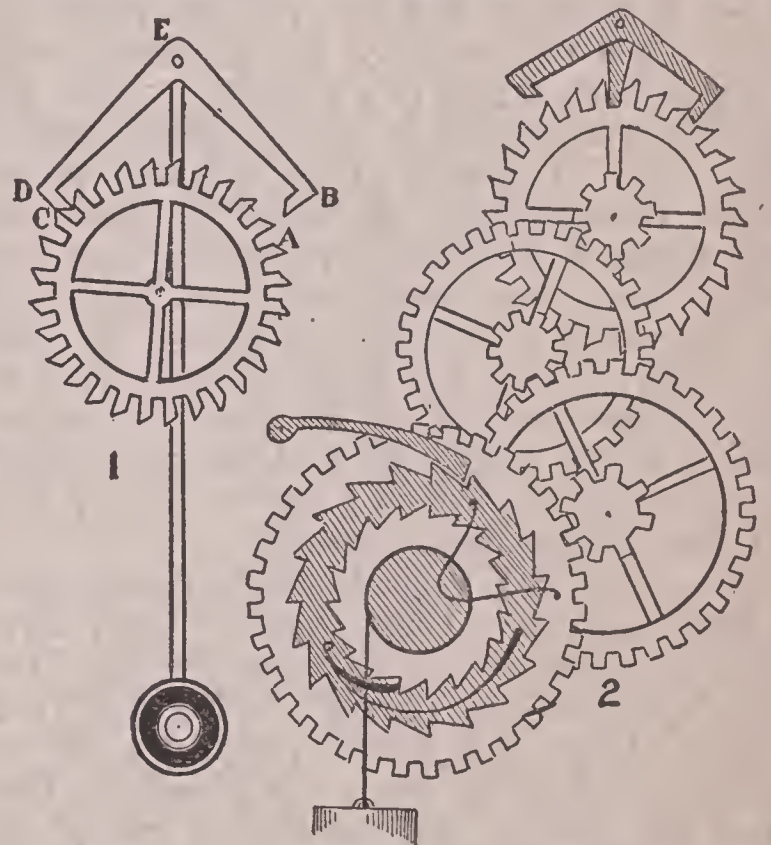
**CLINTON**, a town in Worcester County, Massachusetts, 44 miles west of Boston, on the Boston and Maine and the New York, New Haven and Hartford railroads. It has a public library of 26,500 volumes, a central high school, and a fine public park. Among the manufactures are carpets, ginghams, plaids, clothing, machinery, and utensils. The public utilities include waterworks, gas and electric lighting, and street pavements. A system of electric railways connect it with other trade centers. It has been an incorporated town since 1850. Population, 1905, 13,105.

**CLINTON**, county seat of Henry County, Missouri, 88 miles southeast of Kansas City. It is on the Saint Louis and San Francisco, the Missouri, Kansas and Texas, and other railroads. The chief buildings include the high school and Baird College. It has manufactures of earthenware, flour, pottery, and machinery. Large quantities of grain, coal, and live stock are exported. It was settled in 1835 and incorporated in 1840. Population, 1900, 5,061.

**CLOCK**, an instrument for indicating and measuring time. The name is probably derived from the German word *Glocke*, meaning bell. Time is indicated by means of hands in hours and minutes, and in some instruments by similarly noting seconds, days, and months. In ancient times clocks similar to those now in common use were unknown. Time was measured by means of the shadow cast on an instrument by the sun, called a *sundial*. These could not show the time on a cloudy day. In some countries dials were used to indicate the time at night, called *moon dials*. Later time was indicated by means of water glasses. These instruments consisted of vessels filled with water, with small openings at the bottom through which the water passed drop by drop into a vessel beneath. On the sides of the vessels were spaces indicated by lines, and the time was marked by the height of the water. This form was not

satisfactory, since water does not pass uniformly through an opening, and led to the invention of the *hourglass*, similar to those now used. An hourglass is shaped like a figure eight, the upper side being filled with fine sand, which passes through an opening into the lower part in a definite time. When the sand has all passed to the lower apartment, the instrument is reversed and measures time by the sand passing to the apartment formerly at the top. King Alfred the Great measured time by a gradual burning of candles on which colored rings were placed to indicate the period requisite for the flame to consume the material in the candle.

It is not known when clocks were first invented, but they are of great antiquity. Plato invented an instrument in the year 372 B. C.,



1, Escapement and Pendulum; 2, Train of wheels moved by a weight.

which indicated the hours of night upon organ pipes. Archimedes made a clockwork filled with springs and weights in about the year 200 B. C., and likewise adopted the apparatus to move toys and mechanical engines. The invention of a mechanism for regulating the speed of the going works, on a plan whereby to join wheels to a pointer which traverses the dial, is of newer date. It is not known when these mechanical features of a clock were completed, but they are thought to date from about the beginning of the 11th century A. D.

Clocks are mainly of two kinds. The style in common use is the one in which the wheels are moved by power from the uncoiling of a spring and the other kind is moved by a gradual falling of a weight, both the uncoiling of the spring and the falling of the weight being regulated by



the swinging of a pendulum. The power is applied to a train of cogwheels. In eight-day clocks the train of wheels consists usually of four cogwheels. The power tends to move the wheels quickly and run down the clock with an even motion, but an escapement, fastened to the pendulum, is connected with the train of wheels. Its effect is to change the even motion into little leaps or jerks, thus governing the entire movement. The escapement is adjusted so as to articulate with the escapement wheel, the last of the train, and which usually has thirty teeth or cogs. This is shown in the illustration. As the pendulum, which is attached on the pinion E, swings to and fro, the two pallets B and D strike alternately against the cogs on the opposite sides of the escapement or balance wheel, as shown at A and C, and thus regulate the movement. Each full swing of the pendulum in an ordinary clock marks two seconds of time, and each two revolutions of the escapement wheel, one minute. The cogs of the different wheels are so arranged that the wheel to which the second hand is attached moves around once in a minute; the minute hand, once in an hour; and the hour hand, once in twelve hours. In cases where days, weeks, and longer periods are indicated similar mechanisms are used. At the beginning of the 13th century clocks were placed in church towers, and are now frequently seen in public buildings and churches.

Among the most remarkable clocks are those in great churches. These usually require large pieces of mechanism to overcome friction. The clock in the tower of Trinity Church, New York, is wound by a crank which is turned about 800 times in winding the clock. In Strasburg, Germany, the clock in the cathedral is one of the most noted ever made. It shows the motion of the planets and the sun, and marks the minutes, hours, days, months, years, and the important festivals of the year. It contains many figures moved by machinery. The statues of four old men are located in the upper part and strike the quarter hours. At every quarter hour death comes forward, but Christ meets him with a spear and drives him back. At the last quarter Christ passes inside, while death comes out and strikes the hour with a bone in his hand, which is followed by beautiful chimes.

American inventions have revolutionized the manufacture of clocks. Those produced largely by the Waterbury Clock Company and other similar manufacturers more nearly resemble watches than clocks, and they have been exported to every country in the world. Electrical clocks were manufactured as early as 1840, but they have been greatly modified and improved

in recent years. In these clocks one accurate clock is connected by wires with others, which are controlled and kept in exact time by the first. The principal clock has a pendulum that makes and breaks a circuit at stated intervals; and all the other clocks in the series beat the same time. They are used extensively in offices and public buildings. In another form of electrical clocks a master clock is attached to a number of clock faces by means of electrical currents. At the expiration of each minute an electrical impulse passes from the master clock to the different clocks in the circuit, and the hands of the clocks controlled advance one stroke each minute.

**CLOISTER** (klois'tēr), a covered passage or gallery running through the walls of certain buildings, especially those used for colleges and monasteries before the Reformation. In most of the buildings of this kind one of the walls was formed by the architectural structure to which it was attached, while an open arcade or a series of windows formed the other side. The roof, which was usually vaulted, was supported by pillars and arches. Cloisters were used by the inmates of the monasteries for exercise and recreation, and many of them had an open space which contained a well and gardens. The German word *Kloster* has reference to the whole establishment, including the chapter house and the dormitories as well as the church. Many churches of Italy, Germany, England, and France retain the galleries or arched ways to which the term *cloister* is applied in a strict sense.

**CLOQUET** (klō-kwět'), a city of Minnesota, in Carleton County, 20 miles southwest of Duluth. It is situated on the Saint Louis River and on the Northern Pacific and the Great Northern railroads, and is noted for its extensive sawmills and lumber yards. The manufactures include machinery and lumber products, such as shingles, furniture, and wood pulp. It has a number of excellent schools, waterworks, electric lights, and a growing trade in manufactures and merchandise. Population, 1905, 6,117.

**CLOTH.** See **Weaving.**

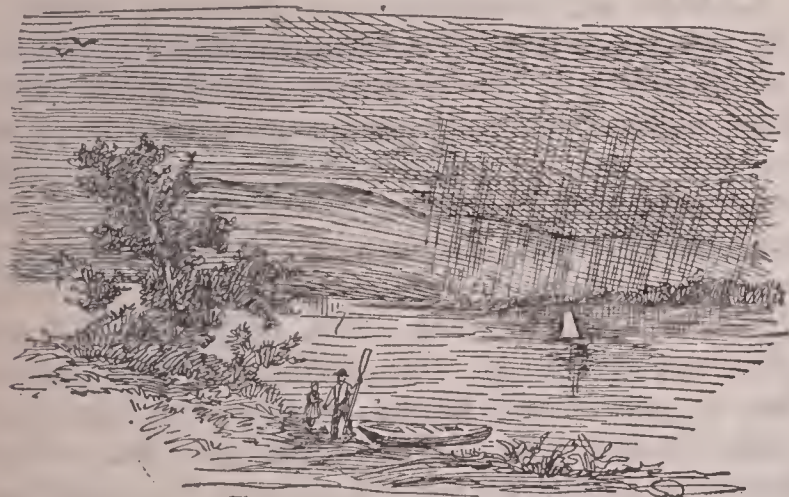
**CLOTHES MOTH,** the name applied to several species of moths, the larvae of which are harmful to furs, woolen, cloths, feathers, and stuffed animals. Exposure to light and the application of turpentine are good preventives.

**CLOUD,** a mass of vapor condensed into minute drops, differing from fogs chiefly in that the drops float in higher regions of the atmosphere. Clouds and fogs are derived from vapors that rise from the moist earth, from fresh water, or from the sea. The minute drops of water that constitute clouds and fogs are formed of a



substance about 800 times heavier than air, and are prevented from settling rapidly by the resistance of air. The minute size of drops renders this possible. Whenever they exceed a certain size, they fall as rain or snow. The warmer air usually carries the greater amount of moisture, and, when coming in contact with colder air, the clouds or fogs result. On the contrary, clouds and fogs disappear on the approach of a warm, dry wind.

Clouds are generally higher during the day than during the night, and are higher in the tropics than in the polar regions. The mean height in winter is from 1,300 to 1,500 yards, and in summer from 3,400 to 4,400. They often exist at a distance of 250 yards above the ground, and as high as 7,500 yards, while the *cirri*, light forms of clouds, attain a much greater elevation. Although clouds generally appear stationary, they are really descending slowly, but their lower parts are dissipated by



▼ NIMBUS ▼ STRATUS  
CLOUDS.

air more highly heated and their upper portions become increased by fresh condensations. For this reason their descent is disguised, giving them a stationary appearance. All are more or less charged with electricity, some positively and others negatively, but their tension is greatest during a thunder storm. Clouds carry the moisture needed by plants from the sea, and distribute it over the vast interior of islands and continents, where it falls in the form of rain, snow, or hail.

Clouds are classified in four primary forms: the *cirrus*, the *cumulus*, the *stratus*, and the *nimbus*. *Cirrus* clouds consist of feathery masses of condensed vapor that are suspended in the higher regions of the atmosphere. They were so named from their resemblance to a lock of hair with fiber diverging in all directions. Owing to their elevation, the moisture is thought to consist of ice particles. The halos or circular bands of light around the sun are

caused by light passing through *cirrus* clouds. *Cumulus* clouds are denser than the *cirrus*, and are formed in the lower regions of the air, where the quantity of vapor is greatest. They consist of irregular heaps and rounded masses with moderately broad bases. They originate from ascending currents of air which have their moisture condensed by the cold produced by expansion and elevation. They are seen more frequently during the hotter part of the day at a height seldom exceeding two miles.

The *stratus* clouds consist of long, horizontal sheets or bands. They are seen more generally in the morning and evening, when the ascending currents are weak, and are caused by gradual settling of the *cumulus* and other clouds. The *stratus* clouds are the lowest, often falling to the surface of the earth and becoming a fog. The *nimbus* are the storm clouds from which rain falls. They may be formed by any of the various clouds coming together or collecting. The *nimbus* clouds are usually seen as a dense cloud spreading out into a cloud of *cirrus* with a shower passing beneath. They are the least attractive among the clouds, but are the only ones attended by the splendid phenomenon of the rainbow, seen only when drops of water fall to the earth in the form of rain. Besides these several classes of clouds, there are several secondary forms, known as the *cirro-stratus*, the *cirro-cumulus*, and the *cumulo-stratus*. These are modifications of the other forms.

**CLOUDBERRY**, a plant of the same genus as the dewberry, distributed more or less widely in America and Europe. It grows to a height of eight or ten inches, has few leaves, bears large white flowers, and produces an orange-red fruit with an agreeable flavor and about the size of a dewberry. It is confined chiefly to the moors of Great Britain and the central part of Europe, but is very abundant in Sweden and Norway, where it is highly valued in making preserves.

**CLOUD-BURST**, the name applied to a very heavy local rain, chiefly when the rainfall exceeds the rate of ten inches per hour and not less than six inches fall during the unusually heavy precipitation. Cloud-bursts occur at rare intervals on the eastern slope of the Appalachian Mountains, especially in the region lying between Georgia and New York, where heavy floods follow excessive rains of a local character. They occur more or less frequently on the coast of Washington and British Columbia, in the valley of the Amazon, and on the southwestern coast of Chile. It must be noted that there is a difference between a heavy rain and a cloud-burst, since the former covers a reason-



ably large area while the latter is confined to a small area, usually a few acres, and is thought to be due to thunderstorms or to the fact that rapidly ascending currents hold a mass of water within the cloud for a brief time, after which it falls suddenly to the earth. Cloud-bursts on the eastern slope of the Rocky Mountains are accompanied by heavy thunderstorms and fill the dry channels with large quantities of water, causing destructive mountain torrents to sweep across the valleys below.

**CLOVER** (klō'vēr), or **Trefoil**, the name of various plants of the pea family and of the genus *Trefoilium*. There are no less than 150 species,

some of which are weeds, but many are valuable food of animals and serve a useful purpose in increasing the fertility of soil. The red clover is a biennial, consisting of several kinds. It is sown with oats, barley, or other grain in the fall or spring, and bears a full crop the succeeding year. The Dutch clover bears a white flower, is a perennial, and is sown with various grasses when intended as permanent pasture for sheep. The French clover ripens early, is an annual, and is useful in pasturage. Timothy, rye grass, and other



RED CLOVER.

species of grasses are sown with clover, being then cut for hay. Several species are useful in bee culture, their flowers being rich in food for the production of honey. Many of the poorer and exhausted lands may be redeemed and fertilized by clover sown with grains and plowed under when six to ten inches high. Alsike or Swedish clover has long been cultivated in the southern part of Sweden. It is recommended for cold climates and as suitable for cultivation in moist and heavy soil. It is similar in growth and structure to the red clover, and is cultivated extensively in North America and Europe. The red clover is the best for hay, while the

white clover, when mixed with grasses, serves the best purpose for pasturage. Caterpillars and burrowing quadrupeds are common enemies to clover. They destroy it either by eating the foliage or by damaging its roots.

**CLOVES** (klōvz), the unexpanded dried flowers of the clove tree, used as a pungent aromatic spice. The tree is of the myrtle family and attains a height of from fifteen to thirty-five feet, being an evergreen with leaves from three to five inches long. Its flowers are of a purple color. The value of cloves is due to the oil of cloves, which constitutes about one-sixth of the whole weight. It has an acrid taste and a characteristic odor. It is used as a medicine, especially as a stomachic and to stimulate the appetite, and in cookery is prized for flavoring dessert dishes. The tree was first discovered by the Dutch in the Moluccas, but is now cultivated in India, Zanzibar, Ceylon, and the West Indies.

**CLUB**, an association of persons combined for the promotion of a common object, whether social, political, or otherwise. The name probably comes from knot, meaning a knot or gathering of persons. The earliest club of London was organized in the beginning of the 17th century, at Mermaid Tavern, on Friday Street. It numbered among its distinguished members William Shakespeare, Sir Walter Raleigh, Fletcher, Beaumont, and Sheldon. Ben Jonson was a prominent figure at the club that met near Temple Bar. The Literary Club, established in 1760, numbered among its members Burke, Goldsmith, Boswell, and Johnson. Clubs and kindred associations are maintained at present in all the countries, especially in those of Europe and America, and the larger organizations are centered in the cities.

The club life of America has been greatly enlarged within the past twenty years. Every large city has one or more important buildings erected especially as the quarters of some prominent club, such as the Illinois Club of Chicago, the Metropolitan Club of New York, and the Hunt Club, Cote des Neiges, of Montreal. Clubs of this class usually have reading rooms, apartments for bathing and playing various games, and rooms designed for meetings of a business nature. Many men's clubs admit women as visitors, but a large number of clubs are maintained distinctly for women.

Women's clubs are numerous in all the cities of Canada and the United States, and interest themselves in religious, professional, temperance, suffrage, social, educational, and other lines of study. In some of the larger cities these clubs maintain reading rooms and excellent



libraries. It has been observed that the clubs of both men and women serve a useful purpose in modern civilization. They are aiding materially in philanthropic and educational lines, and thereby tending toward a betterment of humanity.

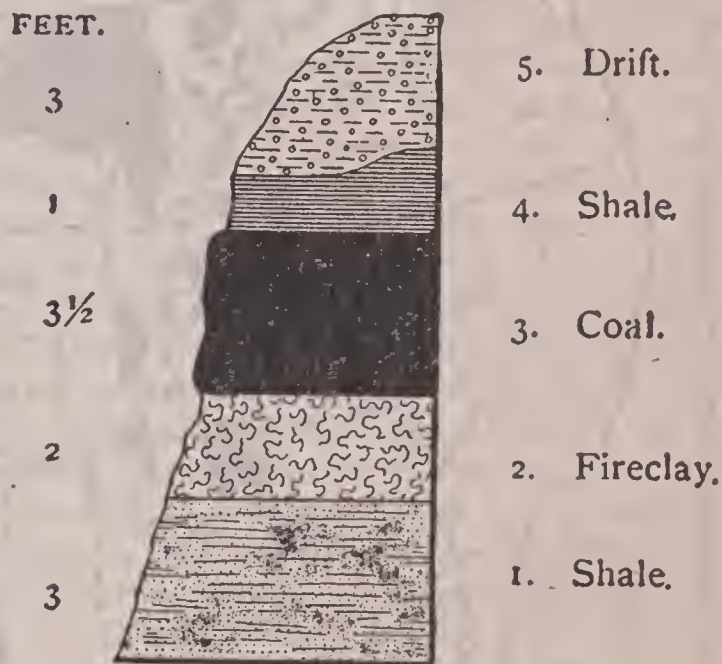
**CLUNY** (klü-nê), or **Clugny**, a town of France, in the department of Saône-et-Loire, twelve miles northwest of Maçon. It is situated on the Grône River, in a valley between two mountains, and has extensive manufactures of pottery. Cluny is noted chiefly for its history in connection with a number of monasteries. It was a small village until 910, when an order of the Benedictine monks was founded here, and it had fully 2,000 monastic communities prior to the French Revolution. They were known as the Monks of Cluny, or the Congregation of Cluniac Monks, and had establishments in France, Spain, England, Italy, and other countries of Europe. The Abbey church at Cluny, one of the finest monuments of the Middle Ages, was destroyed in 1789.

**CLYDE** (klid), a river of Scotland, flowing westward a distance of 106 miles. A number of important cities are on its banks, including Glasgow, Bothwell, and Lanark. Near Lanark are four famous falls. The river has been deepened and made available for steamboats; the first large steamboat launched in Europe was on the Clyde in 1812. Near the mouth it widens into the Firth of Clyde. The basin drained by it contains rich mineral deposits and fertile soil, and the manufacturing centers upon its banks are among the most important in Scotland.

**COACH**, a four-wheeled closed carriage for private or public conveyance. In ancient Rome they were constructed in the form of both covered and uncovered carriages and constituted the chief means of conveying passengers. At present these vehicles are built largely for four passengers in the inside, and in some countries contain arrangements for ten or twelve on the outside. In the early history of America, especially before the Revolution, regular lines of coaches and stages were maintained to convey passengers and goods between the largest cities. Transportation of this kind is still available in the sparsely settled regions of the western part of the United States and the northern and western sections of Canada. However, coach conveyance has been largely superseded by railways, automobiles, and street cars. See **Carriage**.

**COAL**, a carbonaceous mineral of a black, shiny, or dull color, and used extensively for fuel. It is composed of about seventy-five per cent. of carbon and contains hydrogen, oxygen,

a small per cent. of nitrogen, and small quantities of earthy impurities. It is formed of compressed and chemically changed vegetable matter derived from luxuriant growths during former geological ages. The stems, leaves, and spores of jungle growths accumulated, and hydrogen and oxygen were evolved with some of the carbon. The volume was reduced so as to form about one-ninth to one-eighteenth of its original bulk, the relative proportion of carbon was increased in the mass, and eventually the whole was solidified into a decomposed vegetable pulp very much like peat. The constituents in every hundred parts of dry vegetable matter were about forty-nine per cent. of carbon, six per cent. of hydrogen, and forty-five per cent. of oxygen. In decomposition, which occurred under water, it retained most of the



COAL STRATUM.

carbon, together with parts of the hydrogen and oxygen.

The different kinds of mineral coal are divided by Dana into *anthracite*, *bituminous coal*, *cannel coal*, *lignite coal*, *earthy brown coal*, and *mineral charcoal*. Anthracite, bituminous, lignite, and cannel coal are the kinds marketed most extensively. Anthracite coal contains about ninety per cent. of carbon, burns with little flame, and is much used in kilns, furnaces, and by blacksmiths. Bituminous coal has more or less bituminous matter and is commonly used for fuel in heating and in engines. Cannel coal has an earthy appearance, burns with a bright flame, and is used extensively in gas making. The lignite or brown coal contains only about fifty per cent. of carbon and is not used extensively for manufacturing purposes. However, it is a valuable fuel in sections where other grades of coal are not found, as in North Dakota and some sections of Saskatchewan, and



burns easily when an extra draft of air is admitted to the stove.

In many of the coal fields there are from one to four veins, with a thickness of from two to fifty feet. It is not often that all the veins are workable, nor are all of them of equal value. Many deposits consist of drifts, or pockets, and others are in great veins and underlie large tracts of country. The formations common to the coal fields, including both the coal and the intervening rocks, are known as the *coal measures*. The methods of mining differ with the thickness of the veins, the class of coal, and the character of the roof, or rocky formation covering the deposits. In many localities the vein crops out at the hillsides and the coal

extensively by all civilized people, and is found widely distributed in all the continents. The United States, Great Britain, Germany, Austria-Hungary, and Russia are among the greatest coal-producing countries in the world. Coal deposits are found in thirty-five of the states and territories of the Union, and the products in twenty-nine have reached commercial quantities. Pennsylvania, West Virginia, Illinois, Ohio, Alabama, Indiana, and Colorado, are the leading coal-producing states. The annual production of the United States aggregates about 360,500,000 tons, valued at about \$390,500,000. Besides, the deposits of the colonial possessions, particularly those of the Philippine Islands, are known to be of great extent. Canada has ex-



COAL AREAS OF THE UNITED STATES.

(The black are bituminous and anthracite and the shaded are lignite.)

may be easily secured, while in others shafts are sunk several hundred feet and the coal is hoisted by means of steam or electric power. The output of bituminous coal greatly exceeds all others, but the anthracite is the most valuable and is regarded the best for many purposes.

Coal was not known to the early ancients. It appears to have been used in 852 A. D. in England, but was not known to the Britons before the Roman invasion. For a long time it was thought to be injurious to health, and a common prejudice prevented its entering largely into a fuel material in the avenues of manufacture and household economy. It is now used

tensive deposits of coal and has an annual output of about 15,000,000 tons. The deposits are chiefly in British Columbia, Nova Scotia, New Brunswick, and Alberta.

**COAL TAR**, or **Gas Tar**, a product obtained in the manufacture of illuminating gas from tar. It is a dark-colored, opaque liquid, is somewhat heavier than water, and has a disagreeable odor. Coal tar is made up of many compounds, including anthracene, benzene, creosote, ammonia, xylene, naphtha, and carbolic acid. It is used in making several kinds of dyes and aniline colors and in the manufacture of alizarin and salicylic acid. Coal tar formerly was considered a waste material, but it now



constitutes the source of many substances valuable in science and the industries. It is used as it comes from the factory as a substitute for paint in coating shingled roofs and to protect wood from rotting, especially such as posts and the portions of telegraph poles put in the ground.

**COASTAL PLAIN** (kōst'al), the name generally applied to the lowlands bordering on the sea. The most noted region of this character in North America stretches from New York Bay, along the Atlantic Ocean, to the Gulf of Mexico, in Florida, whence it extends along the northern and western coasts of that body of water to the state of Vera Cruz in Mexico. It varies in width from 20 to 200 miles, but extends inland considerably farther along the streams, especially in the Mississippi Valley, where it penetrates north to the mouth of the Ohio River. A rise known as the Fall Line marks the eastern boundary of the Atlantic coastal plain, due to the upheaval of rocks near the foothills of mountains, and in many places the streams pass over precipices and form cataracts, such as those in the James River at Richmond, Va., and in the Potomac at Washington, D. C., below which cities these streams are navigable. The formations of the coastal plain include those deposited during the Pleistocene, Neocene, Eocene, and Cretaceous periods, and retain their position quite like that acquired during deposition, but are more elevated than originally on account of being uplifted above the ocean.

**COASTING**, an outdoor pastime originated in Russia, and next to skating one of the most popular winter sports in the colder parts of the temperate regions. It consists of sliding by means of a sled down an inclined grade or bank covered with snow or ice. The sleds are made in a variety of forms, frequently of a framework of iron or of solid board. In the former the runner is wholly of iron and extends forward and upward in a curve, while wooden runners are usually shod with steel. Coasters may either sit or kneel in making the trip, or may lie so as to steer with one leg. Coasting may take place on a hillside or on an artificial embankment or grade, though places used for public traffic cannot be used for this purpose. See **Toboggan**.

**COAST RANGE**, a range of mountains in California, extending from the northern to the southern part of the State, and trending parallel to the coast. At the southern extremity are San Bernardino Mountain, 11,580 feet above the sea, and San Jacinto Mountain, 10,987. The range is about forty miles wide, is rich in min-

erals, and contains some beautiful and fertile valleys, among them the Santa Clara, Los Angeles, and Sonoma valleys. An extension of this range penetrates northward through Oregon, Washington, and British Columbia, where it merges into the Cascades on the east and the Island Range on the west. Most of the mountains belonging to the Coast Range are steep and rocky, but the region has fine forests and several passes penetrate the system.

**COAST SURVEY**, a survey of the coast of the United States, first recommended by President Jefferson in 1807. By an act of Congress the President was authorized to cause the coast to be accurately surveyed and a chart of each part to be prepared for future reference. The work was not commenced until 1817, when E. R. Hassler, a German of Switzerland, was secured to begin the surveying and mapping. Owing to a want of suitable appropriations, the work was not prosecuted with much success until 1832, when Professor Hassler was authorized to employ astronomers to carry forward the enterprise with vigor. He remained in the work until his death, in 1843, when he was superseded by A. D. Bache, who continued to superintend operations until his death in 1867.

Since 1867 the coast and geodetic survey has been promoted without intermission under competent superintendence. It is now a bureau under the Department of Commerce and Labor. The coast lines of the United States, exclusive of Alaska, reach a total of 7,050 miles, and, including the numerous indentations of bays and gulfs, aggregate a total length of 29,350 miles. The coast survey has for its object to determine the position of various points along the coast by accurate methods, to secure a definite knowledge of the coast line and features of the land, to survey the channels and shoals near the shore, and to note the effects of currents, tides, and winds upon navigation and the bottom of the sea. The work is one of vast importance to navigation and commerce, and by means of it many advantages have been obtained for the American shipping enterprises. Besides saving many lives, it has been the means of shortening routes, avoiding dangers, and making travel by water much more efficient and profitable.

**COATESVILLE** (kōts'vil), a borough of Pennsylvania, in Chester County, forty miles west of Philadelphia, on the Pennsylvania and the Philadelphia and Reading railroads. It is located on Brandywine Creek, is surrounded by a fertile country, and has a large trade in produce and merchandise. The manufactures include silk and woolen goods, ironware, boilers,



and hardware. The waterworks are owned and operated by the municipality. Coatesville was settled about 1800 and has been incorporated since 1867. Population, 1900, 5,721.

**COATI** (kō-ä'tê), or **Coati-Mondi**, a genus of carnivorous animals native to the tropical regions of South America and Mexico. The *Mexican coati* has a brownish-gray color and is found from Panama to southern Mexico, while the *red coati* is native to the northern part of South America. Both are closely allied to the raccoon and have an elongated snout, which is used in rooting up the earth when in search of worms and insects. The tail is long, covered with hair, and usually held erect. These animals have coarse hair, are about three



MEXICAN COATI.

feet in length, and easily climb the limbs of trees, where they lie quietly most of the day, but come out at night in search of food.

**COBALT** (kō'bölt), a metal used to form compounds of commercial importance. It is brittle and compact, may be easily reduced to powder, and has a greenish-white or a steel-gray color. Cobalt is not found in a pure state, except in meteorites, but occurs with lead, iron, and other minerals. It is found extensively in Saxony and other parts of Germany. The most important American productions come from Mine la Motte, Missouri. Cobalt, when heated with alumina, yields a pigment known as *cobalt blue* or *cobalt ultramarine*. The oxide of cobalt is used by enamelers and to produce a fine blue glaze on porcelain.

**COBLENZ** (kō'blents), or **Koblentz**, a fortified city of Rhenish Prussia, at the junction of the Rhine and Moselle rivers. It is one of the

most securely fortified cities of Germany, the castle of Ehrenbreitstein being one of the strongest points. The fortifications can accommodate an army of 100,000 men. They contain magazines capable of holding provisions sufficient to support 8,000 men for ten years, and have reservoirs sufficient for supplying water for three years. Coblenz was fortified as a bulwark of defense against France. The city has several fine schools, pavements, electric lights, and rapid transit. Among the principal buildings are the Church of Saint Castor, founded in 836, the old Jesuit College, the public market, and the town hall. It has a considerable trade in corn, mineral water, and wine. The manufactures include clothing, furniture, machinery, cigars, and Japan ware. Coblenz was the capital of the department of Rhine-Moselle under the French in 1798 and became a part of Prussia in 1815. Population, 1905, 53,897.

**COBOURG** (kō'bûrg), a city of Ontario, capital of Northumberland County, sixty-eight miles northeast of Toronto. It is located on Lake Ontario, on the Grand Trunk Railway, has a commodious harbor, and is important as a port of entry. The manufactures include woolen goods, clothing, machinery, and spirituous liquors. It is the seat of a college and several fine schools and churches. The public utilities include electric lighting, waterworks, and a number of well-improved streets. Population, 1900, 4,239.

**COBRA DE CAPELLO** (kō'brá dâ kâ-pêl'lô), the Portuguese name of a poisonous snake of India, meaning hooded snake. It is allied to the cobra or asp found in Northern Africa. The color is pale yellow or brownish-yellow with a tinge of bluish-white beneath. The head is broad and at its rear has nine plates, and the neck may be expanded to cover the head like a hood. It is sometimes called the *spectacled snake*, owing to the appearance of a pair of barnacles on the neck that resemble spectacles, when the neck is expanded. It is from four to six feet long, is sluggish in habits, and is easily killed. Its food consists of lizards, eggs, frogs, birds and small reptiles. It is an excellent swimmer and delights to invade the water in search of food. The bite is exceedingly poisonous, recovery from it being rare and death often resulting instantly or within a few hours. It is estimated that several thousand natives of India die from the bite of this snake annually. The poison is secreted in a gland located in the head of the serpent, and flows through a cavity of the tooth into the wound when the animal compresses its mouth upon any object. The government pays a bounty on the cobra head in



order to extinguish it, but it is held sacred by some of the Hindu people, and is protected by them as a being that has power to injure. Indian jugglers charm the snake and have it



COBRA DE CAPELLO.

serve their purpose in giving exhibitions. The animal may be taught to perform by music and keep time by swinging its head and body to the delight of spectators.

**COBURG** (kō'bōōrg), capital of the duchy of Saxe-Coburg-Gotha, Germany, on the Itz River, a tributary of the Main. It is noted for its palace of the Duke of Saxe-Coburg-Gotha and the ancient castle of the dukes of Coburg. In this castle Luther occupied apartments for some time, his bedstead and pulpit still being objects of interest. The public library has 60,000 volumes. It has manufactures of clothing, woolen and linen fabrics, and porcelain. The public utilities include electric street railways, a public park, and waterworks. Coburg was made the capital of Saxe-Coburg in 1735. Population, 1905, 22,488.

**COCA** (kō'kā), a shrub native to Peru. It attains a height of eight feet. In the Andes it is cultivated at an altitude ranging between 2,500 and 5,000 feet. The leaves are dried and mixed with powdered chalk and are chewed as a stimulant much like tobacco. Coca leaves contain an alkaloid *cocaine* and a waxy substance called *coca wax*. The habit of using it is as obnoxious among the Peruvians as the use of opium is among the Chinese.

**COCAINE** (kō'kā-īn), an alkaloid obtained from the leaves of the coca plant. The leaves

of the plant are green, about two inches long, and the alkaloid is extracted by alcohol and a small quantity of sulphuric acid. It is a colorless, transparent drug, has a bitter taste, and is odorless. The drug is soluble in ether, and is used as a local anaesthetic. It is valuable as such in operations on the eye, ear, and other delicate organs of the body. When taken internally, it is a powerful nerve stimulant, and, if used persistently, causes nervousness and later insanity. Cocaine was first made in Peru in 1885, and vast quantities are now exported from that country and Bolivia to the United States and Europe.

**COCCULUS INDICUS** (kōk'kū-lūs īn'dī-kūs), the fruit of a climbing plant native to the East Indies. It is about the size of a pea, has a dry exterior coat, and somewhat resembles the bayberry, but is very poisonous. The bitter principle, known as *picrotoxin*, when taken internally in poisonous doses, acts much like strychnine. It is used to destroy lice and the ringworm and for various purposes in medicine. The seeds are sometimes called *fishberries* from the circumstance that they stupefy fish. They are used to some extent by fishermen, who cast them into the water for the purpose of stupefying the fish so they may be easily caught by hand or in a small net.

**COCCUS** (kōk'kūs), a group of insects which include the bark lice, mealy bugs, scalelike insects, and a number of others. The species are very numerous and differ greatly in appearance, but in most of them the female is wingless and the male has a single pair of wings. They attach themselves to plants by inserting their beak, with which they suck the sap, hence are very injurious to hothouse and garden plants. These insects include those from which cochineal, gum lac, and kermes are obtained.

**COCHABAMBA** (kō-chā-bām'bà), a city of Bolivia, capital of the department of Cochabamba, on the Rio de la Rocha. It is located in a fertile valley, has wide and regular streets, and has considerable trade in produce and merchandise. The manufactures include soap, leather, earthenware, and cotton and woolen goods. Among the chief buildings are a theater, two hospitals, several churches, and the government building. The city was founded in 1563. Population, 1906, 30,175.

**COCHIN** (kō-chēn'), a city of British India, a seaport in the district of Malabar, eighty miles southeast of Calicut. It is important for its large foreign and interior trade, has transportation facilities by railroads and steamship lines, and is the seat of extensive shipyards. Many classes of Asiatics and Europeans make up the



inhabitants, who carry on a large trade in oil, cocoa, teak wood, and merchandise. Cochin was visited by the Portuguese under Vasco da Gama in 1503, but the Dutch captured it in 1662, when it was made a great emporium of trade. It has been a British possession since 1796. Population, 1906, 18,250.

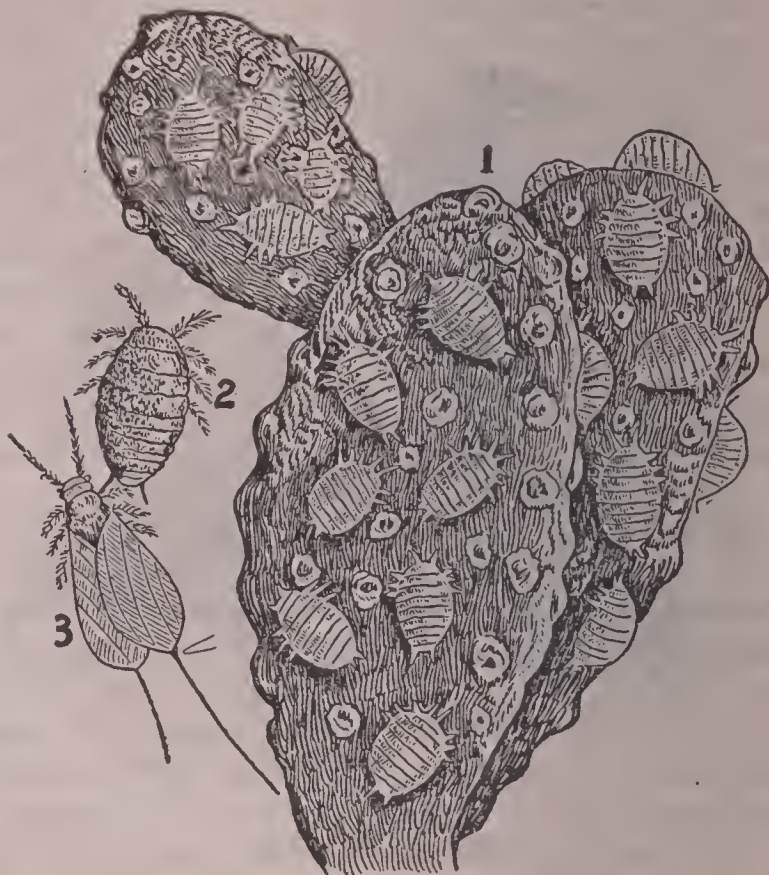
**COCHIN CHINA** (kō'chīn chī'nà), the name applied to the French colony in the southern extremity of the eastern portion of the Indo-Chinese peninsula. The designation is loosely attached to the former empire of Anam, which included three distinct regions: Lower Cochin China, Upper Cochin China, and Tonquin. Lower Cochin China is now the French colony of Cochin China. Upper Cochin China is the French protectorate known as Anam, and the remainder lying to the north is called Tonquin. These and Cambodia constitute the present French possessions in Southeastern Asia.

Cochin China occupies the southeastern extremity of the Indo-Chinese peninsula, and includes a small part of the territory embraced within the former empire of Anam. The area is 23,182 square miles. It is bounded on the northeast by the region included in Anam, northwest by Cambodia, south and east by the China Sea, and west by the Gulf of Siam. It now has a number of railroads and is extensively connected by telephone and telegraph lines, and many of its cities are in a growing condition. The chief products consist of rice, cotton, hides, domestic animals, fish, pepper, and tropical fruits. The French government has established free schools and erected a number of public buildings. There is a French army of about 2,000 soldiers, besides about that number of Anamese troops. The Mekong River furnishes an avenue for interior navigation. A number of the seaport cities have a large foreign and interior commerce.

The region was conquered with Anam by China in 214 B. C., and became independent as a part of Anam in 929 A. D., and in the early part of the 15th century was successful in a war against China. In 1517 it was made a part of the Portuguese possessions. Later it was conquered by the Dutch, and in 1789 became tributary to France. The population is 2,976,521, of which 5,000 are French settlers and traders.

**COCHINEAL** (kōch'ī-nēl), an insect found native on the cactus plants of Mexico and Central America. It has been naturalized in the warmer portions of Eurasia and Africa. The value of the insect consists of its importance in preparing *cochineal*, an article used in producing scarlet colors and in making carmine and lake. However, the commercial product is obtained

only from the females, which outnumber the males in the proportion of about 150 to one male. Each of the females lays about 1,000 eggs, and the crops are picked in the period from December until May. The insects are brushed off the



1, Cochineal insects on cactus; 2, Female; 3, Male.

plants and killed by the heat of the sun or in an oven. A single pound of cochineal contains about 70,000 of the insects. The value of these insects was first discovered by the Spanish in 1518.

**COCKATOO** (kōk-à-tōō'), the name applied to a genus of birds of the parrot family. They have a large head crowned by a tuft of long and pointed feathers. The bill is strong and curved from the base, and the plumage is bright, commonly white in color, but sometimes mixed with red, blue, and yellow. The name was given to these birds on account of their peculiar utterance, screamed out harshly. They are able to acquire a few words, but are not possessed of much imitative power. The chief food consists of fruits, seeds, and small insects. Australia and the Eastern Archipelago are well populated with these birds, where they live in large tribes and may be easily domesticated. See illustration on following page.

**COCKCHAFER** (kōk'chā-fēr), a class of beetles widely distributed in Europe and North America. The larvae live from two to five years in meadows and pastures, where they burrow in the soil and feed on the roots of the grass. In the adult state they are about an inch long and live only a few days, hence they do little damage to the leaves of trees upon which they feed.



This class of insects is known in England as *May bugs* and in America as *June bugs*, since they come out of the ground in May or June. In some seasons they occur in great numbers,



AUSTRALIAN COCKATOO.

though usually they are not regarded as a pest, except in some meadows and strawberry patches.

**COCKLE** (kōk'k'l), a common name for several species of bivalve mollusks. They are found in the sandy shores of the sea, have a heart-shaped form, and are much used as food. The cockle is nearly equivalvular, with a hinge fastening the two parts.

**COCKLEBUR** (kōk'k'l-bûr), or **Clotbur**, the name of several species of troublesome weeds found in most of the continents, especially in the Temperate zones. One species, the *xanthium canadense*, is native to North America, and two other species were introduced from Europe. The species known as *xanthium strumarium* is particularly troublesome in the fields of Southern Canada and most sections of the United States. The plant is branching, has coarse heart-shaped leaves, and grows to a height of from one to four feet. It is an annual plant and produces burs about an inch long covered with stout prickles. The burs have two cells and retain their vitality a number of years, hence it is difficult to rid fields of them, except by seeding the ground in timothy and clover, or some other perennial grasses, thus preventing

the plants from seeding. Cockleburs are injurious to the wool industry as the burs fasten themselves in the wool, hence stringent laws are in force in the south of Africa and other continents to eradicate the obnoxious weed.

**COCK OF THE ROCK**, a bird found in the northern part of South America. It is about the size of a large pigeon, has orange colored plumage, and the head is crowned by a beautiful flattened crest. These birds are so named from their habit of building nests on rocks near rocky watercourses and on bushy hillsides. The males court the females by assembling in cleared places, where they display their plumage until chosen as a mate by some observant female. The skins are valued for millinery purposes and command a high price in the market.

**COCKROACH** (kōk'rōch), a genus of insects belonging to the order having straight wings. The Oriental or proper cockroach is thought to have come originally from India, but is now found widely distributed. In the male the wings are half the length of the body when mature, while in the female they are but rudimentary. The body is oval, elongated, and has a well-marked smoothness on its upper surface. The eggs remain in the abdomen of the female for six or eight days, when they are attached to some solid body by means of a gummy fluid secreted by glands. Several species of cockroaches in America are widely distributed, some of which attain a length of from two to three inches. The *Croton bug*, so named from the Croton Aqueduct of New York, has followed man to all parts of the globe and is confined chiefly to the larger cities. Cockroaches are nocturnal in habit, have a ravenous appetite, and leave an unpleasant scent on food that they are unable to devour.

**COCOA** (kō'kō), or **Cacao**, one of the best known and most prized of the palm trees. It is found on the coasts of islands and continents having a warm climate, and is common to the West Indies, South America, India, and the East Indies. The tree thrives best near the seacoast, but rare ones are found at an elevation of 2,500 feet above the sea. It attains a height of from sixty to ninety feet. The trunk is slender and is marked by scars when the leaves have fallen off, these constituting transverse rings. In most cocoa trees the rings serve as a means of ascending the trees to secure the fruit, and are used for that purpose by the natives. The leaves grow in the form of a bunch or tuft at the top, are from twelve to fifteen in number, and are of gigantic size. About eighty to one hundred nuts are produced on an average tree. They are used for various purposes in the pro-



duction of food and other articles valuable in commerce. The terminal bud is considered a delicate food. The leaves are used for baskets, buckets, and thatched dwellings. In a number of localities fences are made of them, and they also serve as a substitute for writing paper. The



COCOA. TREE AND FRUIT.

midribs of the leaves are used for oars, while their ashes yield potash, and a portion is used in cradles and in the manufacture of clothes. The stem of the leaves serves in making drums and in constructing huts and furniture. The roots yield medicines and serve the natives as a chewing substance. Chocolate is a product from the cocoa and is formed as cakes, after the fatty substances have been removed and sugar, spices, and other ingredients are added.

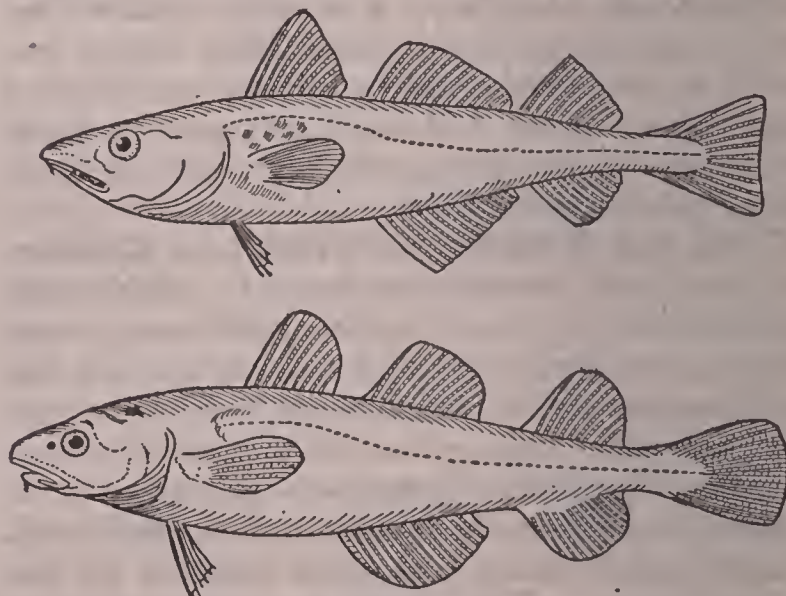
**COCOANUT**, the fruit of the cocoa palm growing in tropical countries. It is from three to eight inches in length, covered with a fibrous husk, and contains a fleshy kernel. It is an agreeable article of food and is used for various purposes in manufacture. The interior of the nut is of a whitish color and contains a milkish white fluid. In some regions large quantities are dried before the oil is expressed, when the product of the kernel is known as *copra*. The fibrous covering is used in the manufacture of yarn, matting, and cordage, and is known as *coir*. Cups and vessels are made from the hard shell of the nuts, which, when polished, serve a useful purpose. The wood of the tree is used in the construction of houses and for other building purposes. The tree yields a sweetish liquid called *toddy*, which, when distilled, forms a spirit called *arrack*. A sugar is obtained from the juice known as *jaggery*. The nut produces

the *cocoa butter*. This butter is used as a substitute for creamery butter, and is sometimes mixed with butter and colored with a butter coloring. It is usually yellowish white and has a weak chocolate odor and an agreeable taste. It does not become rancid when kept.

**COCOON** (kō-kōon'), the outer covering of silky fibers or hair with which the pupae of many insects are protected. This silky fiber is formed in some insects, as in caterpillars, some varieties of spiders, and silkworms. The cocoon gathered from silkworms is the article from which silk is manufactured.

**COD**, the name of a cape and bay in the eastern part of Massachusetts. They were so named from the large number of codfish that abound in and near the bay. See **Cape Cod**.

**COD**, a valuable food fish abundant in the waters off Newfoundland and throughout the temperate seas of Eurasia and America. There are several well-defined species, all belonging to the soft-finned fishes. They feed mostly in water about twenty-five to sixty fathoms deep, and weigh as much as a hundred pounds. They spawn from January to May, at which season great numbers crowd together. In two years the young fish become marketable and reach maturity at the end of three years, when they weigh about sixty pounds. The best months for cod fishing are October, November, and December. The codfish is a good biter at almost any kind of bait and ordinarily feeds on worms, mollusks, and small fishes. It is a valuable fish for food, while isinglass is made of its bladder and cod-

COMMON COD.  
TOM COD.

liver oil from its liver. Cod-liver oil was recommended as early as 1833 for diseases of the lungs and in cases of chronic rheumatism. Codfish are caught mostly with hooks and lines, one man being able to catch from 300 to 500 in a day. However, most of the fishing is done by



the aid of schooners, from which the fishermen put out long lines called *trawls*, and to these are attached shorter baited lines. The fish are taken off the lines from time to time and are immediately dressed and salted. Some of the best cod fisheries are adjacent to Newfoundland and off the coast of Norway.

**CODE NAPOLÉON**, the laws of France promulgated between 1804 and 1810, which are contained in the so-called Five Codes. The laws of France were greatly diversified at the time of the Revolution and a general or national code was demanded by the people. Napoleon promulgated the first code, generally known as the "Civil Code of France," to which additions were made subsequently, and the title was changed to Code Napoléon in 1807. Few new laws were introduced, but those in existence were codified and edited so as to present simple and clear statements. It may be said that the Code Napoléon harmonized the customary laws of the German provinces in the north with the laws of southern France. The rapid rise of French power caused these laws to be adopted in many countries of Europe before 1814, and many of them are still in force in Belgium, Italy, and Holland. The code of Louisiana and those of a number of republics in Central and South America are based upon the Code Napoléon.

**CODEX** (kō'děks), the name applied to the wooden tablets coated with wax and used for writing by the ancients. Subsequently the name was applied to all large manuscripts, as the works of the poets and historians, and under the emperors of Rome it designated collections of civil and ecclesiastical laws. The oldest and most celebrated collections of civil laws are those known as the "Codex Theodosianus" and "Codex Justinianus." In more recent times the term came to be applied more generally to the ecclesiastical writings, such as the "Codex Alexandrinus," which is written on parchment and contain the entire Greek Bible, except the books of Matthew, John, and II. Corinthians. In this work the Old Testament is in the Septuagint version. The "Codex Rescriptus" is an ancient parchment on which the original writing has been defaced and upon which a different composition has been copied. A parchment of this kind is now called a palimpsest. See **Palimpsest**.

**COD-LIVER OIL**, a fixed oil obtained from the livers of the cod, ling, torsk, and other related species of fish. The adipose tissue of these fish is confined almost entirely to the liver, from which it is obtained by heat or by pressure in a cold state. Formerly the fishermen put the livers in barrels, where they were kept

from one to four months, during which time they underwent putrefaction and the oil would rise to the top and be drawn off into vessels. The oil is now obtained in a much cleaner way by simply heating the fresh livers for two or three hours, after which the oil is pressed out. Cod-liver oil has a pale yellow color and is a better food than any other oil. It is easily digested and is valuable as a food in consumption and other wasting diseases. The taste is very disagreeable, hence it is administered in various ways, frequently in capsules. A preparation known as *emulsion* has a milky appearance and is made by mixing a number of remedies with cod-liver oil, usually such as chloroform, elixir of saccharin, malt extract, alcohol, oil of bitter almonds, sodium bicarbonate, etc. A tablespoonful taken three times a day is a common dose of the pure oil.

**COEDUCATION** (kō-ěd-ŭ-kā'shŭn), the association of males and females for instruction in the same institution, school, or class, each receiving the same training and culture. This system prevails generally in the elementary public schools of the United States, being the most convenient and economical, except in a few large cities, such as New York and Boston. This practice appears to receive, not only the tolerant assent of parents as a necessity, but unqualified approval is given in most cases on the ground that it is the best to be adopted. However, nearly half the private elementary schools have separate instruction and courses of study for boys and girls, and in 1908 about eight per cent. of the pupils receiving elementary instruction attended such schools.

Those who oppose coeducation give a number of reasons in support of their views. Among these is the chief one that mixed schools do not provide instruction and discipline quite as well fitted to the peculiarities of the sexes. They think that the manners of the girls are influenced unfavorably by the coarser conduct of the boys, and that on the other hand the boys receive little or no benefit from the presence of the girls. Some think that there is a liability of influencing unfavorably the moral character of each, which is guarded against by preventing the constant presence and intermixing of the sexes in the classes and on the playground. Those who favor coeducation, on the other hand, think that the presence of the girls tends to improve discipline and stimulate self-respect and politeness. It is held by this class that both instruction and one-sided training is prevented, and that interest will center in such studies as mathematics as well as literature and poetry when both sexes meet in recitation work. So



far as moral tendencies are concerned they think daily association of the sexes is healthful and provides a general uplift and induces a tendency toward the practice of the good rather than toward the more base.

It must be observed that coeducation is gaining ground steadily in America as well as in the more progressive countries of Europe. This is true particularly of England and Germany, though the gymnasiums and *realschulen* of Germany are with few exceptions for boys exclusively. The last few years a struggle of women for admission to the universities of Germany has been going on, and resistance has not only given way to a considerable extent, but many advocate coeducation who formerly opposed it, being satisfied by a practical test that coeducation has many advantages. In England and Scotland women are admitted to nearly all the universities, though exception is made in some to their admission where law and medicine are studied, while in Australia women are not only admitted as students, but are given places as lecturers and professors, and wider privileges have been extended in Austria and Russia. All the universities of Switzerland are open to women on the same terms as to men. In 1908 there were 5,450 coeducational high schools in the United States out of a total of 5,500, while the private secondary schools, which number 1,960, included 325 for boys and 550 for girls, while 1,085 were coeducational. Practically the same proportion of coeducational schools are maintained in Canada.

In speaking of separate schools for the sexes Jean Richter said: "To insure modesty, I would advise the education of the sexes together; for two boys will preserve twelve girls, or two girls twelve boys, innocent, amidst winks, jokes, and improprieties, merely by that instinctive sense which is the forerunner of natural modesty. But I will guarantee nothing in a school where girls are alone together and still less where boys are." Dr. Clark, in his work entitled "Sex and Education," says: "Boys must study in a boy's way, and girls in a girl's way. Appropriate education of the two sexes carried as far as possible is a consummation most devoutly to be desired; identical education of the two sexes is a crime before God and humanity, that physiology protests against, and that experience weeps over." President Fairchild, of Oberlin, said: "During my experience as professor—twenty-seven years in all—I have never observed any difference in the sexes as to performance in recitation." James Burrill Angell, president of the university of Michigan, said: "We have not had the slightest embarrassment

from the reception of women. They have done their work admirably, and, apparently, with no peril to their health." In speaking on this subject, Caroline Wells no doubt expressed the correct view in saying: "Education is to be adapted neither to boys nor to girls, but to individuals. The mother, or the teacher, has learned little who attempts to train any two children alike, whether as regards to the books they are to study, the time it is to take, the attitudes they are to assume, or the amusements they are to be allowed."

**COELENTERATA** (sě-lěn-tě-rā'tà), a branch of the animal kingdom, the next to the lowest of the types of Metazoa, which include the polyps and jellyfishes. The body cavity and circulatory system are not distinctly separate, but the food enters through the mouth into a system of chambers or tubes, which take the place of the body cavity and of the digestive system. These chambers serve as a stomach for digestion and as a circulatory system in conveying food to the different parts of the body. Around the mouth are grouped a number of tentacles, which serve as organs of touch and for taking hold upon food, and some of the species have a form of stinging cells that serve to stun or paralyze the food. Most of the coelenterates live in the sea, only a few inhabiting fresh water. The jellyfish is not regarded as a true member of this class of animal life and is a free-swimming organism, while the corals, hydroids, and sea anemones are fastened to some object during their natural life. The sponges, though classed with these animals, have no tentacles.

**COFFEE** (kǒf'fě), a genus of shrubs cultivated in warm climates, native to Abyssinia and Arabia. The coffee plant is now grown in the West Indies, Bermuda, and the tropical climates of America and other continents. About fifty species are grown for commercial purposes. Those producing the coffee seeds of the market attain a height of from fifteen to twenty feet in the native state, but they are treated usually so as not to exceed more than ten feet. In this way the production is increased largely, since the seeds grow mainly on the smaller and newer twigs. The seeds or beans are destitute of flavor in a raw state, but in roasting a peculiar brown oil, known as *caffeine*, is developed, and this gives to coffee its beautiful aroma. Caffeine is the most valuable constituent of coffee, and is identified closely with the alkaloid *theine* found in tea. It is found in roasted coffee in a proportion of about one per cent. Coffee is ground and made into a drink which constitutes one of the most wholesome beverages



known. It assists digestion, retards waste, and exhilarates the spirits. It is adulterated with chickory in a ground form, and is sometimes mixed with figs, malt, and raisins. The best way to avoid adulteration is to use only the coffee beans and grind them as the coffee is needed for household use.

Among the different kinds of coffee are *Mocha*, secured from the region of the Red Sea; *Java coffee*, *Jamaica coffee*, and the *Rio coffee* of South America. Coffee was entirely unknown to the ancient Greeks and Romans. The Dutch first brought the coffee plant to other lands and cultivated it. Seeds were brought to Java about 1690, and to Brazil and South American countries in 1774. The production is continually increasing. The world's

country which produces fruits and cereals. Coal, petroleum, natural gas, and potter's clay are obtained in the vicinity. The manufactures include flour, pottery, brick, machinery, and cigars. It has a number of fine schools and churches, gas and electric lighting plants, waterworks, and a public library. The first settlement in its vicinity was made in 1869 and it was incorporated two years later. Population, 1900, 4,953; in 1910, 12,687.

**COFFIN** (kōf'fīn), a box or chest in which a corpse is inclosed for burial. Coffins were used by the ancients mostly for the bodies of distinguished persons. They are mentioned in the Scriptures in relation to the embalmed body of Joseph. The Egyptians used wooden coffins and sometimes placed the bodies in caskets of stone and baked clay. The Romans and Greeks employed cedar wood in constructing coffins, and in later times the former practiced cremation, placing the ashes in urns. However, the Greeks placed many corpses in coffins made of a limestone known as *sarcophagus*, which absorbed the tissues of the body in a few weeks, and the name soon came to be applied to the coffin itself. The Christians introduced the extensive custom of burying in coffins. Those used in modern times are made of wood or metal.

**COGNAC** (kōn-yāk'), a town of France, in the department of Charente, twenty-five miles west of Angoulême. It is situated on the Charente River, has an old castle in which Francis I. was born, and is famous for the manufacture of Cognac brandy. The surrounding country is devoted largely to the cultivation of the vine. Among its improvements are electric lights, a public library, and extensive transportation facilities by railways. Population, 1906, 19,590.

**COHESION** (kō-hē'zhūn), the force by which molecules of the same kind or of the same body are held together. It is strong in solids, weak in liquids, and absent in gases. It varies with the nature of the bodies and with the arrangement of the molecules in the same body. Thus, the tempering of steel alters the molecular arrangement in that substance, with the effect also of altering its cohesion. The hardness, ductility, and tenacity arise from modification in the cohesion of substances. See **Adhesion**.

**COHOES** (kō-hōz'), a manufacturing city of New York, in Albany County, at the confluence of the Mohawk and Hudson rivers. It is on the Erie and Champlain canals and on the New York Central and the Delaware and Hudson railroads. The chief buildings include the public library, the high school, the Episcopal Saint John's Church, and the Roman Catholic Saint Bernard's church. It has iron foundries,



COFFEE PLANT.

A, Flower; B, Fruit Stock; C, Fruit; D, Section of Fruit.

annual output is about 1,550,000 tons, more than one-half of which is grown in Brazil. Other countries that are extensive growers of coffee include Mexico, India, the Dutch East Indies, Arabia, and Central America. The United States and Canada secure their supply principally from Brazil. According to recent authority, the consumption of coffee in Holland is twenty-three pounds per year for each person; Belgium, eleven; United States, ten; Germany, six; France, four; Great Britain, one.

**COFFEYVILLE**, a city of Kansas, in Montgomery County, 170 miles southwest of Kansas City, on the Santa Fé, the Missouri Pacific, and other railroads. It is nicely located on the Verdigris River and is surrounded by a fertile



machine shops, rolling mills, knitting mills, pin and needle factories, cotton mills, and furniture factories. Cohoes ranks as one of the leading manufacturing cities on the Hudson and has a large trade in produce and merchandise. Gas and electric lighting, pavements, waterworks, public parks, and rapid transit are among the improvements. It was settled by the Dutch about 1630 and was chartered as a city in 1870. Population, 1905, 24,183; in 1910, 24,709.

**COINAGE** (koin'āj), the process of making money of metal by stamping certain characters upon it, giving it a definite legal current value. Coinage was practiced early in history, the first mention of brass money being made by Homer in 1184 B. C. The Lydians coined money of gold and silver. The most ancient coins now extant were made in the 5th century B. C. In Rome metal money was made of brass previous to 269 B. C., at which time Fabius Pictor began to coin silver, and gold was coined in 206 B. C. The early coin money of Rome contained the heads of deities, or those statesmen and warriors who had been granted divine honors. Julius Caesar was the first living Roman whose portrait was placed on coins, and the example was soon followed by various rulers in other nations. Much of the coin money of ancient times was made of iron and brass, but gold and silver were used more or less by the richer nations.

In Great Britain the coinage is regulated by Parliament, although the prerogative of coining is vested in the crown. The coinage of Canada is regulated by the Dominion Parliament and is directly in charge of the deputy master and the superintendent of the royal mint. Silver is used for small change in Canada, and the coins are of the same denominations and have the same names as those of the United States. Although gold is coined extensively, it is rarely seen in circulation, practically the whole stock in the country being held by the government against the issue of legal tender notes and as reserves in the banks.

The first coinage laws of the United States went into effect in 1792. They provided a double standard, that of gold and silver, the latter of equal legal value, coined fifteen times greater in weight than the former. Since then various changes have been made, which are fully explained in other articles. The metric system is used to a certain extent in determining the weight of silver coins, and the monetary system is based on the most convenient scale of increase and decrease. Gold coins at the present time consist of double eagles, eagles, half eagles, three dollars, quarter eagle, and the dollar. The coins of three dollars and one dol-

lar are quite rare. The silver coins consist of dollar, half-dollar, quarter-dollar, and dime, or ten cent, pieces, while the minor coins of nickel and bronze include five-cent, three-cent, and one-cent pieces. See **Mint**.

**COIR** (kōir), the fiber of the cocoanut and other palms, used in the manufacture of ropes, mats, bags, cables, etc. The fiber is obtained from the husk and is divided into two classes, the outer or ordinary fiber and the inner or brush fiber. Mats are made largely of the ordinary fiber, which is the coarser and less durable, while the brush fiber is the finer product and is shipped in great quantities to the manufacturers, who use machinery in making cable yarn and yard matting. The waste or refuse of coir supplies the stuffing for mattresses and other commercial products.

**COKE** (kōk), an article of fuel obtained by heating coal in ovens, or other devices, where little air is admitted. It is often prepared in heaps, but generally in ovens built for the purpose. The heat is applied until the volatile constituents have been expelled; thus, the coke consists largely of impure forms of carbon and contains earthy matter and often some sulphur. It is brittle, hard, and porous, and floats in water until it becomes saturated, when it sinks. Coke produces an intense heat when burnt, gives off no smoke, and is useful for cooking purposes and in manufactures. It is valuable in separating metals from their ores and for refining and smelting. Coal coke is formed in the manufacture of coal gas, being a residue left after all the gas has been distilled. Coal yields from sixty to seventy per cent. of coke. Large quantities of coke are made in Pennsylvania, West Virginia, Germany, and England.

**COLBY COLLEGE** (kōl'bi), an educational institution founded at Waterville, Me., by the Baptists in 1813. It was first named Waterville College, but changed to Colby University, in honor of Gardener Colby, a philanthropist, by whose generosity the institution prospered greatly. In 1899 the name was changed to Colby College. It has departments for the education of both sexes. The library has 38,500 volumes. It has an attendance of about 275 students.

**COLCHESTER** (kōl'chēs-tēr), a river port of England, in Essexshire, 50 miles northeast of London. It is located on a hill near the south bank of the Colne River, twelve miles from the sea, and has electric and steam railway facilities. The manufactures include boots and shoes, clothing, and machinery. Among the public utilities are waterworks, public baths, a public library, and substantial street paving. It is the seat of the Albert School of Science and Arts.



Colchester is an old town and dates prior to the Roman invasion. Many ancient vases, urns, and coins of imperial Rome have been found in the vicinity. Population, 1906, 40,425.

**COLCHICUM** (kōl'kī-kūm), a genus of plants allied to the lilies. The meadow saffron is a species of colchicum. About thirty other species have been described. They are stemless and thrive in meadows and pastures. The plants attract little attention in the spring, but the flowers are beautiful and appear from August to October. Most species are acrid and poisonous, but some yield valuable medicine for gout and inflammatory rheumatism.

**COLD HARBOR**, a locality in Hanover County, Virginia, about ten miles northeast of Richmond. It was the seat of several battles in May and June, 1864, between the Union and Confederate armies. The first battle began on June 1 and continued three days. Gen. Grant commanded the Federal forces and had advanced from Spottsylvania to Chickahominy. Gen. Sheridan occupied Cold Harbor, where he was joined on June 1 by forces from Butler's army. The assault made on the Confederates was partially successful, but resulted in a loss of 2,000 men to the Union army. An attack was made on the right flank of the Confederates on June 3, but little advantage was gained, though 7,000 men were lost. Later the Federal army gained some advantage by the battles at Petersburg. The several battles at Cold Harbor cost the Union army almost 13,000 men, while the Confederates lost not over 2,000.

**COLD STORAGE**, a system of preserving perishable articles of food, such as eggs, meats, and vegetables. Cold storage plants are very common in the cities having a population of 10,000 or more, and are controlled and operated as private enterprises. They are usually divided into a number of rooms or departments, and in nearly all cases are associated with plants maintained for the manufacture of artificial ice. The articles preserved in cold storage are placed in rooms where the temperature is little above the freezing point, whereby it is possible to preserve perishable articles of food so the market can be supplied with choice varieties in good condition at all times of the year. Cold storage is used in large hotels and breweries, and in the transportation of butter, fruits, vegetables, and meats. Furs are kept in summer to a considerable extent in cold storage.

**COLDWATER**, county seat of Branch County, Michigan, on Coldwater River, about forty miles southeast of Kalamazoo. It is located in a fertile agricultural country, on the Lake Shore and Michigan Southern Railroad,

and is a prosperous trading and manufacturing center. The city is the seat of a State school for indigent children. Among its institutions are a public school building costing \$100,000, a fine courthouse, and numerous churches. Electric lights, pavements, and a library are among the facilities. It was settled in 1830 and became an incorporated city in 1862. Population, 1904, 6,225; in 1910, 5,945.

**COLGATE UNIVERSITY**, an institution founded at Hamilton, N. Y., in 1820. The name was changed to Madison University in 1846. Later the name was changed to Colgate University in honor of James B. Colgate, a leading dry goods merchant of New York, who made a number of large gifts to the institution. The university is now endowed with about \$2,000,000. It has a faculty of forty instructors, 350 students, and a library of about 35,500 volumes.

**COLIMA** (kō-lē'mā), capital of the state of Colima, Mexico. It is located on a fertile plain and is surrounded by hills and mountains. Near it is the volcano Colima, which has an altitude of 12,743 feet. The city has railroad connections, a number of costly edifices, and a large trade in cotton and fruit. Among the chief buildings are the city hall, the state capitol, and the Hospital de San Juan. Colima was founded in 1522. Population, 1906, 22,445.

**COLLEGE** (kōl'lēj), an institution of learning which offers opportunities for study in advanced courses. The instruction is usually in the liberal arts, with a course of study, either fixed, or partly fixed and partly elective, commonly requiring four years for completion. Although there are many institutions that claim rank as colleges, the courses differ very widely. No distinct line of demarkation has yet been fixed between the requirements of a course of study for an academy and a college, and between that of a college and a university. Besides, many of the high schools carry courses covering college branches, in some cases even ranking higher in efficiency than some of the colleges. A typical college course contains provisions for the study of English, German, Latin, Greek, and French languages, mathematics, physics, literature, moral and mental philosophy, civics, engineering, and other allied departments. At the completion of a definite course a degree may be granted, which, in most cases, is recognized by universities where students wish to pursue still more advanced work. Some American colleges have departments for professional training, especially for teaching, while some of the universities have academic or collegiate departments. The list of colleges also includes institutions for special training, as colleges of pedagogy, theol-



ogy, medicine, music, agriculture, industrial arts, and others. It is thought that colleges had their origin in connection with the University of Paris, in the beginning of the 15th century.

Colleges have been established in many cities of the United States, some as private enterprises and others by State or Federal aid. In the leading towns and cities, from Maine to California and from Canada to the Gulf, there are one or more institutions doing college work. These institutions are usually open alike to both sexes, though there are some exceptions. Many have taken pride in building up extensive libraries, collecting museums, and attaching gymnasiums for the physical development of both sexes. The collegiate institutes of Canada occupy a place between the high school and the university, and pupils attending these schools are prepared for matriculation in the universities. Ontario had 42 collegiate institutes in 1906, and a proportional number is maintained in the other provinces. The name *college*, in Canada, as in England, refers more specially to the body of institutions that constitute a university. Several hundred college papers, including weeklies, monthlies, and quarterlies, fill a valuable field in cultivating an educational sentiment and in furthering knowledge, both among the students and general readers. College societies are maintained in all institutions of this character, having for their object the study of literature and other useful lines. In the larger colleges a number of these societies are supported, usually with courses of study and outlines for research fitted for the different classes of pupils, based upon age and educational attainments.

Many colleges have followed the plan now maintained by most universities in that they provide college extension work. By means of this department it has become possible for the instructors and officers to come in contact with people in adjacent cities and states, and to carry the benefits of higher study to localities remote from educational centers. Thus, a taste for higher education has been awakened in younger students, while older classes and professional and business men have remained in touch with wholesome reviews of branches, thereby enlarging and extending culture and learning. It is quite unnecessary to name the different colleges of the United States in this article. A number of leading institutions have been mentioned in special articles. It may be in place, however, to say that American colleges are so widely distributed and carry such a diversity of courses that it is possible for any person of thrift and brains to attain to educational power and usefulness. These colleges are open alike to poor

and rich, while the expense of attendance has been reduced to a minimum. The annual expense of college attendance in many good institutions does not exceed \$350, though some students can barely bridge over a year's work with less than \$3,000. This, of course, depends upon the habits of economy, the society surrounding college life, and the institution at which an education is sought.

**COLLEGE POINT**, a locality in Greater New York City, in Queens County, on the south shore of Long Island Sound, about ten miles east of Central Park. It has a number of factories, which are devoted chiefly to the production of India-rubber goods. The streets are well improved and many of the edifices are costly structures. It is the residence of many New York business men.

**COLLIE** (kŏl'ly), or **Sheep Dog**, the name of several kinds of dogs employed extensively in controlling flocks of sheep or cattle. It is a hardy animal with long hair, stands about 25 inches high at the shoulders, and is noted for its intelligence. The muzzle is tapering and the appearance is somewhat foxlike, and the ears are carried flat on the side of the head. Dogs of this class can be easily trained to take a flock of sheep to pasture and drive them home safely at the appointed time. Sheep become accustomed to their dog and regard it as a friend. It is peculiar in its remembrance of places and for protecting flocks from wolves. The collie is a favorite sheep dog in Scotland and the Scotch breed is a representative of this class. Other breeds include the *Welsh*, the *Schipperke*, and the *Pomeranian*. The last mentioned is known as the *Spitz dog* and is favored as a house pet, being somewhat smaller than the Scotch collie.

**COLLINGWOOD** (kŏl'ling-wŏod), a port town of Ontario, in Simcoe County, 94 miles northwest of Toronto, on the Northern Railway. It is nicely situated on Georgian Bay, Lake Ontario, and has important steamboat transportation facilities. The manufactures include flour, leather, spirituous liquors, and machinery. It has a large trade in lumber, manufactures, and merchandise. The public facilities include electric lights, several fine schools, and waterworks. Population, 5,755.

**COLLODION** (kŏl-lŏ'di-ŏn), a solution prepared by mixing pyroxylin with alcohol and ether, or by treating the pyroxylin in ether and afterward adding alcohol until it is completely dissolved. The process recommended is to treat eight parts of pyroxylin by weight in 125 parts of rectified ether and then add eight parts of rectified alcohol. The product is very volatile,



and on evaporating leaves a film which adheres to the surface of bodies, thus making it a convenient application to cuts and wounds in the place of sticking plaster. It is applied by brushing it alone over the edges of the incision, or by spreading it upon strips of ribbon. Collodion is used extensively in photography for preparing sensitive films, which are made by spreading a mixture of collodion and substances sensitive to light over glass plates. It is used in constructing small toy balloons, for making wood and fabrics waterproof, for coating to render pills and other medicinal preparations tasteless, and for a variety of other purposes.

**COLMAR** (kôl'mär), or **Kolmar**, a city of Germany, in Alsace-Lorraine, forty miles southwest of Strassburg. It is finely situated on the Lauch River, near the base of the Vosges, and is the converging center of several important railroads. The principal buildings include a college, a theater, a townhouse, and a cathedral. Among the chief manufactures are cotton goods, leather, hosiery, cutlery, ribbons, and machinery. It has a considerable trade in produce and merchandise. Colmar has electric railways, stone and asphalt paving, gas and electric lights, and a number of fine public schools. By the Peace of Ryswick, in 1697, it was ceded by Germany to France, but was returned by the Treaty of Versailles in 1871. Population, 1905, 41,791.

**COLOGNE** (kô-lôn'), (German, Cöln), the capital of Rhenish Prussia, Germany, on the Rhine River. It is strongly fortified, a number of its fortifications dating from the Middle Ages, but they have been vastly improved by the construction of modern defenses. It has a number of famous churches of various styles of architecture, including the Romanesque, Gothic, and Transition. The Cathedral of Cologne (see Architecture) is the finest specimen of Gothic architecture in Europe. It was built in the reign of Charlemagne, and was burned in 1248, but was rebuilt soon after, although it was not fully completed until 1880. The cost of this magnificent structure is estimated at more than \$10,000,000. The city is remarkable for its beauty and educational facilities. Its streets, public boulevards, botanical gardens, and zoölogical institutions are among the finest in Europe. The public school system and higher institutions of learning take high rank, while the public library and monuments embody much beauty and value. It is extensively connected by electric lines and railroads, and has a large interior and river navigation commerce. The manufactures embrace fabrics, clothing, musical instruments, glue, toys, tobacco, machinery, and the celebrated *eau de Cologne*, or Cologne water. It has grown

with remarkable rapidity in commerce since the beginning of the 20th century. Cologne dates from an early period of European history. It was founded about 30 B. C. by the Ubii. In 870 it became a part of the German Empire, entered the league of the Hanseatic cities in 1201, and was joined to Prussia in 1801. Population, 1905, 428,722.

**COLOMBIA** (kô-lôm'bê-ä), a republic of South America, located in the northwestern part of that continent. It is bounded on the north by the Caribbean Sea, east by Venezuela and Brazil, south by Ecuador, and west by the Pacific Ocean and the Republic of Panama. The location is between latitude 3° south and 12° 30' north and between longitude 67° 30' and 83° west. Choco Bay, Tumaco Bay, and Cupica Bay are the chief indentations on the Pacific Coast, while the Gulf of Darien is the principal inlet on the Caribbean Sea. The area is not definitely known, since some of the territory usually included is claimed by Peru, Ecuador, and Brazil, but it is generally given at 473,000 square miles.

**DESCRIPTION.** The surface may be divided into two regions, the great plains or llanos of the southeastern part and the Andean Cordilleras of the western section. A valley separates the Cordilleras from the highlands of Panama. The central range of the Cordilleras is the most elevated, including the volcanoes Tolema and Huila, the former reaching an altitude of 18,000 feet. The valley of the Magdalena River separates the central range from the eastern Cordilleras, which includes great tablelands and several mountains which are about 16,000 feet above the sea. In the eastern part is a great plain with streams tributary to the Orinoco and Amazon rivers. The coast line, including the indentations, is about 2,800 miles long, about half of which is on the Caribbean Sea.

The rivers belong to three systems of drainage, those flowing into the Pacific, those of the Caribbean Sea, and those draining by the Orinoco and Amazon into the Atlantic. Through the east central part flows the Magdalena, which traverses the country almost the entire distance from south to north and discharges into the Caribbean Sea. The Atrato flows northward near the western shore and discharges into the Gulf of Darien, while the Cauca is the chief tributary of the Magdalena. Among the principal affluents of the Amazon are the Japurá and the Uaupés, while the Meta and the Guaviare are the principal tributaries of the Orinoco.

The climate varies materially in different sections. It is hot in the valleys, especially where the mountains tower to considerable heights,



and the tablelands are pleasant. Two rainy seasons occur in the mountainous parts, while the coast region has an abundance of rain at all times of the year, and the extreme southwestern part is quite dry. The thermometer frequently registers about 100 at Magdalena and in the eastern plains, but sea breezes make the climate pleasant along the Pacific.

**FLORA AND FAUNA.** The flora is greatly varied, ranging from the tropical plant life of the lower regions to scant vegetation of the elevated tablelands. Among the forest trees are many varieties of palms, including the lofty wax palm and the useful rubber tree. Forests of considerable density clothe the mountains up to a short distance from the timber line, which is located about 10,000 feet above the sea. The region is well grassed and produces many medicinal plants, such as the aloe and sarsaparilla. The plains in the eastern part are covered with nutritious and useful grasses.

Colombia has many wild animals, such as the tapir, jaguar, sloth, puma, and ant-eater. Several species of the red deer are abundant on the plateaus, and numerous kinds of monkeys are found widely distributed. Among the birds are the condor, toucan, vulture, and humming bird. The reptiles include serpents, turtles, and lizards.

**MINING.** Nearly all the precious and useful minerals abound, but mining has not been developed to a considerable extent. Gold mining is carried on chiefly in Antioquia, and silver mines are worked in Cauca and Tolima. Valuable deposits of coal occur in the eastern Cordilleras, and emeralds are found in the state of Boyaca. Salt mining is a government monopoly and is carried on chiefly in the vicinity of Nemocón and Zipaquirá, where extensive deposits of salt rock and salt springs abound. Other minerals known to exist include lead, copper, iron, and platinum.

**AGRICULTURE.** Farming is the principal industry, but the methods are still primitive. It is confined largely to the elevated plateau in the western part, where the climate and soil are very favorable. Sugar cane, coffee, cacao, and tobacco are cultivated largely in the warmer districts, while corn, maize, and barley are the leading crops in the more temperate parts. Fruit is grown very extensively, especially the banana, orange, apple, and lemon. The tolu, valuable for its balsam, thrives in the uplands, and the rubber tree is native and yields large quantities of commercial rubber. All the domestic animals common to North America thrive, but cattle raising is receiving the greatest share of attention.

**TRANSPORTATION.** Public highways have been constructed in the settled districts, but the railroad lines do not exceed 500 miles. Many of the railways are short, ranging from 15 to 100 miles, and are operated largely as a means of connecting the streams or to penetrate a short distance inland from the coast. The Magdalena is the most important stream for inland navigation and together with the Cauca reaches the chief points of the interior. A considerable distance of the lower Atrato is navigable, and communication with the Orinoco is facilitated through the Meta River. Telephone and telegraph connections are abundant, and many steamers carry trade to the ports of Europe and North America.

**MANUFACTURES AND COMMERCE.** Manufacturing is confined largely to articles used in domestic consumption. They include straw mattings, cotton fabrics, pottery, and Panama hats. Sugar is manufactured to a considerable extent, and the government has a monopoly of the distillation of liquor from sugar. The chief exports include cattle, coffee, minerals, hides, and fruits, while the imports embrace principally flour, petroleum, ironware, drugs, chemicals, and machinery. Trade with the leading nations in the order named is with the United States, Great Britain, Germany, and France. The imports slightly exceed the exports.

**GOVERNMENT.** The government is constitutional, with the chief administrative power vested in a president chosen for six years by an electoral college. A ministry of six members assists the president, and there is a council of state of six members. The congress has full legislative power, and consists of a senate and a house of representatives; the former, of 24 senators, three from each of the eight departments, and the latter, of 66 representatives. A supreme court of seven judges, nominated by the president and confirmed by the senate, has the highest administration of justice, and subject to it are the supreme and provincial courts. Each of the states has a governor and is divided into smaller districts corresponding to a county in Canada or the United States. The army and navy are made up of all able-bodied citizens, but the peace organization embraces only about 1,500 men.

**INHABITANTS.** Colombia is inhabited by a people of Spanish descent. Roman Catholic is the official religion, but other denominations have been granted freedom in building churches and conducting public worship. The educational interests have been developed by a system of common schools supported by the government. Elementary education is free, but not compulsory,



and many private and parochial schools are maintained. Among the special and higher institutions are several normal schools, an agricultural college, four general colleges, and a national university. Spanish is the spoken and written language. Bogotá, in the west central part, is the capital and largest city. Barranquilla and Cartagena, both on the Caribbean Sea, and Buenaventura, on the Pacific, are the principal seaports. Magdalena, on the Magdalena River, is important as a river port and has connection by railway with Cartagena. Other cities of importance include Medellín, Pápayan, Sonsón, and Socorro. Population, 1907, 4,279,674.

**HISTORY.** The country now forming most of Colombia was formerly called New Granada. It was discovered in 1499 by Alonzo de Ojeda and was visited by Columbus in 1502, while he was on his fourth voyage to America. The first settlement was made by the Spanish at Santa Maria, in the Gulf of Darien, in 1510, and the whole region was organized as a province in 1547 under a captain general. In 1811 New Granada declared its independence from Spain and effected its liberation with the help of Venezuela, after a war lasting eleven years. The two states united with Ecuador under the name of Colombia, but separated in 1831 into three independent republics. New Granada adopted a constitution in 1863 and became known as the United States of Colombia. In 1884 the country was suddenly thrown into a revolution, which was terminated in 1886 and a new constitution was adopted, which gave the country a more strongly centralized government. Another revolution occurred in 1903, when Panama broke away from the mother country and organized as an independent republic. Since then the country has had an era of peace and is making material strides in constructing internal improvements and enlarging its influence among the states of South America.

**COLOMBO** (kô-lôm'bô), a seaport city and the capital of Ceylon. It is an important center for railway and navigation commerce. Among the public buildings are a museum, the government house, the supreme court, and several educational buildings. The post office and the palace of the governor are on Queen Street, which is the principal thoroughfare. A large majority of the houses are of one story, each having a veranda in front, and few are furnished by doors and windows. The harbor affords vast accommodations and has been improved by an extensive breakwater. Electric lights, street railways, and other municipal facilities have been provided. The city was founded by the Portu-

guese and was captured by the British in 1796. Population, 1906, 161,490.

**COLÓN** (kô-lôn'), or **Aspinwall**, a seaport in the republic of Panama, important on account of its location on the Caribbean Sea, forty-nine miles northwest of the city of Panama. It is situated at the northern terminus of the Isthmian Railway, near the Atlantic extremity of the Panama Canal, and has a deep harbor on Navy Bay. The site is low and somewhat unhealthy, but has been improved materially by constructive work of the United States in the Panama Canal zone. The streets are wide and regularly platted and are improved by grading and drainage. Among the chief buildings are a number of schools and churches, several fine business establishments, and the structures erected by the government. Colón was first named Aspinwall from its founder, who built the Isthmian Railway, but it is officially known as Colón, so named in honor of Columbus. A fine statue of Columbus was erected in one of its public places in 1883. Population, 1908, 14,825.

**COLONNA** (kô-lôn'nà), **Cape**, the most southerly point of Attica, Greece. The ruins of the celebrated temple of Minerva, of which sixteen columns of white marble remain, are on its highest elevation, 270 feet above the sea.

**COLONY** (kôl'ô-nÿ), a company of people who associate together for mutual advantage in the settlement of a remote country. The colonists usually have a common object and unite on account of similar social interests, or religious or political views. They may migrate from different countries, or from a single country. This mode of settlement is called *colonization*, and is due largely to the over-population or the suppression of certain liberties in the mother country. The name *colony* is commonly applied to a foreign dependency of a state or country. These dependencies are secured in various ways, often by settlement of large numbers, by purchase, or by wars of conquest. The tendency of Germany for many centuries was to direct emigration to various favorable regions for commercial enterprises, personal development, or religious liberty without seeking to profit by foreign possessions. Great Britain adopted a policy of colonization, directing emigration thither, and later sought to secure control by diplomacy or war. Spain and various other nations sent armies abroad largely for conquest by the sword, though many settlements were made under their direction similar to those of Germany and England.

**ANCIENT COLONIES.** The Phoenicians, the Greeks, and the Romans were the principal promoters of colonization among the ancient nations



of which we have an authentic history. The Phoenicians, though a small people, founded a majority of the most powerful colonies of antiquity. Isaiah called Tyre the daughter of Sidon, meaning that Tyre was originally a Sidonian colony. Later Tyre founded important colonies, such as Carthage in Northern Africa and Cadiz in Spain. Colonies were sent from almost every Greek state. They settled the whole of West Asia Minor, the islands of the Mediterranean Sea, and southern Italy, and extended into southern France. The colonies of the Phoenicians and Greeks were small states with a form of government which was almost entirely independent of the mother country, while Rome made her colonies subject to the parent government. The Roman colonies were of two classes, civil and military. Coins issued for the former contained a plow, while those of the latter were decorated with warlike designs. The Roman colonies extended over a vast area of Eurasia and Africa. Where they became sufficiently strong, the languages of the native races were modified or displaced by the Latin, the effect of which is seen in the modern French, Spanish, Italian, and Portuguese. The present languages of these peoples are modifications of the old Roman tongue and bear much similarity to the Roman.

**PORTUGUESE AND SPANISH COLONIES.** The Portuguese rank as the first great colonizers of modern times. They discovered Madeira in 1419, and shortly after followed the discovery of the Azores, the Cape Verde Islands, the Congo River, the Cape of Good Hope, and the Malabar coast of India. Later they established trading posts at Mozambique and Sofala in Southeastern Africa, at Muscat and Ormuz on the Persian Gulf, on the western coast of India, and at Goa and Daman. Their colonies in Ceylon were established in 1505, and were followed by settlements in the Moluccas, Brazil, India, and other localities. The foreign possessions of Portugal now include the Cape Verde and other islands, and several districts in Africa and Australasia. The Spanish colonization policy was one of the most extensive in the world. Columbus sailed under the Spanish flag in 1492 and discovered the island of San Salvador. His subsequent discoveries and those of other Spaniards caused Spain to occupy all of South America, except Brazil. The Spaniards also occupied Central America, Mexico, the East Indies, the Philippine Islands, large portions of the territory now included in the United States, and many other regions. However, the Spanish colonies have dwindled down to insignificance, owing to continued wars and dissensions.

**DUTCH AND DANISH COLONIES.** The Dutch were among the greatest colonizers. In 1620 several companies were formed to monopolize trade in the East Indies, at the Cape of Good Hope, in South America, in continental Asia, Australia, and many islands of the sea. Wars with France, Spain, and England caused a loss of many Dutch possessions. Their foothold in New York was absorbed early by the English, and later various other possessions passed from their control. The most important possessions now controlled by them are in the East Indies. Denmark has long pursued a policy of colonization. The dependencies of this nation are of considerable extent, but of small value. They include the Faroe Islands, Iceland, Greenland, a number of islands of the East Indies purchased of France in 1733, and several others colonized by them.

**FRENCH COLONIES.** France has long ranked as a colonial power. Citizens of France began colonizing in 1627 in various portions of the world. The most valuable parts of North America were once under the dominion of the French, and they likewise possessed vast colonies in Asia and numerous island archipelagoes. Their northern possessions in North America were lost in several wars with the British, while the western portions were sold by Napoleon in 1803 to the United States. The chief colonies of France at present include those in India, Tonquin, Anam, and Cochin China in Southeastern Asia; Tunis, Algeria, Madagascar, Guiana, and various islands, the whole constituting a large area of valuable regions.

**BRITISH COLONIES.** England began colonization in 1585 by encouraging settlements in North America, but made little success until 1607, when the first permanent settlement was made at Jamestown. Later, territories were acquired in Asia, Australia, Africa, and many islands of the sea. The principal possessions of the British now include Australia, British America, South Africa, most of India, Belize, Guiana, Ceylon, New Zealand, Tasmania, and various islands in different parts of the oceans and seas. The British possessions and dependencies embrace nearly one-sixth of the land surface of the earth and fully one-seventh of mankind.

**GERMAN AND OTHER COLONIES.** Germany has mainly directed its emigration to foreign countries without attempting to secure permanent foothold until within recent years. Its colonies at the present time are of considerable extent. The principal German possessions include a portion of New Guinea, the Bismarck Archipelago, Cameroon, Togoland, German East Africa, Ger-



man Southwest Africa, the Caroline Islands, Kiauchau, in China, and a number of islands. Various other European powers have a foreign colonial policy, especially Italy and Russia. The latter country is operating more particularly in the northern and western regions of Asia, and is endeavoring to control the larger portion of that continent, making its possessions largely contiguous to its home central government. The United States entered upon a colonial policy in 1898 by the annexation of the Hawaiian Islands. After the war with Spain, in 1898, Porto Rico, Guam, and other islands were annexed. The Philippine Islands are the largest colonial possessions of the United States.

The experience of past ages demonstrates clearly that the possession of foreign territory does not add to the stability of a nation. Hostilities generally growing out of the purchase or conquest of a region which is populated by an unfriendly people require a vast navy and a large colonial army even in the time of peace, while racial and commercial complications may be the causes of insurrections at any time. The colonial policy of Spain, though continuing for over 300 years, ultimately almost bankrupted the nation, while Great Britain, because of her vast colonial interests, has need for large naval and military forces. Aside from spreading particular religious beliefs and languages, no permanent advantages have accrued to the nations having colonial policies, while many have been materially weakened at home and even brought to a condition of retrogression. Colonization has given to Brazil the Portuguese language, and to all the rest of South America, Central America, and Mexico the Spanish, while all these vast regions have become Roman Catholic in religion. The English language has been carried to the United States, British America, Australia, and other regions in the same way.

**COLOPHON** (kōl'ō-phon), one of the twelve Ionian cities on the coast of Asia Minor, located eight miles north of Ephesus, on the Halesus River. It was celebrated for its navy and cavalry, and was one of the seven cities that claimed to be the birthplace of Homer.

**COLOR** (kūl'ēr), that quality of bodies by which they present different appearances in respect to hue or tint to the eye. In optics, color is studied chiefly in connection with the *solar spectrum*, which is the spectrum of solar light. The white lines that reach us from the sun disperse or decompose into several colors when passed from one medium into another. The solar beam may be developed into seven colors by means of a prism. They are red, orange, yellow, green, blue, indigo, and violet. Red, vio-

let-blue, and yellow are considered *fundamental* colors. Sir Isaac Newton was the first to decompose white light by a prism and then recompose it. According to his theory, bodies decompose light only by reflection, their colors depending upon their reflecting power for the different simple colors. Bodies that reflect all colors in proportions as they exist in the spectrum are white, those that reflect none are black. A wide diversity of colors exists between these two limits, this being dependent upon the extent to which bodies absorb some colors and reflect others. According to this hypothesis, it is presumed that bodies have no colors in themselves, but produce them by the kind of light which they reflect. When white light falls on a green leaf, all the colors but green are absorbed, and, this given off, makes the leaf appear green. A red cloth in the same way absorbs all colors but red, and therefore appears red. Thus, the different color effects of the beam of light depend upon the qualities of the substances on which they fall.

The rainbow is formed by drops of falling rain, through which light passes, and is separated into its prismatic colors, all the colors of the solar spectrum. Plant tissues are largely colorless, a silvery white, or a pale yellow. The green color taken on subsequently is due to the action of the solar light, which produces *chlorophyll*, the name applied to the green coloring matter of plants. The pigments or colors used by painters are distinguished from the colors of the solar spectrum. In the arts the pigments blue, red, and yellow are the *primary* hues and may be made to form any other colors, but they cannot be formed by any others. The national colors of the United States are blue, white, and red; of Germany, black, white, and red; of Russia, white, blue, and red; of Great Britain, red and blue; of Australia, red, white, and green; of France, blue, white, and red; of Spain, yellow and red; of Sweden, blue and yellow; of Denmark, red and white; of Switzerland, red and white.

**COLORADO** (kōl-ō-rä'dō), a western State of the United States, located in the center of the portion of the United States lying west of the Mississippi River. It is bounded on the north by Wyoming and Nebraska, east by Nebraska and Kansas, south by Oklahoma and New Mexico, and west by Utah. The State is quadrilateral in shape and is bounded by the parallels 37° and 41° north and the meridians 102° and 109° west from Greenwich. It is about 370 miles long and 280 miles wide, and has an area of 103,925 square miles.

**DESCRIPTION.** The continental range of the



Rocky Mountains extends across the State from north to south, near its center. Pike's Peak, west of Colorado Springs, is the most famous summit in the State, but not the highest, being one of many that have an elevation of 14,000 to



1, Denver; 2, Greeley; 3, Colorado Springs; 4, Leadville; 5, Pueblo; 6, Pike's Peak. Chief railroads shown by dotted lines.

14,500 feet. In the western section are three more or less prominent ranges, including the White River Mountains in the west, the Park and Saguache somewhat farther east, and the Front Range near the Saguache. Among the mountains are numerous plateaus known as parks, of which the surface is quite fertile and the climate is healthful. Two natural divisions characterize the general surface of the State, those embraced in the mountains and the plains, the former having an elevation of 5,000 to 14,500 feet, while the latter is located from 4,000 to 5,000 feet above the sea. In many places the scenery is beautiful and grand, especially in the localities known as Monument Park and the Garden of the Gods.

The western part of Colorado is crossed from north to south by the great continental divide. On the eastern slope, flowing toward the Mississippi, are the South Platte and Arkansas rivers. The Rio Grande drains the San Luis Valley, while the Grand flows toward the southwest. The Yampa and White are tributaries of the Green, which unites with the Grand in eastern Utah and forms the Colorado River. None of these rivers is navigable, but they with their numerous branches furnish a supply of water for irrigation purposes. A large number of the streams flow through canyons which are noted for their grandeur, and in many places are cold and thermal springs with distinctive medicinal properties. The most noted springs are located at Manitou, Cañon City, Idaho Springs, Glenwood Springs, Hot Sulphur Springs, Steamboat Springs, and Pagosa Springs.

The climate is delightful, the air is dry, and the sunshine is abundant. Rains fall throughout the warm parts of the year and snows occur in winter, but both are moderate in quantity. The altitude and dryness minimize the heat in summer and the cold in winter. The perpetual snow line varies between 13,000 and 14,000 feet, except on the side of the mountains sloping toward the north and in deep canyons, where it is considerably lower. Colorado has a mean annual rainfall of 14.8 inches, and it is distributed quite generally throughout the State, though it is heaviest in the mountains. In summer time the days are frequently quite hot, but the nights are cool and bracing. At Denver the mean temperature in January is 28.2° and in July, 71.8°.

**MINING.** Colorado leads in the production of the precious and allied metals all other states in the Union, producing twice as much gold and silver as any other State and more than one-fourth of the total output of the United States. It has extensive coal resources, both bituminous and anthracite, and in the output exceeds all the states west of Illinois and is seventh in rank among the coal-producing states, being surpassed only by Pennsylvania, Illinois, West Virginia, Ohio, Alabama, and Indiana, in the order named. It ranks second among the states in the output of anthracite, being exceeded only by Pennsylvania. The coal fields are situated on both sides of the Rocky Mountains, those on the western slope being the largest and most important in quantity and quality. Other minerals found extensively include lead, iron, copper, zinc, gypsum, petroleum, onyx, and kaolin. Cripple Creek, Leadville, Colorado Springs, Pueblo, Silverton, Creede, and Telluride are located in the vicinity of productive mining districts.

**AGRICULTURE.** Colorado was formerly regarded unsuitable for agriculture, owing to its aridity and elevation, but irrigation has been a potent influence in developing its resources. The rainfall is sufficiently large in some parts of the State in particularly favorable seasons, especially to induce the vigorous growth of native grasses, and wherever water is available the investments in farming are very profitable. The main canals and ditches constructed for irrigation have a total length of about 12,000 miles and the farms average 384 acres, which is much larger than the size of the average farm in the United States, due chiefly to the number of holdings used for stock grazing. Alfalfa is grown very extensively for fodder and yields from one to three cuttings per year. The culture of sugar beets has grown extensively the last decade, and the output is valued at about \$7,500,000 annually.



Other crops grown extensively are cereals, fruits, potatoes and vegetables.

The State is favored with the growth of many nutritious grasses suitable for grazing, and stock raising was an important industry before general farming was attempted. Large herds of cattle are grown for meat and dairy products, both of which form important items in the business enterprises. Sheep raising is possible in all sections, but the largest flocks are in the southern counties. Swine are not raised as extensively as in the states of the Mississippi Valley, owing to the fact that corn is grown on a comparatively smaller area, but horses and mules are reared in large numbers.

**TRANSPORTATION AND COMMERCE.** None of the rivers is navigable, but the State has many lines of railroads, aggregating about 5,250 miles, and they are well distributed in all sections. The lines include a number of the trunk railways which connect the commercial centers of the State with the business emporiums of the Mississippi Valley and the Pacific Coast, including many branch lines that penetrate in all directions, affording unexcelled highways of commerce. Denver is noted as a market and wholesaling and jobbing center.

**MANUFACTURING.** The great variety of raw materials give Colorado advantages as a manufacturing State. Among the leading industrial establishments are the iron and steel works at Pueblo and the foundries and machine shops at Denver. Coke is manufactured extensively, the State ranking fourth in the quantity of this product. A fine quality of brick clay is abundant in many localities, especially in the vicinity of Denver, where the brick plants have a large output. Other industrial enterprises include flouring and grist mills, canning factories, creameries and cheese factories, printing and publishing plants, beet sugar factories, and gold, silver, copper, and lead smelting works. Sawmills are located in many places for cutting fir, pine, and spruce forests, which cover a large area in the mountains below the snow line.

**EDUCATION.** Ample provisions have been made for the education of the youth. The State has a permanent school fund obtained from the sale and rent of about 3,550,000 acres of school land, and the income is apportioned among the schools of the State. The University of Colorado is located at Boulder; the State School of Mines, at Golden; the State Agricultural College, at Fort Collins; the State Normal School, at Greeley; the Mute and Blind Institute, at Colorado Springs; and the Industrial School, at Golden. Many private and denominational schools and institutions of higher learn-

ing are maintained, including Denver University, Denver, and Colorado College, Colorado Springs.

**GOVERNMENT.** The constitution was adopted by a vote of the people in 1876, when the State was admitted, but it has been amended several times. It requires a residence of six months as a prerequisite to vote and extends the right of suffrage to both sexes at school elections, and in addition provides that the Legislature may extend the right of suffrage to women, but such an act must be approved by a vote of the people. Executive authority is vested in the governor, lieutenant governor, secretary, treasurer, auditor, attorney-general, and superintendent of public instruction, each being elected for two years. The legislative functions are vested in the Legislature, which consists of the Senate and the House of Representatives. Senators are elected for four and representatives for two years. The aggregate membership in both houses cannot exceed 100. At present there are thirty-five senators and sixty-five representatives. The judicial power is vested in a supreme court, the district and county courts, justices of the peace, and such other courts as may be provided by law. Local government is administered by counties, townships, and municipalities.

**INHABITANTS.** Colorado has a larger population than any of the Rocky Mountain states. About one-fifth are of foreign birth, and fully forty per cent. reside in the cities with a population of over 4,000. Denver, the capital, is the largest city and chief commercial center. Other flourishing cities include Pueblo, Colorado Springs, Leadville, Cripple Creek, Boulder, Trinidad, Salida, and Rockyford. The State has had a steady growth in population, which, in 1900, was 539,700; in 1910, 799,024.

**HISTORY.** Colorado was acquired in three sections. About one-half was acquired from France by the Louisiana Purchase in 1803; a portion of the west and north, by the Mexican Cession of 1848; and the remainder, by purchase from Texas in 1850. Coronado visited the region in 1541. He is supposed to have been the first white man to set foot within the present limits of the State, which received its name from him. Zebulon Pike explored the region under the authority of the government in 1806. The next expedition was undertaken in 1819 by Stephen S. Long, and John C. Frémont began a series of five explorations in search of practical railway routes in 1842. Immigration was attracted by the discovery of gold in 1858, at which time the parks were inhabited by the Ute Indians and the plains were occupied by the Cheyennes, Arapahoes, Kiowas, and Comanches.



In 1861 it was organized as a Territory and was admitted as a State in 1876, hence is popularly known as the *Centennial State*. In 1893 the State adopted woman suffrage at a special election by a majority of about 4,500 votes. The capitol building, which cost about \$2,500,000, was completed at Denver in 1894.

**COLORADO, University of**, an educational institution at Boulder, Colo. It was incorporated by the territorial Legislature in 1861, and became the State university by the provisions of the constitution of Colorado in 1876. When it was opened formally, in 1877, it embraced a preparatory department and the college proper, to which were added the medical school in 1883, the law school in 1892, and the school of applied sciences in 1893. At present it embraces five departments, including the college of liberal arts, the graduate department, the school of law, the school of applied science, and the medical school. It is maintained by a direct tax upon the properties of the State and is governed by a board of regents. The library contains about 30,000 volumes. The faculty consists of one hundred professors and instructors and the average annual registration of students is about 1,000.

**COLORADO BEETLE**, better known as potato bug, an American beetle first described by Thomas Say in 1824 from specimens found by him in Missouri. It was first noticed as a pest in the potato fields of Colorado, hence its name. Subsequently it moved eastward rapidly, and reached the Atlantic coast in 1874. It is of a yellowish color, with black stripes along the back. The young are reddish, fleshy, and soft, and do most of the damage to the growing plants.

**COLORADO RIVER**, a river of Texas, rises near the southeastern boundary of New Mexico, and discharges into the Gulf of Mex-

Austin, Bastrop, Bay City, Lagrange, and Whar-ton. It is navigable for small boats to Austin, a distance of about 200 miles, and the total length is about 900 miles.

**COLORADO RIVER**, a large river of the United States, formed in the southeastern part of Utah by the junction of the Green and Grand rivers. It flows south and west in Utah, passes through the northwestern part of Arizona, and forms the boundary between Arizona on the east and Nevada and California on the west. Near its mouth it passes into Mexico and discharges into the Gulf of California. The length of the Colorado River proper is 900 miles, but with the Green, its largest confluent, it has a course of nearly 2,000 miles. It is remarkable for its great canyons, the principal one being the Grand Canyon. This natural phenomenon is about 300 miles long, with perpendicular walls at some places fully 6,000 feet above the water. In the northern part of Arizona the Grand Canyon is five to six miles wide at the top and 6,000 feet deep, narrowing by successive depressions until the narrow and gloomy gorge in which the river flows is reached, where the descent is almost perpendicular to depths varying from 2,000 to 3,000 feet. Among the chief tributaries are the San Juan in Utah, the Little Colorado and the Gila in Arizona, and the Virgin in Nevada.

**COLORADO SPRINGS**, a city in Colorado, county seat of El Paso County, sixty-five miles south of Denver, on the Denver and Rio Grande, the Santa Fé, and other railroads. It is the seat of Colorado College, an institution which carries full college courses. This institution has a library of 35,000 volumes, a faculty of forty instructors, and about 675 students. Ten miles from the city is Pike's Peak, which lifts its snowy summits in great beauty and may be reached by several railways. Manitou is a health resort six miles from the city, at the foot of Pike's Peak, and between the two cities is the wonderful Garden of the Gods. Fine natural and artificial scenery make the city one of the most delightful in the west. It has good schools, a fine trade, and numerous industries. Gas and electric lights, pavements, waterworks, and rapid transit are among its improvements. It was settled in 1870 and incorporated in 1872. Population, 1900, 21,085; in 1910, 29,078.

**COLOR BLINDNESS**, or Daltonism, a term used to describe a defect of vision, which is not usually accompanied by any other imperfection of the eye. It is incurable and peculiarly affects families, being transmitted from parents to child. The eye in a normal condition has three primary sensations, those of green, red, and violet, and color impressions are formed by



COLORADO BEETLE.

A, Eggs; B, Larvae; C, Pupa; D, Adults; E, Wing (magnified); F, Leg (magnified).

ico through Matagorda Bay. The Llano, San Saba, and Concho are its chief tributaries. Among the chief cities located on its banks are



the combinations of these. Color blindness is due to the absence of one of the primary sensations, usually the red or green, and very rarely the violet. About one per cent. of women and from three to four per cent. of men have a color blind vision. It is due to a defective retina or the admission of an insufficient amount of light. The latter is noticeable when examining any objects that are more or less colored by artificial light, since it is impossible to distinguish colors properly at night, except the shades of white and black. Color blindness is frequently acquired by the excessive use of tobacco and by children being confined in schoolrooms that are not sufficiently lighted. It may be detected by a selection of colored worsteds, a test devised by Prof. Holmgren of Upsala. In many countries a strict examination is required for those who are employed in the railway service, especially in the departments where color signals are used.

**COLOR PRINTING**, the art of producing several colors in printing. The process formerly required as many impressions as colors desired in the finished product. A card or chromo in which ten colors were desired required passing through printing presses ten different times, once for each color to be applied. Now color printing is done largely by three impressions. The principle involved is that if a photograph be taken in three colors of nature—red, blue, and green—and plates be made from each photograph by a photomechanical process, impressions of the plate may be taken in their appropriate colors, thus producing a combination which involves the colors of the original, even showing blendings much as are seen in nature.

**COLOSSEUM** (kōl-ōs-sē'ūm), the name applied to the greatest of Roman amphitheaters. It was built in the form of an ellipse, the length



COLOSSEUM AT ROME.

being 612 feet and the breadth 515 feet. It was begun by Vespasian and was finished by Titus in the year 80 A. D. The base covered five acres, and there was a seating capacity for about 87,000 people. It ranked as the largest and most important inclosure for the celebration of the

national games, and its ruins are still among the interesting relics of antiquity. Titus dedicated it by games lasting a hundred days, in which 5,000 wild animals were slain. It was surrounded by a row of pilasters, contained eighty openings on the ground story, over which were constructed three other stories, the whole rising to a height of 160 feet. Open galleries were constructed throughout the whole building, passing beneath the columns. The interior space was covered with sawdust or sand, in which the games were exhibited in the presence of vast multitudes occupying the seats in the different stories, arranged in circular order. These games were visited by the emperor, senators, and the populace, forming the most interesting of public demonstrations.

**COLOSSUS** (kō-lōs'sūs), a term applied generally to statues of great size built by the people of antiquity. The most important statue of this class built by the Grecians was the *Colossus at Rhodes*, being a brass statue of Helios, the sun god, which came to be counted among the wonders of the world. It was constructed from the spoils left by Demetrius Poliorcetes when he raised the siege of Rhodes. The work was done under the sculptor Chares of Lindus, who spent twelve years in finishing the work, completing it in 280 B. C. An earthquake threw it down about 224 B. C. The statue is said to have stood upon two moles, a leg being extended on each side of the harbor so that a vessel in full sail could enter between. Some writers assume its height to have been from 100 to 125 feet. It was in ruins for nearly nine centuries, and when the Saracens captured Rhodes they pulled it to pieces and sold it to a Jew. The Jew transported it to Alexandria about 653 A. D., requiring 900 camels to effect the transportation. A number of modern memorials are known by the general name of Colossus from their enormous size, such as the *Bavaria* at Munich, the *Germania* at Niedervald, on the Rhine, and the statue of *Liberty Enlightening the World*, in New York Harbor.

**COLTSFOOT** (kōlts'fōōt), a genus of plants native to Europe and naturalized more or less extensively in America. The common coltsfoot is a weed and is so named from the broad and heart-shaped leaves, which resemble the foot of a colt. It has yellow flowers. The leaves are somewhat glutinous and the lower side is downy. Bees seek the flowers for honey.

**COLUMBIA** (kō-lūm'bī-à). See **District of Columbia**.

**COLUMBIA**, county seat of Boone County, Missouri, 114 miles northwest of Saint Louis, on the Wabash and the Missouri, Kansas and



Texas railroads. It is the seat of the Missouri State University, Christian College, Stephens Baptist College for Women, and the State College of Agriculture. Besides doing a good jobbing trade, it manufactures flour, woolen goods, tobacco, and spirituous liquors. It has a system of waterworks and a monument to Thomas Jefferson. The first settlement in the vicinity was made in 1820. Population, 1910, 9,662.

**COLUMBIA**, county seat of Maury County, Tennessee, on the Duck River, forty-five miles south of Nashville. It is on the Louisville and Nashville and other railroads, and is surrounded by a fertile farming country. Phosphate is produced in the vicinity. The chief buildings include the courthouse, Jackson College, two seminaries, and a United States arsenal. Flouring mills, grain elevators, and cotton mills are among its industries. The city has electric lights, waterworks, and a sewerage system. It was settled in 1811 and incorporated in 1822. Population, 1900, 6,052.

**COLUMBIA**, a borough of Pennsylvania, in Lancaster County, on the Susquehanna River, eighty miles west of Philadelphia. It is on the Pennsylvania and the Philadelphia and Reading railroads. On the opposite side of the river is Wrightsville, with which it is connected by a bridge about a mile in length. It has a large trade in merchandise. The chief industries include cotton, flouring, and planing mills, iron foundries, stove works, and shops for the production of implements, railroad iron, and steam engines. Among the public utilities are waterworks, stone and macadam pavements, and electric street railways. Columbia was founded by the Quakers in 1726, when it was known as Wright's Ferry. Population, 1900, 12,316.

**COLUMBIA**, the capital of South Carolina, in Richland County, on the Congaree River, 128 miles northwest of Charleston. It is on the Seaboard Air Line, the Atlantic Coast Line, and the Southern railroads, and has transportation facilities by the Congaree River and the Columbia Canal. The site is on a beautiful plateau, about 200 feet above the river, and affords an excellent view of the surrounding country. The city has broad streets, many of which are macadamized and paved, and the residential sections are beautified by parkings and avenues of trees. The State capitol is a fine structure of granite, erected at a cost of \$3,000,000. Other noteworthy buildings include the Federal courthouse and post office, the city hall, and a number of excellent public schools and churches. It is the seat of the South Carolina University, which was organized as a college in 1806 and changed to a university in 1880. Other insti-

tutions of learning include the Ursuline Convent, the Presbyterian Theological Seminary, and the Winthrop Normal College. The State University has a library of 40,000 volumes, besides which other libraries are maintained. Among the industries are commerce and the manufacture of cotton goods, tobacco products, machinery and furniture. It has extensive systems of waterworks, sewerage, and electric street railways. Columbia was settled in 1700 and became the State capital in 1786. General Sherman captured it in 1865, when a large part of the city was destroyed by fire. Population, 1910, 26,319.

**COLUMBIAN UNIVERSITY**, a coeducational institution located at Washington, D. C., maintained by the Baptists. It was organized in 1821 as Columbian College, when it comprised courses in theology, medicine, and the classics, and it was reorganized under its present name in 1873. At present it embraces the Corcoran Scientific School, Columbian College, the law school, the medical and dental schools, the school of jurisprudence and diplomacy, and the school of graduate studies. It has a library of 25,000 volumes, a faculty of 185 instructors, and an attendance of about 1,500 students.

**COLUMBIA RIVER**, an important river of North America, rises in British Columbia, flows through Washington, forms the boundary between Washington and Oregon, and discharges into the Pacific Ocean. The total length is 1,350 miles. Its principal tributaries include the Willamette, Deschutes, Snake, Spokane, and Okanogan rivers. More than 650 miles are navigable. It contains a number of magnificent falls and rapids, and is valuable for its abundance of salmon fisheries. The scenery along its lower course is grand and in many respects surpasses that of the Hudson.

**COLUMBIA UNIVERSITY**, an educational institution in New York City, on Morningside Heights. It was chartered by George II. as King's College in 1754, but the name was changed to Columbia College after the Revolutionary War, in 1784. In 1896 the name was changed to Columbia University, which designates the entire institution, while the name Columbia College is restricted to the undergraduate department. At present it comprises Columbia College, Barnard College, the school of law, the college of physicians and surgeons, the school of political science and philosophy, the school of applied science, the school of fine arts, the Teachers' College, and the summer school. It has endowments of \$20,000,000, an annual income of \$880,000, a library of 350,000 volumes, a faculty of 575 instructors, and about 4,525 students. About 25,500 persons have grad-



uated from its courses. Its courses are extensive, ranking among the most thorough in America.

**COLUMBUS** (kō-lŭm'bŭs), county seat of Bartholomew County, Indiana, on the east fork of the White River, about forty-one miles southeast of Indianapolis. It is on the Pennsylvania and the Cleveland, Cincinnati, Chicago and Saint Louis railroads. It is surrounded by an agricultural country, and has large flouring mills, machine shops, and implement and furniture factories. Among the public utilities are waterworks, sewerage, and electric street railways. It has a brisk trade in merchandise and farm produce. Population, 1910, 8,813.

**COLUMBUS**, a city in Georgia, county seat of Muscogee County, on the Chattahoochee River and on the Southern, the Seaboard Air Line, and the Central of Georgia railroads. It is located about 300 miles from the Gulf of Mexico, with which it has steam navigation connections. The water power of the river is unlimited, and is utilized largely in manufacturing. The manufactures include hardware, textiles, machinery, cigars, clothing, and furniture. Its cotton and woolen mills are among the largest in the South and produce vast quantities of ginghams and colored goods. Besides an extensive public school system, the city contains a male academy, a female academy, and several public buildings and churches. The streets are broad and improved by pavements and avenues of trees. It has gas and electric lights, street railways, waterworks, pavements, sewerage, and a public library. Columbus was platted in 1828 and incorporated in 1829. Population, 1900, 17,614.

**COLUMBUS**, the capital of Ohio, county seat of Franklin County, on the Scioto River, 100 miles northeast of Cincinnati. It occupies a fine site near the geographical center of the State, on the Baltimore and Ohio, the Pennsylvania, the Cleveland, Cincinnati, Chicago and Saint Louis, and other railroads. An extensive system of electric railways furnish facilities to reach all parts of the city and many suburban and interurban localities. Natural gas is utilized largely for manufacturing and by private families for fuel and lighting. The leading industries include wholesaling and the manufacture of carriages, machinery, implements, cigars, clothing, furniture, earthenware, boilers, and engines. It has a large trade in coal, petroleum, and farm produce.

The public parks of the city cover about 200 acres and contain many improvements and attractions. Among the public structures are a fine State capitol, the State fair grounds, the

United States garrison, and the Ohio State University. The capitol building is in the Doric style and cost about \$2,500,000. It is the seat of the Capital University (Lutheran), the Columbus Law School, and the Columbus Art Institute. It has a hospital for the insane, asylums for the blind, deaf, and dumb, and a State penitentiary. In its public places are monuments erected to James A. Garfield, Salmon P. Chase, U. S. Grant, and W. T. Sherman. Columbus was platted in 1812, made the capital of the State in 1816, and incorporated in 1834. Its location in the center of the State and within a vast field of iron, coal, petroleum, and gas has given it marked commercial advantages. Population, 1900, 125,560; in 1910, 181,548.

**COLUMBUS**, county seat of Lowndes County, Mississippi, on the Tombigbee River, and on the Southern and the Mobile and Ohio railroads. It is surrounded by coal and iron fields, and has cotton mills, machine shops, foundries, and lumber yards. Columbus is the seat of several educational institutions, including the State Industrial Institute. It has a county courthouse, a public library, and waterworks. It was settled in 1830 and incorporated in 1832. Population, 1900, 6,484.

**COLUMN** (kōl'ŭm), in architecture, a pillar or post employed for the purpose of supporting a weight, such as a roof or other superstructure. In some classes of architecture the column serves chiefly as a support, but in others it is designed both to strengthen the building and to serve as an ornament. Many designs and sizes of columns were employed by the ancients, including those that may be designated as massive, decorative, smooth, square, and polygonal. The Egyptians crowded the columns together with the view of giving the building a heavy and massive appearance, while those of the Persians and Greeks were quite tall and slender. A column consists of three parts known as the *base*, the *shaft*, and the *capital*. The base is the portion on which it rests; the shaft is the central part, usually cylindrical in form; and the capital surmounts the shaft. Among the principal columns are the Doric, Ionic, Tuscan, Corinthian, and Composite.

The Doric column is common among the ruins of ancient Greece and is thought to be one of the oldest classic orders. It is usually without a base and has a plain capital, and the shaft is fluted and in height is equal to five of its diameters. The Parthenon at Athens contains good examples of the Doric column. As classical architecture advanced, greater lightness and elegance were obtained by diminishing the thickness of the shaft and increasing its



height. In this respect preference is given to the Ionic column, which was originated by the Asiatic Greeks, who made the shaft equal in height to eight diameters, ornamented the capi-

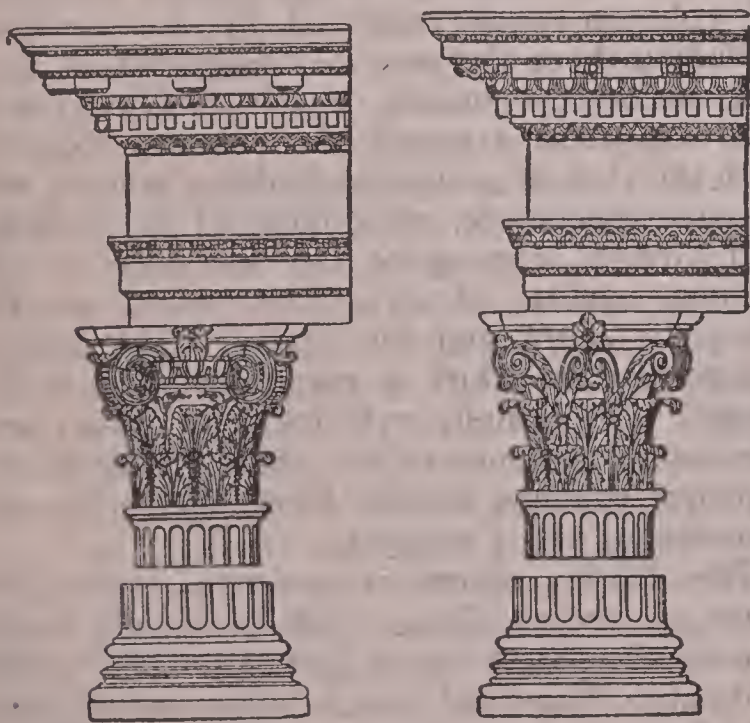


IONIC ORDER.

DORIC ORDER.

tal, and constructed a substantial and decorative base. A good example of the Ionic style is represented in the Erechtheum, on the Acropolis at Athens.

The Greeks originated the Corinthian style, which differs from the Ionic column in that the capital is beautifully ornamented, but it was



COMPOSITE ORDER.

CORINTHIAN ORDER.

developed in its higher artistic form by the Romans. The latter added the Tuscan, named from the Etruscans, and the Composite, which

is sometimes called the Roman or Italic order. In the Tuscan style the ornamentation is simple, but the Composite column is rich with carving and sculptured decorations. The Romans increased the size of the column as well as the material used in construction and combined with it the arch and the architrave. They not only employed the column in substantial and utilitarian architecture, but utilized it in constructing monuments to commemorate persons and events, such as the Column of Antonine and the Column of Trajan.

The early Christian architecture extended the use of the column by employing it in the interiors with the arch in the churches and basilicas. It served both for decoration and in the support of the roof or galleries, the latter being placed above the principal aisles. These columns were similar to the piers or pillars of more modern times, which divide the nave from the aisles in many churches. A second row of columns was frequently introduced to support the roof above the gallery, but these were usually of the lighter Ionic or Corinthian styles, while the lower columns were modeled after the Doric order. The column is not used extensively in modern architecture, neither in constructive work or for decorative purposes.

**COMA** (kō'mà), a morbid state which is regarded a symptom of apoplexy. It is attended by heavy, unconscious sleep, stupor, lethargy, slow breathing, and fevers of the typhoid type. Coma frequently accompanies Bright's disease, alcoholic intoxication, and opium and morphine poisoning. It is advisable to arouse the patient, if possible, in cases of poisoning.

**COMANCHES** (kō-măn'chěz), a tribe of North American Indians, formerly leading a roving life from the regions traversed by the headwaters of the Brazos and the Colorado to those of the Missouri. The French came in contact with them in 1719 and the Spaniards afterward engaged them in fierce wars. They were skilled hunters and warriors. Once a tribe of 12,000, they have been scattered and number about 4,000, the greater portion being located in Oklahoma.

**COMB** (kōm), a thin piece of horn, metal, shell, or other material with one or both edges made into teeth, suitable for cleaning, dressing, or holding the hair in place. The name is also applied to a fleshy crest on the head of a domestic fowl, especially developed in the male. The typical form is upright and notched, reddish in appearance, and often double or treble.

**COMBUSTION** (kōm-būs'chūn), in chemistry, the continuous combination of a substance with certain elements, as oxygen and chlorine,



accompanied by light and heat. Generally, combustion is the action or operation of burning. *Spontaneous combustion* is caused by the internal development of heat without the application of fire. It frequently occurs in heaps of slate and refuse coal, in rags, oils, moistened hay and straw, and in other substances closely confined or stored in large quantities. The alleged combustion of the human body caused by the saturation of the internal organs with alcoholic drinks coming in contact with coal or fire is not well authenticated. It is claimed by some writers that in advanced stages of drinking, besides being advanced in life, the internal organs burn with rapidity, after which oily substances and fetid ashes remain. Most chemists believe the combustion of the human body in this way to be impossible.

**COMEDY** (kŏm'ĕ-dÿ), that branch of the dramatic art which represents the manners of common life, the object of which is to amuse by presenting the laughable incidents and humorous style. The masterpieces of French tragedy were first called *comedies*, but later the term became confined to the compositions which paint the vices and follies of mankind and describe ridiculous situations. Comedy is opposed to the tragic, serious, or ceremonial form of dramatic art. Among the widely known comedies of modern literature are the following: Goldsmith's "She Stoops to Conquer," Jefferson and Boucicault's "Rip Van Winkle," Lessing's "Minna of Barnhelm," Moliere's "L'Avare," Sheridan's "The Rivals," Sheridan's "The School of Scandal," Shakespeare's "Comedy of Errors," "Shakespeare's "Merchant of Venice," Shakespeare's "Much Ado About Nothing," Shakespeare's "As You Like It," Shakespeare's "Twelfth Night." See **Drama**.

**COMET** (kŏm'ĕt), a heavenly body so named from the hairy appearance of its tail. Comets usually consist of three parts—the *nucleus*, the *coma*, and the *tail*. The nucleus is a bright point in the center of the head, the coma is the cloudlike mass surrounding the nucleus, and the tail is a luminous train extending generally in the direction from the sun. Some comets have no tail, others have several, while some have no nucleus. Those belonging to the last mentioned class consist of a fleecy mass known to be comets from their rapid motion in orbits. Comets, unlike planets, are not confined to the limits of the zodiac, but appear in every quarter of the heavens and move in every direction. A comet when first seen presents a faint spot of light on the background of the sky. As it approaches the sun its brightness increases, and the tail begins to become visible.

The greatest brightness occurs near perihelion, but gradually fades away as it recedes, and is finally lost even to the telescope.

Comets have excited attention in every age, and until recently have inspired terror in the minds of people who were ignorant of astronomical phenomena. Superstitious fears attended their appearance, and they were looked upon as threatening the world with plague, famine, and war. The Romans looked upon the comet that appeared in 43 B. C., after the assassination of Julius Caesar, as a celestial chariot conveying his soul heavenward. Josephus enumerates among the indications of the destruction of Jerusalem "a star resembling a sword which stood above the city, and a comet that continued a whole year." Aristotle thought comets were not higher than our atmosphere, and that they consist of igneous vapors. Seneca published the opinion that comets are a kind of planets, while Tycho Brahe, in 1577, demonstrated that a certain comet was at a greater distance from the earth than the moon. The concave orbit of a comet was ascertained by Hevelius, in 1668, and the former notion that a straight line represented the path was fully disproved. Sir Isaac Newton in 1704 proved that comets obey the law of gravitation and showed that they move in elliptic orbits. Halley demonstrated in 1682 that comets are periodic in their returns and that their approach may be foretold. He proved that the comet appearing in 1531 returned again in 1607 and again in 1682, and predicted its return in 1759, in 1835, and at regular intervals of seventy-six years. This comet was named *Halley's comet* from the discoverer.

More than 600 comets have been noticed and their appearance and characteristics recorded, but it is thought that no less than 17,500,000 exist in connection with our solar system. Only a small number of this vast aggregation are visible to the naked eye, and a few attract observation on account of their superior size and brilliancy. They move in the solar system and respond to the laws of gravitation. While their orbits differ from those of the planets, they revolve round the sun. The orbit of planets is very nearly circular and they never depart so far from the sun as to be invisible to us, while the paths of the comets are extremely flattened ellipses; hence, they may be observed by us only through a very small part of their paths. Comets that travel in greatly elliptical orbits pass vast distances from the sun, but return within a fixed time. However, some are thought to have a parabolic course and to pass from our solar system. It is probable that they never return.



Some writers think there are three classes of comets—one having an orbit in the form of an ellipse, while the other two pass in paths formed like a hyperbola and a parabola. Those having a highly elliptical orbit sweep very near the sun at perihelion and recede to great distances during their aphelion. Newton estimated that the comet of 1680 was very near the sun and that it had a temperature about 2,000 times that of red-hot iron, while the comet of 1843 was about 30,000 miles from the sun and passed around that body in two hours' time. The comet of 1844 was estimated to have a distance of over 400,000,000,000 miles from the sun at aphelion. Astronomers estimated that the comet of 1680 moved at a rate of 277 miles per second in perihelion, while the velocity in aphelion was only six miles an hour. The density of comets is exceedingly small, so small that stars may be observed through them by means of a telescope. It is thought that the earth passed through the tail of a comet in 1861, its presence being indicated by a peculiar phosphorescent mist. While it is believed that a comet coming



DONATI'S COMET.

in contact with the earth would disturb or destroy the surface at the point of direct contact, it would not dangerously affect the earth's orbit.

It is not known whether comets shine by their own or by reflected light, but the latter seems to be the most reasonable, since they become invisible on going away from perihelion. They are thought to decrease in brilliancy at each successive revolution round the sun. At the first appearance no tail is visible and the light is faint. With the increase of velocity, as it approaches the sun, the brilliance increases and the tail shoots out from the coma and becomes longer and of greater splendor each day. The tail of the comet of 1843 increased in length 5,000,000 miles per day. The length of the tail

depends upon the size and velocity of the comet. It often reaches a length of 200,000,000 miles. Examination and analysis of the light of comets by the spectroscope have shown that these bodies are composed chiefly of carbon combined with oxygen. Few other elements have been found, but those known to exist in comets include iron, sodium, magnesium, and nitrogen.

Among the remarkable comets is one that appeared in 1811. It had a head whose diameter was 112,000 miles, the nucleus was 400 miles, and the fan-shaped tail stretched out 112,000,000 miles. Its distance at aphelion was estimated at 4,000,000,000 miles, fourteen times that of Neptune, and it is announced to return in thirty centuries. *Halley's comet*, mentioned above, is one of the most remarkable and best known. It appeared in 1835 and has a period of 76.08 years. *Donati's comet* was discovered by Dr. Donati of Florence, June 2, 1858. Its periodic time is about 2,000 years. *Biela's comet* was discovered by W. Biela, a German officer of the Austrian army, on Feb. 28, 1826. The periodic time of this comet is about 138 weeks. It returned in 1832, in 1839, and in 1845. In 1846 it was separated into two comets, which came back together in 1852. Though it has not been observed since, its periodic time has been distinguished by a more or less prominent display of meteors. These displays occurred notably in 1867, in 1872, and several times since. *Encke's comet* was discovered by Johann Encke, director of the observatory at Berlin, Germany, in 1819. It has a periodic time of 1,210 days, and an orbit which is nearer to the sun at all points than that of Jupiter. Encke proved that this comet is identical with the one appearing in 1786, in 1795, and in 1805. With its appearance in 1822 and 1828 it was accurately examined and measured, and former observations were verified at its reappearance in 1881.

**COMMENCEMENT** (kōm-měns'ment), the occasion on which degrees are conferred by colleges and universities upon their graduates. The term is employed in the University of Cambridge, England, and in other institutions of Great Britain to designate the day when masters of art and doctrines received their degrees. In the United States it has reference to the elementary and secondary schools as well as the institutions of higher learning, and the exercises, usually held at the close of the school year, are meant to indicate the commencement of a fuller life after graduation. The alumni of many institutions hold a reunion at the time of the commencement, and usually the literary societies hold annual meetings and the presi-



dent of the institution receives the report for the past year. Members of the class deliver orations, those of the highest rank being assigned the places of *salutatorian* and *valedictorian*, and frequently an address or oration is delivered by a prominent educator or public man. Commencement exercises may be considered a potent agency in stimulating educational zeal among the students and their friends, and in promoting a spirit of attachment among the graduates to their Alma Mater.

**COMMERCE** (kōm'mērs), the exchange of goods or property of any kind, especially the exchange on a large scale between states, nations, and colonies. The foreign commerce of the United States, including exports and imports, is exceeded in value only by the commerce of Germany and Great Britain, although the interior commerce of the United States is greater than that of any other country. In fact the collection of raw material from the various portions of the United States at the points of manufacture or export, the distribution of manufactured products, and the distribution of foreign imports give rise to a commerce exceeding in extent the commerce of any other two nations in the world. This vast commerce has resulted largely from the building of extensive railroads, canals, and other avenues of transportation. Incident to it are the construction of factories and the location of vast storehouses. The larger commercial centers are in the cities, where the principal railroads converge and the vast factories and storehouses for distribution are located.

The Phoenicians were the great commercial nation of the ancient world. Their primitive seat was at Sidon and their next center was at Tyre. The prophet Isaiah speaks of Tyre in these words: "The crowning city whose merchants are princes, whose traffickers are the honorable of the earth." This was written about 588 B. C. Their trade was extended to all parts of the world which were known at that time. The Greeks and Romans ranked as commercial nations. In the Middle Ages the Venetians, the Hanseatic towns, and Flanders took the lead in commerce. With the discovery of America the Spaniards, Portuguese, Dutch, and British developed vast commercial interests, though the Hanseatic towns in Germany remained important commercial centers.

Germany and Great Britain both have a larger foreign commerce than any other nation of the world. In this respect the two countries are about on the same footing, sometimes one and then the other standing at the head, with the tendency of growth being in favor of Germany.

In 1907 the commerce of the countries named was as shown below:

Country	Imports	Exports	Total
Canada .....	\$340,374,745	\$272,206,606	\$612,581,351
France.....	1,064,587,361	910,650,450	1,975,237,811
Germany .....	2,395,850,280	1,719,600,925	4,115,451,205
Great Britain.....	2,390,680,240	1,690,325,840	4,081,006,080
United States.....	1,434,421,425	1,880,851,078	3,315,272,503

**COMMERCE, Chamber of**, a board or association organized by the merchants and traders of a city to protect the interests of commerce. Organizations of this kind are very common in the cities of Canada and the United States, where they are maintained to further the interests of trade and to build up manufacturing and commercial enterprises. Usually they work in harmony with the town or city council, and frequently petition the Legislature for the enactment of laws favorable to the extension of trade relations within the states and provinces, or among the different sections of the nation. These organizations have been united to a large extent in building up a system of international chambers of commerce, which is designed to promote trade within the country and on a larger scale with foreign nations.

**COMMERCE AND LABOR, Department of**, one of the executive departments of the United States. It was created by an act of Congress on Feb. 11, 1903, and is under the direction of a secretary, who is a member of the Cabinet. The head of this department, like the other cabinet officers, is appointed by the President, subject to confirmation by the Senate, and the salary is \$8,000 per year. The duty devolving upon this department, as set forth in an act of Congress, is to foster, promote, and develop the domestic and foreign commerce of the United States, manufacturing, mining, and the fishery industry. It is incumbent upon the department to promote improvement of transportation facilities, supervise the business of insurance, and develop the interests of labor. George Bruce Cortelyou (born 1862) was made the first Commissioner of Commerce and Labor, but he resigned in 1904 and was succeeded by Victor H. Metcalf (born 1853), of California.

The Department of Commerce and Labor includes an effective organization of bureaus. These are the Bureau of Labor, Bureau of Corporations, Bureau of Navigation, Bureau of Manufactures, Bureau of Standards, Bureau of Foreign Commerce, Census Bureau, and Bureau of Statistics of the Treasury Department. With it are affiliated the steamboat inspection service, the lighthouse board, the lighthouse establishment, the immigration service, and the fish



commission. The Bureau of Corporations is presided over by a commissioner of corporations. This officer receives a salary of \$5,000 per annum, and has partial jurisdiction of the investigation and control of trusts and trade combinations. It is his duty to investigate the business management of any corporation of joint-stock companies engaged in commercial pursuits, both domestic and foreign, except common carriers, whose business is subject to the interstate commerce law. In an investigation by the commissioner of corporations he may subpoena and compel the attendance and testimony of witnesses.

**COMMERCIAL LAW**, or **Mercantile Law**, the branch of law which regulates the affairs of trade and commerce. It originated largely from the customs of merchants in the Middle Ages, when the peaceful arts of exchanging commodities began to replace the methods employed by the stronger nations in conquering the less powerful peoples. Though the relations of the citizen to his family and the state may differ widely under climatic and economic conditions, it must be admitted that some satisfactory arrangement for buying and transmitting commodities can be devised among the nations of the world. Besides, each of the nations has a system of commercial law which refers particularly to the domestic trade. It includes the enactments that refer to contracts, promissory notes, bills of exchange, deeds of trust, etc.

**COMMISSARY** (kõm'mis-sã-rÿ), in military, the term applied to the civil officer appointed to inspect the musters' stores and provisions of the army. During the times of war a number of commissaries are appointed, each being charged with some specific department of duty.

**COMMISSION** (kõm-mish'ün), a document issued by civil authority conferring designated rank, power, or authority on the person or persons therein named. The instrument bearing this title is issued by the government to officers in the navy and army, postmasters, justices of the peace, and other similar officials. Another class of commissions are those granted to a number of persons who are intrusted with the performance of certain duties of a legal or public character.

**COMMITTEE** (kõm-mit'tê), one or more persons appointed or chosen by a larger number, or by an organized body, to give special attention to some matter or to perform some service. In legislative bodies committees are appointed in special lines of legislation to examine bills of a particular character and to report

on the advisability of their passage. The whole body often resolves itself into a committee to consider any bill or matter, in which case the chair is occupied by some member, called the chairman of the committee. The *Committee of Public Safety* was made up of members of the French national convention during the first revolution. In 1792 the national convention abolished the monarchy and proclaimed a republic. The Committee of Public Safety was appointed on April 6, 1793, and had authority to supervise the work of several committees, among whom the executive functions of the government were divided. Later extended powers were vested in this committee and all the executive authority passed into its hands. The communists established a similar committee in March, 1871, but it fell about two months later.

**COMMODORE** (kõm'mõ-dõr), a naval officer of the United States, ranking next above a captain. A commodore generally has command of a few ships of war when they are detached for any purpose from the rest of the fleet.

**COMMON LAW**, the law of England which rests for its authority upon usage and universal acceptance, rather than upon any express and positive declaration of a legislative body. Blackstone classified the civil law of England under two divisions, the *statute law* and the *common law*, and defined the latter as a system of laws which consist of general customs and are accepted by particular courts. The common law is overruled by a statute law, but has precedence in cases in which equity is opposed to it. The State courts of the United States as well as the courts of the provinces of Canada rely upon the English common law, which constitutes the basis of the jurisprudence of these countries. However, Louisiana is an exception to this rule, since the laws in that State are based quite largely upon the jurisprudence of France.

**COMMONS**, the term applied to the common people as distinguished from the nobility. In England the term includes all the people below the peers, comprising the class represented in the lower house of Parliament, the House of Commons. The term is applied in the same way to the Parliament of Canada.

**COMMON SCHOOLS**, the term usually applied to the public schools below the high school, although the educational system of the cities includes schools of several grades, such as primary, grammar, high, and manual training schools. Those located in the rural district are called district schools, being under the supervision and control of the officers of the school district, and those situated in the wards of a



city are sometimes called ward schools. The schools of most countries are not organized and maintained under a national law, but are usually supported and controlled by the states or provinces, or are dependent largely upon local taxation. The courses of study in the common schools cover eight grades, or years, and outline the study in the common branches, which include chiefly reading, writing, spelling, arithmetic, geography, history, physiology, and grammar. In some of the states and provinces a number of other branches are included, such as music, algebra, drawing, botany, and civil government. These are supplemented in the high schools by courses covering four years of more advanced work. See **Education; Schools**.

**COMMONWEALTH** (kŏm'mŭn-wĕlth), a state in which the government is vested in the people, as in a representative republic. The term was applied to England after the execution of Charles I., Jan. 30, 1649, soon after which Oliver Cromwell became protector. It ended with the restoration to the throne of Charles II., on May 29, 1660.

**COMMUNE** (kŏm-mŭn'), the smallest territorial and administrative division of France and Belgium. It is the unit for local self-government and is regarded a legal body, hence may sue and be sued, contract debts, and buy and sell property. The chief officer, called the *mayor*, is assisted by a deliberative assembly known as the *conseil municipal*. Communes usually embrace several villages, but sometimes coextend with a town or city, or several communes are located within the same city. Those having a population of more than 3,000 are more largely under the direction of the central government, by which the mayor is appointed, while the chief officer in the smaller communes is appointed by the prefect of the department.

**COMMUNE OF PARIS**, a revolutionary committee organized in Paris in the French revolution of 1789, which soon absorbed the supreme authority in the government. The leading characters included Danton, Marat, and Robespierre. Of this triumvirate Marat was assassinated July 13, 1793, Danton was guillotined on June 5, 1794, and Robespierre met the same fate on July 28, after being captured at the headquarters of the commune at the Hôtel de Ville. The same name was applied to an insurrection in Paris which occurred on March 18, 1871. The organization was formed to carry out the traditions of the old revolutionary commune, and was proclaimed on the 28th. This occurred after a siege by the Germans, when the people gave evidence of much discontent with the government. Among the notable deeds

were the burning of the Tuileries and the Hôtel de Ville, the destruction of the Column Vendome, and the defacement of many notable buildings of historic interest. For ten weeks the most bloody and desperate fighting continued, and during the last ten days of May fully 65,000 communists were killed. On May 28, 1871, Paris was taken by storm and the Commune fell, many of the leaders being either executed or transported.

**COMMUNISM** (kŏm'mŭ-nĭz'm), the theory of government and social order according to which property is held as a common trust, and the profits derived from all labors are devoted for the general good. This theory involves the abolition of all private property and the transfer of everything possessed by individuals to the state, which is then charged with the task of assigning work to each of the citizens and dividing the profits among them. There are several communistic bodies in the United States. A number of them are religious organizations, such as the Shakers, Altruists, Church Triumphant, Bruderhof, Mennonites, and Separatists. Besides these are societies known as the Amana Community, the Harmonists of Harmony, Pa., and the Oneida Community of New York. A certain form of communism was advocated by Robert D. Owen in his publication of "New View of Society" in 1833, in Great Britain. He attempted to found a society on the new plan, without government assistance, on the banks of the Wabash in 1825, but was unsuccessful. The most prominent communistic leaders in France included Saint Simon, Proudhon, and Fourier, who operated as communists; in Russia they are known as nihilists, and in Germany as socialists. The Amana Community, located in Iowa, has been quite successful, but many of the communities have not realized the hopes of their organizers. See **Brook Farm**.

**COMMUTE** (kŏm-mŭt'), to pay in gross less than would be paid for each separate item combined, or accept an easier, lighter, or different kind of payment, obligation, or service instead of one formerly understood. The term is applied in judicial proceedings to an alteration or reduction of a sentence, as the commutation of the death penalty to imprisonment for life.

**COMO** (kŏ'mŏ), a lake in Lombardy, northern Italy, located at the foot of the Alps, and formed mainly by the Adda River, which enters it at the north and flows from it at the southeastern extremity. The lake is about two and one-half miles wide and about thirty-five miles long. Its excellent climate and beautiful scenery have made it the most celebrated pleasure resort



in Italy, and caused its shores to be studded with fine villas, vineyards, and gardens. It was once the residence of Queen Caroline. Trout and other valuable fish abound. The lake is visited by large delegations of pleasure seekers.

**COMO**, a city of Italy, in the province of Como, twenty-five miles northwest of Milan, with which it is connected by a railroad. It is situated at the southwestern end of Lake Como and is surrounded by a picturesque country. It has a fine gothic cathedral of the 14th century. Among the chief manufactures are silks, woolen textiles, velvet, cigars, and machinery. It has a brisk trade in merchandise, fruit, and earthenware. The public utilities include a museum, a public library, waterworks, and electric street railways. Como is the birthplace of Volta, Innocent XI., and Pliny the Elder and the Younger. It was anciently known as Comum. Population, 1906, 39,125.

**COMORO ISLANDS** (kōm'ō-rō), or **Comores**, a group of volcanic islands in the Mozambique Channel, between Africa and the northern extremity of Madagascar. The islands include Mohilla, Comoro, Johanna, Mayotta, and a number of smaller islets. The total area is 790 square miles. They have a fertile soil, though they are of volcanic origin, and produce fruits, sugar cane, and rice. These islands were ceded to France in 1886 and are governed as a dependency of Réunion. The inhabitants are chiefly of Arabic and Negro descent and profess Mohammedanism. Population, 1906, 75,500.

**COMPANY** (kūm'pā-nŷ), in business, a number of persons associated for carrying on any business, or for the performance of any duty. The shareholders divide the profits among themselves in proportion to the amount of capital invested. The term is applied in infantry to the smallest command of a captain. In the United States the full strength of a company is one hundred men.

**COMPARISON** (kōm-pār'ī-sūn), the act of setting forth the points of similarity or contrast between one thing or person and another. In grammar comparison is that inflection of adjectives or adverbs which indicates difference in the degree of quality. The three degrees of comparison are *positive*, *comparative*, and *superlative*. The last two are usually expressed by adding *er* or *est* to the positive, or by using *more* or *most*, *less* or *least*, before it. Great, greater, greatest; truthful, less truthful, least truthful are examples of comparison.

**COMPASS** (kūm'pās), an instrument for determining direction by means of a poised magnetic needle. In surveying, such an instrument

is used for measuring horizontal angles. It consists of a rotating telescope, mounted above a card showing the cardinal and other points. In electricity, an instrument known as a compass is employed for measuring the intensity of a voltaic current, in which a small needle is placed. The intensity of a current is measured from its proportion to the angle of deflection. This deflection is ascertained by the instrument, after which its corresponding value is obtained from a table of tangents.



MARINER'S COMPASS.

In nautics the *mariner's compass* is used to determine the course of a ship. It is usually inclosed in a box and this is again placed in a larger one, called a *binnacle*, and located in the back part of the vessel. The essential part of the mariner's compass is the magnetized needle. This is fastened to the lower part of the card, which is made of a leaf of mica, an ordinary cardboard, or some similar substance. The arrangements are so constructed that the card revolves with the needle. On it the four *cardinal points*, north, east, south, and west, are marked and some smaller divisions are indicated so as to constitute thirty-two in all, each one having a name compounded from the cardinal points. The compass is supported on gimbals to keep it in a horizontal position, notwithstanding the moving and rocking of the ship. In large iron or steel vessels a notable deviation of the north and south line from the magnetic meridian is ordinarily noticed, which is due to the permanent magnetism of such vessels. To overcome this a permanent steel magnet is placed in the vicinity of the compass, by



means of which an opposite attraction to that due to the ship is exerted with equal force. The helmsman carefully observes the movement of the compass when steering the ship so as to move forward in a continuous and proper course.

It is believed that the Chinese were the earliest inventors of the mariner's compass, using it first on land and afterward to guide ships on the sea, but the name of its inventor is not known. It was brought to Europe by Marco Polo, a Venetian traveler, in 1260. The Swedes knew of the compass in 1250, in the time of King Jarl Biger. The variations at different degrees of longitude were first discovered by Columbus in 1492, and rediscovered by Sebastian Cabot in 1540. The hanging compass now used was invented in 1608.

**COMPASS PLANT**, an annual plant of the Compositae order, native to the prairies of the Mississippi Valley. It was so named from its radical leaves, which are sensitive to the light and in midsummer point quite nearly to the north and south. Asa Gray, the noted botanist, attributed this property to the fact that both surfaces of the leaves are equally affected by the light, hence their edges are turned vertically and their tips assume a north and south position so as to receive an equal amount of illumination on both sides. The stems contain a large per cent. of resinous matter, hence the plant is known locally as *resin weed*.

**COMPOSITAE** (kõm-põz'ĩ-tē), an order of plants, distinguished by compound or composite flowers. The order is given various designations by writers, such as aster family, composite family, sunflower family, and thistle and chicory families. About 12,000 species of this order have been described, hence it is the largest family of plants that bear flowers. The heads of flowers are composed of a number of florets congregated upon a common receptacle, which is surrounded by bracts in the form of leafy or scaly involucre, giving the appearance of a single flower. In many species the florets are so uniformly arranged that it is common to speak of the aggregation as a flower, instead of referring to the individuals that make up the head as separate and distinct blossoms. However, in some species the florets differ materially in shape, size, and color, and those near the outside are frequently imperfect and sterile. In the typical flower the stamens are five in number and are united together by their anthers, and the ovary has one cell and one ovule. The corolla is above the ovary, and is either tubular or strap-shaped, both forms frequently occurring in the same plant. Many species of this

order are cultivated for ornaments, such as the aster, daisy, goldenrod, dahlia, and chrysanthemum. Others are important for their medicinal value and for food, including the sunflower, chicory, tansy, salsify, lettuce, dandelion, chamomile, arnica, wormwood, artichoke, etc.

**COMPRESSED AIR** (kõm-prẽst'), the name applied to atmospheric air compressed by means of pumps and utilized to propel machinery by the general force of expansion. It is used for propelling engines constructed quite like steam engines; the force of the expanding air being exerted against a piston in a cylinder. It has been made serviceable in water pumps, in elevators, facing machines, hydraulic presses, motors, railroad engines, brakes, hydropneumatic hoists, for ventilation, and various other purposes. In compressing air sufficiently to force a hundred cubic feet to occupy one cubic foot, it becomes very hot and loses some of its force in cooling. However, it serves a useful purpose in many respects, especially in rock drills, mining machinery, and various other purposes in the industries. The first attempt to utilize compressed air was made in 1700, since which time many improved machines have been invented and its use has been vastly extended. See **Air Compressor**.

**COMPROMISE** (kõm'prõ-mĩz), an agreement entered into between two parties to refer a matter in dispute to arbitration, and to abide by the decision of the arbitrator. In recent years compromises have been the means utilized extensively to settle various disputes between nations, such as the boundary dispute between the United States and Canada and that of Venezuela and British Guiana. See **Ashburton Treaty**.

**COMPROMISE OF 1833**, a tariff measure passed by the Congress of the United States in 1833, as a compromise for the high tariff act of 1828. The latter had caused intense dissatisfaction in the Southern States, and its strict enforcement brought about the nullification by South Carolina and a threat that the State would secede from the Union. Henry Clay proposed a compromise in the Senate, but the House took up the issue and passed a bill which became a law, though it was practically the same as that introduced by Clay in the Senate. It was designed to reduce the high duties gradually, until after ten years a free trade basis should be reached.

**COMPROMISE OF 1850**, a name given to a series of measures passed by the Congress of the United States in 1850, designed as a compromise between the antislavery and proslavery parties. Clay's Omnibus Bill was proposed and



defeated a short time before and the two were practically identical. The compromise provided that Texas was to receive \$10,000,000 for New Mexico; California was admitted into the Union under a free constitution; Utah and New Mexico were organized as territories, with the power to adopt or reject slavery; the Fugitive Slave law was enacted, under which fugitive slaves were returned when their owners made certain affidavits; and redress to free colored seamen imprisoned in Southern ports was prohibited. Henry Clay, Daniel Webster, and John C. Calhoun made celebrated speeches upon the various compromises. The measures thus enacted after much controversy were rendered futile when Stephen A. Douglas introduced his Kansas and Nebraska Bill, in 1854, when the whole controversy was opened anew in Congress and on the plains of Kansas.

**COMSTOCK LODGE** (kūm'stōk), an extremely rich metallic vein on the eastern slope of the Virginia Mountains, in the western part of Nevada. In this large and productive vein the Big Bonanza and other mines have produced gold and silver to the value of \$350,000,000. It was discovered in 1859. The depth of the mines is about 2,250 feet.

**CONCENTRATION** (kōn-sēn-trā'shūn), in pedagogy, the connection between the parts of each study and such a spinning of relations and connecting links between different sciences that unity may spring out of the variety of knowledge. Herbart was the first educator to make use of the term, and it is now employed quite generally by the Herbartians. The theory of concentration makes the child's mind the center for concentrating efforts in education, and utilizes the natural tendency of the mind to unify all its ideas, feelings, and incentives. Consequently concentration is concerned chiefly with the relation of different studies to each other.

**CONCEPCION** (kōn-sēp'shūn), a seaport city of Chile, capital of a province of the same name, on the Biobio River, about seven miles from its mouth. It is a well built city and has a number of public buildings and a cathedral. Many of the streets are paved with stone, lighted by electricity, and traversed by electric railways. Its port is Talcahuano on the Bay of Concepcion, about eight miles distant, and one of the most important in Chile. The city was founded in 1550 by Pedro de Valdivia (1510-1554). It suffered at various times by attacks of the Araucanian Indians and has been damaged frequently by earthquakes. Population, 1906, 61,786.

**CONCEPTION** (kōn-sēp'shūn), the formation of an idea or image in the mind. It con-

sists of a conscious act of the understanding, bringing an object or impression into the same class with a number of other objects or impressions, by means of some character or characters common to them all. *Perception*, by which individual ideas are acquired through the senses, is the first step in forming ideas or concepts. The power of conception depends largely upon the ability of the mind to separate ideas and classify them according to qualities, and then group them into a class. To cultivate this faculty it is necessary that the mind receive clear and definite ideas of objects and their properties, that they be deeply impressed so they may be permanently retained and readily recalled, and that they be associated according to their intrinsic or logical relations. Conceptions of the highest order can be obtained only by a close and accurate observation of the objects from which they are derived. When training the perception, the instructor is at the same time training the conception, but the latter process is relatively more important than the former. In forming conceptions the mind is greatly influenced by its feeling, and the concepts formed under circumstances causing deep emotion, either of pain or pleasure, remain almost indelibly.

**CONCERTINA** (kōn-sēr-tē'nà), a musical instrument in which the sounds are produced by admitting air through metallic reeds, as in the accordion. It was invented by Charles Wheatstone in 1829. The form is hexagonal and at each end is a keyboard, which is worked by the finger while drawing out and pressing the bellows to obtain a pressure of air, which works on the reeds as the keys are pressed. Every sound in the scale is double and can be produced by pulling or pressing the bellows.

**CONCH** (kōnk), a name applied to many marine univalve mollusks, especially to the rose-lined *stromb* of Florida and the West Indies. Large quantities of these mollusks are obtained in the Bahama Islands, where they are gathered and exported for cutting shell cameos. The fleshy parts are prized as food by the natives and the Indians use the shells in making white wampum. The *triton* of the East Indies has a large spiral shell that is known as conch, and, like that of the *stromb*, may be perforated and fitted with a mouthpiece and finger holes and used as a sonorous musical instrument.

**CONCHOLOGY** (kōn-kōl'ō-jy); the science of shells. See **Shells**.

**CONCLAVE** (kōn'klāv), the apartments where the cardinals of the Roman Catholic Church assemble for the election of the Pope, or the assembly of cardinals convened for that pur-



pose. The cardinals are permitted to appoint the place for the election, but the conclave is usually held in the Vatican or the Quirinal palace at Rome. They assemble on the tenth day after the death of the Pope, the meeting being in a large hall connected with small rooms, two of which are assigned to an ordinary cardinal and three to one of princely rank. The deliberations are held in privacy and all of the members of the conclave are locked in and attended by two or three conclavists or attendants. No communication is allowed with any one on the outside, and the food is carefully inspected so no concealed missive may reach the conclave. The vote is by ballot taken twice a day until it is possible to secure an election, for which a two-thirds vote is necessary.

**CONCORD** (kɔ̃n'kɛrd), a town of Middlesex County, Massachusetts, on the Concord River, and on the Boston and Maine Railroad. It is the seat of the Massachusetts Reformatory, has a public library, and is a market for fruit and produce. The manufactures include harness, clothing, and rubber goods. At the bridge across the river the first shots of the American revolution were fired on April 19, 1775. A monument marks the spot where several British soldiers fell. The Battle of Lexington commenced at Concord, the Americans pursuing the British, who were on a rapid retreat. At that time the population of Concord was 1,300, and it sent 174 men to the army in 1775. The soldiers' pay was raised by the town. Among the persons of literary eminence who made their home at Concord are Alcott, Hawthorne, Emerson, and Thoreau. The town was founded in 1635. Population, 1905, 5,421.

**CONCORD**, the capital of New Hampshire, in Merrimac County, on the Merrimac River, 58 miles northwest of Boston. It is on the Boston and Maine Railroad and several electric inter-urban lines. The river divides the city into two parts, which are connected by a large number of bridges. The streets are well paved, lighted, and otherwise improved. It has street railways, waterworks, and a sewer system. Among the educational institutions are the high school and the Saint Paul's School. The city has a public library of 15,000 volumes. Among the noteworthy buildings are a State insane asylum, the city hall, two orphanages, a home for the aged, the State prison, and a beautiful State house built of granite. The manufactures include hardware, carriages, woolen and cotton fabrics, cutlery, flour, shoes, and musical instruments. Near it are some of the most valuable granite quarries of the East. It was first settled in 1725, when it was known as Pennock. In 1816 it be-

came the State capital and was incorporated as a city in 1853. Population, 1900, 19,632.

**CONCORD**, a city in North Carolina, county seat of Cabarrus County, twenty miles northeast of Charlotte, on the Southern Railroad. It has a public library, several county buildings, and a number of educational institutions. The manufactures include cotton goods, ironware, cigars, and machinery. The city has good municipal improvements. It was settled at an early date in the Colonial period and was incorporated in 1793. Population, 1900, 7,910.

**CONCORDANCE** (kɔ̃n-kôrd'ans), an index in alphabetical order to the words or topics of a book, especially such an index to the Bible. The first known concordance of the Bible in any language was that prepared by Saint Anthony (1195-1231), who issued such a work in the early part of the 13th century under the title of "Concordantiae Morales in Sacra Biblia." This work is a concordance of the Latin Vulgate. A more elaborate edition was prepared, using Saint Anthony's as a basis, and published in 1244. Since then various concordances have been published in the Greek, English, German, and other languages. The same name is applied to a work designed to facilitate reference to other works, such as were published to Shakespeare in 1790, Milton in 1856, and Tennyson in 1870.

**CONCORDAT** (kɔ̃n-kôr'dăt), any public act of agreement, as a treaty. The term is applied most frequently in papal history to an agreement between a papal see and a secular power for the settlement and regulation of the ecclesiastical affairs. Among the most prominent concordats are those concluded between Pope Calixtus II. and Emperor Henry V. of Germany, in 1122, which still regulates, to a limited extent, the affairs of the Catholic Church of Germany. A concordat was effected between Pope Leo X. and Francis I. of France in 1516, by which the election of the bishop and of several sees was regulated. The concordat between Pius IX. and Emperor Francis Joseph I. of Austria, in 1855, made provisions whereby the legal powers of the papacy were defined in application to the empire. It was set aside in all the dominions of the Emperor of Austria in 1868. Many other concordats were made with different countries.

**CONCRETE** (kɔ̃n'krêt), in arithmetic, a term used to designate a number or quantity applied to certain persons or things as opposed to an *abstract* number. Thus, the expressions five men or eight bushels are concrete numbers; five and eight are abstract. In logic, the name concrete is applied to any quality which is considered in connection with the object to



which it belongs. Thus, *wisdom*, when spoken of alone, is abstract, but when we speak of a *wise man* the quality is concrete.

**CONCRETE**, an artificial stone composed of a mixture of gravel or broken stone, sand, and hydraulic cement. The proportions of material depend upon the purpose for which concrete is to be used. In most engineering works one part consists of cement, one to three parts of sand, and four to six parts of gravel, broken stone, pebbles, shells, or some other hard material. The value of concrete in construction work consists in its property of changing from a plastic condition into a hard and rigid stone, due to the fact that the cement paste sets and hardens with age. It is estimated that concrete composed of two parts sand, one part cement, and six parts broken stone at the age of one year has a compressive strength of from one to two tons per square foot.

Within recent years concrete has become exceptionally popular as building material. This is true in all construction work, such as bridges, dams, foundations, and even large dwellings. For the last-mentioned purpose hollow concrete building blocks have come into extensive use. A fine example of the value of concrete is seen in the great sea wall at Galveston, Tex., which is about five miles in length and seventeen feet high, and supplies a safe and efficient protection of the city from overflows of the sea. This sea wall was constructed at an outlay of \$3,505,040. Concrete has also come into use in the construction of lighthouses and to reënforce breakwaters. An example of the former is in the lighthouse recently completed at the mouth of the Boug River, flowing into the Black Sea.

Prof. I. O. Baker summarizes the use of concrete in "A Treatise on Masonry Construction," as follows: "Concrete is admirably adapted to a variety of most important uses. For foundations in damp and yielding soils, and for subterranean and submarine masonry, under almost every combination of circumstances likely to be met with in practice, it is superior to brick masonry in strength, hardness, and durability; it is more economical, and in some cases is a safe substitute for the best natural stone, while it is almost always preferable to the poorer varieties. For submarine masonry, concrete possesses the advantage that it can be laid, under certain precautions, without exhausting the water, and without the use of a diving bell or submarine armor. On account of its continuity and impermeability to water, it is an excellent material to form a substratum in soils infested with springs; for sewers and conduits; for basement and sustaining walls; for columns, piers,

and abutments; for the pointing and backing of walls faced with brick, rubble, or ashlar work; for pavements in areas, basements, sidewalks, and cellars; for the walls and floors of cisterns, vaults, etc. Groined and vaulted arches, and even entire bridges, dwelling houses, and factories in single monolithic masses, with suitable ornamentation, have been constructed of this material alone."

**CONDENSED MILK** (kōn-dēnst), an important article of commerce made of cow's or goat's milk. The milk is placed in vacuum pans and evaporated to about one-fourth of its volume. Sugar is added to the amount of about one pound to the quart of condensed milk. The manufacture of this article is enlarging continually. See **Milk**.

**CONDIMENT** (kōn'dī-mēnt), any seasoning or sauce used to excite the appetite by communicating a pungent taste to food with which it is mixed. Many condiments assist in digestion, and, by tempting the palate, stimulate the appetite and increase the amount of food consumed. Among the most common are salt, pepper, mustard, nutmegs, vinegar, cloves, horseradish, and pickles. It is necessary to exercise moderation in using condiments, as an over consumption is injurious to digestion.

**CONDOR** (kōn'dōr), the largest vulture of South America, native principally to the Andean regions of Chile, Peru, and Colombia. The favorite haunts of this bird are elevations in the mountains, usually from 4,000 to 16,000 feet, but at times it soars to the tremendous elevation of 21,000 feet above the level of the sea. It floats with outstretched and motionless wings in airy circles. The size is about nine feet measured from wing to wing and four feet from the beak to the end of the tail. Humboldt found none exceeding this measurement, though rare specimens have been found that measure eleven feet from wing to wing, and in one instance a condor was captured which measured as much as fourteen feet. The head and neck are bare, the former being flattened at the top and crowned with a comb on the head of the male. The plumage is usually a deep black with a tinge of gray. The wing coverts in the males are white, and the legs are bluish gray. The powerful talons are large, but quite smooth and blunt.

These birds make no nest, but instead lay their eggs on the bare rocks, usually two in number, which are hatched after seven weeks by the warmth of the sun. The young are covered with down of a whitish color, reaching maturity at two years, and accompanying their parents for some time after being able to fly.



The mountain heights are their favorite abode, to which they return after descending into the valleys and plains for food. Their food consists of carrion, but in the absence of an abundance they attack sheep, deer, goats, and other small animals. Their mode of attack is to dart against the eyes of their prey and seek to inflict mortal wounds by means of the beak. When opportunity occurs they gorge themselves



CONDOR.

with carrion and are then easily caught by the Indians and hunters. The *king vulture* is closely allied to the condor and is found in the warmer parts of America. This bird has a reddish plumage above and white beneath, with a bluish-gray ruff and a black tail. It attains to about the size of a goose. The condor and birds of this genus have no voice; the only sound given out is a sort of snorting.

**CONE**, a solid figure that tapers uniformly from a circular base to a point. It is a *right cone* when the point lies in the perpendicular from the center of the base, other wise it is an *oblique cone*. Cones are similar when their axes and the diameter of their bases are proportional. In botany the cone is a kind of collective fruit shaped like a mathematical cone. The fruit of the Scotch fir is a cone.

**CONEMAUGH FLOOD** (kōn'ē-mā), the name of a flood occurring in Johnstown, Penn., on May 31, 1889. A dam was located across the

South Fork creek, ten miles above Johnstown, a little above its junction with the Conemaugh River, by means of which the water formed an immense reservoir. The artificial lake was stocked with fish, and its vicinity served as a pleasure and resort district for the people, most of whom were residents of Pittsburg. Heavy rain preceding the flood tended to weaken the dam and it broke on the afternoon of May 31, sweeping everything before it. The loss of life was 2,500; fully 99 entire families were lost. This loss was partly by drowning and partly by burning those who had been blocked in by the timbers, which had caught fire from an overturned stove. The villages below the lake had a total population of about 45,000, and more or less damage was done to them by the great water wave passing down the valley.

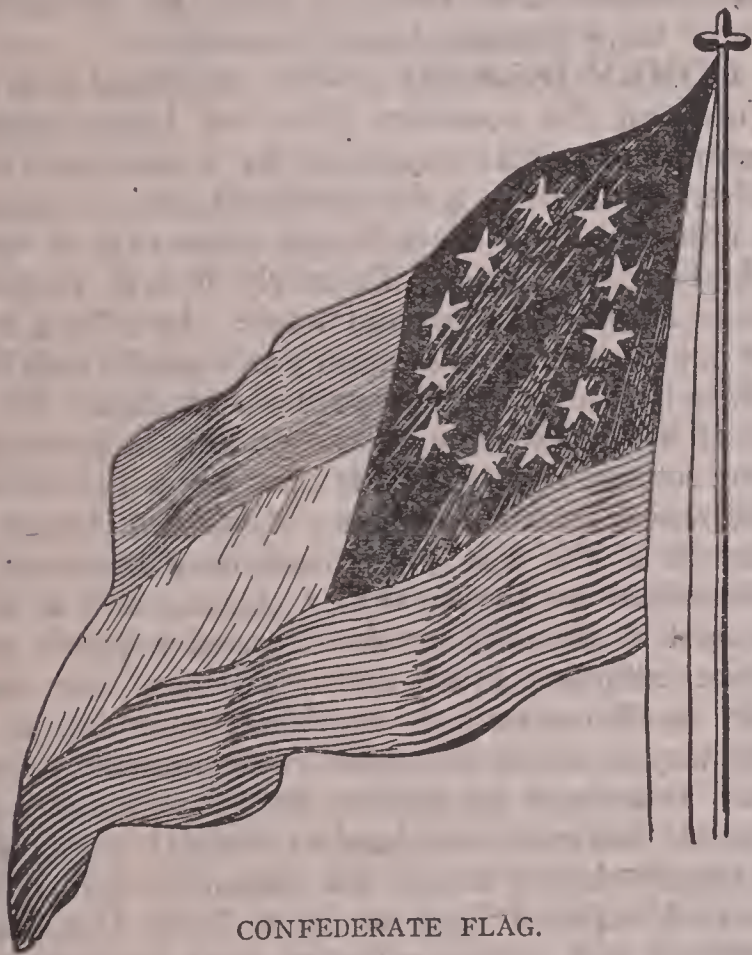
**CONEY ISLAND** (kō'nī), an island in New York, on the southern shore of Long Island, from which it is separated by a narrow tidal inlet. It is from a few hundred feet to nearly a mile wide and has a length from east to west of about five miles. Formerly it was nothing more than an entire sand waste. In 1874 a line of improvements was begun that transformed the district into a highly valuable region. It is lined with handsome summer hotels and concert and bathing houses, and is crowded with visitors the entire summer season. Manhattan Beach is located at the east end, constituting the portion patronized by the wealthier classes, and is improved by magnificent and expensive hotels and other edifices. Music halls, galleries, and concert pavilions furnish ample accommodation in the way of amusement and entertainment. Several steamboat companies carry passengers at regular intervals and land at tubular iron piers a thousand feet long. The island is joined by several railroad lines to New York City, and elevated and surface railways carry the pleasure seekers to different portions of the island. It was annexed to Brooklyn in 1894 and is now a part of New York City.

**CONFEDERATE STATES OF AMERICA** (kōn-fēd'ēr-āt), the name applied to the union formed in 1861, when eleven states seceded from the United States. The slave question was for many years the cause of extended political and social discussion, and the election of Abraham Lincoln to the Presidency was the immediate occasion for taking steps to dissolve the Union and establish a separate government in the southern portion of the United States. South Carolina seceded first and led in the movement to dissolve the Union. A convention assembled on Dec. 17, 1860, and three days later a resolution was adopted which declared that the Union



previously existing between South Carolina and the other states, under the name of the United States of America, was dissolved. Mississippi followed on Jan. 9, 1861, and proposed a convention to form a Southern Confederacy. The convention met at Montgomery, Ala., Feb. 4, with delegates representing six of the seven states that had then seceded. A provisional Constitution was adopted on Feb. 8, with Jefferson Davis, of Mississippi, as provisional President and Alexander H. Stephens, of Georgia, as Vice President.

The permanent Constitution adopted on March 11 set forth the doctrine of State sovereignty and recognized slavery, though it forbade the slave trade. It established free trade, allowed



CONFEDERATE FLAG.

members of the Cabinet to speak before Congress, authorized the President to veto single items in appropriation bills, and forbade the issuance of credit bills. The presidential term was fixed at six years, and the President was not to be reelected. All the seceded states, including South Carolina, Mississippi, Florida, Alabama, Georgia, Louisiana, and Texas, ratified the Constitution through conventions. Besides these seven states, Virginia, North Carolina, Tennessee, and Arkansas seceded and were admitted into the Confederacy. Richmond was made the permanent seat of government and Davis and Stephens were elected President and Vice President under the Constitution and inaugurated on Feb. 22, 1862. Large powers were given to the President and he was authorized to

direct the energetic prosecution of the war. Money was obtained by cotton loans, by treasury notes, and by requisition, while necessary supplies were acquired by every available means. The government secured belligerent rights from most maritime nations, but its independence was never recognized. The spirit entered upon in the war and the alacrity with which the southern people responded to the call to arms demonstrated great bravery and determination to prosecute the cause of the Confederacy. However, the Federal government never recognized its existence and treated its representatives sent to Washington as citizens of the United States. The history of the confederation is limited to the period covered by the Civil War, and the causes immediately leading up to it. It ceased to exist with the surrender of the Confederate army on April 9, 1865, at Appomattox, Va.

About fifty years have passed since the issues of the Civil War divided the nation into two great factions, each contending for what was held to be a sacred cause, a principle in human government worthy to be defended by life itself. The feeling of jealousy and mistrust that separated the two sections in sentiment long after the surrender of Gen. Lee has happily given way to a new era of commercial and political fellowship, a period in which all sections are united in the uplift that makes for the greatness and perpetuity of an intelligent nation. Oratory and editorial comment are now tempered with the spirit of the times, and the discussion of past events and future ambitions is that of a people united in every phase of national life. This is reflected in a recent article of Dr. G. R. Glenn, of the North Georgia Agricultural College, in which he says in part:

"The purpose of the Confederate Constitution was not revolutionary. There was in the instrument no encroachment on the rights of any northern State. All that the southern people asked of the United States was to be allowed to secede in peace and set up a government that comported with the aims and ideals of the governed. Conservative men on both sides urged a peaceful separation. Men like Mr. Greeley at the north and Mr. Stephens at the south plead for the preservation of the Union and, if that could not be preserved, then for a friendly separation.

"When the President of the Confederate States called for volunteers men came by the thousands to enlist. As we look back now, when about half a century has passed, their daring and courage seem colossal. Who were these men and for what were they to fight? Nine-tenths of them were poor and did not own a slave and



certainly they would not engage in a war for the preservation of slavery. The President of the Confederate States said at the beginning of his government that slaves would cease to be property, and Gen. Lee, the head of the army, freed all of his slaves in 1861. The volunteers were offering themselves to their government to defend a Bill of Rights and a Constitution. They were educated to believe that their State governments were their own, and that any encroachments upon their rights to manage their domestic institutions as they saw proper was a violation of a sacred compact. Slavery was to them only one of the incidents in the quarrel. It may have been the occasion; it was not the cause of the separation.

"The Confederacy died, but the cause for which it lived and struggled did not die. A recent writer says: 'So deeply, though silently, have the minds of the American people been impressed by the magnificent struggle of the Confederate soldiers for the right of local self-government that the hold of that right upon the public conscience has steadily increased in many of the northern states. Over and over again, moreover since the war, has the United States Supreme Court affirmed the limitation of the authority of the general government to the powers distinctly delegated, and the reservation to the states of all undelegated power. The prediction is made that the future historian will say that, while the armies of the North saved the Union from dissolution, the armies of the South saved the rights of the states within the Union.'"

About twenty years ago William D. Kelley, known as "Pig Iron" Kelley, said: "The development of the South means the enrichment of the nation." The truth of this expression must be apparent to all who take time to study the amazing progress of the industries and advancement in values in the southern states. Land in Louisiana that sold at 60 cents per acre in 1895 would command \$50 at present; the same proportional increase in values is true in practically all the states south, not alone in land, but also in iron-ore property, coal fields, and other mineral interests. In 1860 the valuation of property in the south was \$5,200,000,000, and in 1870 it was only \$3,000,000,000, but at present it is \$7,500,000,000, an increase of more than a hundred per cent. since the close of the war. The southern states dominate the cotton market of the world, receiving from Europe alone more than \$400,000,000 per annum for ginned cotton, or more than \$1,000,000 for every day in the year. Rice lands have advanced from \$12 to \$50 per acre; the rice-growing fields of Louisiana and

Mississippi are especially prolific. This is true also of the cultivation of other cereals and tobacco, the rearing of domestic animals, and the output of a large variety of products in the manufacturing industry. The following figures for 1890 and 1905 are of interest in studying the growth of industry in the south:

	1890	1905
Number of cotton mills.....	119	780
Railroad mileage.....	42,900	60,250
Phosphate mined, tons.....	510,299	1,875,480
Bales of cotton used.....	546,330	2,165,150
Pig iron made, tons.....	2,600,500	3,250,000
Coke produced, tons.....	2,534,475	6,245,270
Number spindles in cotton mills	1,712,000	9,205,100
Petroleum, barrels.....	498,632	42,495,802
Coal, tons.....	21,250,000	70,185,000
Capital invested in cotton-oil mills.....	\$12,800,000	\$74,600,000
Capital invested in cotton mills	60,000,000	225,000,000
Lumber products, value.....	90,700,000	250,000,000
Value of exports.....	306,000,000	555,480,000
Value of cotton crop.....	390,000,000	680,000,000
Capital invested in manufacturing.....	659,000,000	1,500,500,000
Value of farm products.....	773,000,000	1,750,000,000
Value of manufactured products	917,589,000	1,765,000,000
Property assessed.....	4,510,925,000	6,500,000,000

**CONFEDERATE VETERANS, United,** a patriotic organization of veterans of the Confederate States, founded in 1889 at New Orleans, La. The society was established to gather and preserve an impartial history of the Civil War, to cherish and cultivate the friendships formed during the conflict, to commemorate the valorous deeds of the dead, and to give aid and support to the widows and orphans. All surviving soldiers and sailors of the Confederate service are eligible to membership. The local organizations are classified in three departments, those of the Army of Tennessee, of northern Virginia, and of the trans-Mississippi. A button with a square miniature Confederate flag is worn in the lapel of the coat. About 1,500 local camps with a membership of about 70,000 comprise the society, which holds a general reunion each year.

**CONFEDERATE VETERANS, United Sons of,** a patriotic organization founded in 1896 at Richmond, Va. All the male descendants of the veterans who have an honorable military record in the Confederate army or navy are eligible in the society, which is organized in the three departments known as those of northern Virginia, of Tennessee, and of the trans-Mississippi. Local camps are maintained in all the southern states and reunions are held annually, both by the locals and by the departments. The membership is about 10,000. The society purchased Beauvoir, the home of Jefferson Davis, in 1902, and converted it into a home for Confederate Veterans.

**CONFEDERATION, Articles of.** See **Articles of Confederation.**



**CONGO** (kōŋ'gō), or **Kongo**, a great river of the Southern Hemisphere, in the equatorial regions of Africa. It was discovered in 1484 by Diego Cam and named Pillar River. Shortly after the Portuguese explored a portion of it and named it Zaire, by which it is still known in some countries. The English explored 175 miles of its lower course in 1816. Livingstone discovered a number of its tributaries in 1868, and Stanley explored and published accounts of it in 1876-77. The upper portions widen into Lakes Moero and Bangweolo, from which the waters flow toward the north, then make a bold sweep toward the northwest, thence toward the southwest, and finally enter the Atlantic Ocean. The principal northern tributaries are the Ubangi and Aruwini; the southern, the Kassai and Lulongo. It is divided into the upper, middle, and lower parts. The upper portion is navigable for more than a thousand miles by steamers, from Stanley Pool to Stanley Falls; the middle extends from the cataract regions to Stanley Pool, about 260 miles; the lower, from its mouth to the cataract region, 110 miles. The total length of the river is about 2,550 miles. It ranks as one of the ten great rivers of the world. The volume of water discharged by it is exceeded only by the Amazon.

**CONGO FREE STATE**, a colony of Belgium, located in Central Africa, containing an area of 900,000 square miles. Its boundary line is not well defined, but may be stated in general to be formed by French Congo on the northwest, German East Africa on the east, British Central Africa on the south, and by Angola and the Atlantic Ocean on the west. It owes its organization to the discoveries of Stanley, carried on largely under the International Association founded at Brussels in 1876, under the presidency of the King of Belgium. An international conference was held in Berlin in 1885, at which certain rights and privileges, such as free trade and international navigation, were guaranteed to the principal nations. The state was placed under the sovereignty of Leopold II., King of Belgium, who had contributed largely to the exploration and opening of the Congo district. By a treaty made in 1890 the king conveyed his rights to Belgium with the privilege of annexing it in the year 1900. Much dissatisfaction among the inhabitants was reported in 1907, owing to atrocities practiced by the authorities upon the natives.

The Congo region includes the principal part of the basin of the Congo River. It is exceedingly fertile and includes many valuable mineral and agricultural districts. The river system affords no less than 6,000 miles of navigation facilities, while a railroad line has been built

from the ocean to Leopoldville, a point immediately above the cataract. Its interior and foreign trade is fast developing under twenty-five commercial companies, representing a capital of about \$25,000,000. The principal products and exports consist of caoutchouc, ivory, wax, copra, coffee, cotton, fruits, sugar, and many others of value commercially. The principal minerals include gold, lead, iron, copper, and coal. It has extensive forests, yielding valuable wood, India rubber, palm oil, nuts, and palm kernels. A majority of the trade is with Belgium, Germany, Great Britain, France, and Holland. Manufactures have been developed by means of excellent water power from the numerous falls and cataracts of its rivers, and several important railroad lines have been built. Among the lakes are Moero and Leopold.

The government is administered by the King of Belgium, who is assisted in the affairs of the state by two ministers. A governor general at Boma represents the government in the state. The principal cities are Boma, on the Congo, which is the capital, Leopoldville and Equatorville. The last mentioned is located at the junction of the Bosira and the Congo rivers, under the Equator. Numerous other trading points have been developed from Belgium, under a commission, of which the king is the chief officer. The natives are peaceable and considerably advanced in civilization and industrial arts. They are chiefly of the Bantu race. The European population does not exceed 3,000, of which about two-thirds are Belgians. The total population is estimated at 30,000,000.

**CONGREGATIONALISTS** (kōŋ-grē-gā'-shūn-ā-l-ists), a body of Christian churches, most largely organized in England and the United States. The doctrine of these churches does not differ essentially from the other Protestant denominations, but in government they occupy a vastly different field. Each congregation has independent power of self-government, uncontrolled by any bishop, presbytery, or other external ecclesiastical authority. Deacons are subordinate rulers and ministers are recognized, but the congregation itself decides upon its membership and disciplinary power. They believe their form of government to be of divine authority, and to have been that of the apostolic churches. This view is rejected by the Presbyterian, Episcopal and various other churches, most of which claim similar descendency.

Among the first advocates of a system of government similar to modern Congregationalism was Robert Brown, born in the middle of the 16th century. He was a preacher, schoolmaster, and lecturer, and led a party in opposition to the



constitution of the Established Church. He set up a congregation in London about the year 1593, when the number of his followers was estimated at about 20,000. Owing to opposition against the leaders, especially on the part of the Established Church of England, he was compelled to remove to Holland, where several churches were organized. The history of this movement is an interesting one and connects Oliver Cromwell and his soldiers with the followers, then called *Dissenters* or *Independents*. After vainly petitioning for religious freedom, they became alienated from Parliament and the Presbyterians. From this time on they grew rapidly in numbers, and now constitute the third English denomination. In the United States they rank as eighth in number. An international council was held in Boston in 1899, the second in the history of the denomination, at which it was decided to establish extensive missions for Cuba and Porto Rico. This denomination has 5,850 ministers, 5,760 churches, and 684,500 members in the United States. Their institutions of learning include thirty, with more than 500 professors, 4,575 students, and an endowment fund aggregating about \$10,000,000. In Canada and Newfoundland they have 155 churches and 12,580 members.

**CONGRESS** (kōn'grēs), a formal meeting of persons regarded as representatives of a society or country for deliberation and discussion. The term is especially applied in political affairs to assemblies or conferences and to the legislative authorities of many nations. It is the name given to the legislative branch of the government of the United States, and in history is attached to three different bodies. The first was the Colonial Congress, which met in New York on Oct. 7, 1765, and was constituted of delegates from nine colonies. All the colonies except Georgia were represented in a similar congress at Philadelphia July 5, 1774, and declared certain rights. This body became known as the Continental Congress, and adopted the Declaration of Independence on July 4, 1776. The next Congress was the one organized under the Articles of Confederation. It met for the first time on March 2, 1781, and was succeeded by similar assemblies until March 4, 1789, when the Constitution went into effect. The first Congress under the Constitution met in New York in 1789, then the capital. Its meetings were held at Philadelphia from 1789 until 1800, when the capital was moved to Washington.

The Congress of the United States consists of a *Senate* and a *House of Representatives*, in which the legislative authority of the United States is vested, under the supervision of the

veto power granted to the President. It has power to lay and collect taxes, duties, imposts, and excises; to borrow money; to regulate commerce; to coin money; to constitute judicial tribunals; to declare war; to provide and maintain a navy; to grant letters of marque and reprisal; to raise and support armies; to provide for the calling forth of military forces; and to admit new states into the Union. Among the provisions common to both houses are the power to judge of the election and qualification of its members, to compel the attendance of members, and to determine the rules of its proceedings. Each may punish and expel members with the consent of two-thirds. A *quorum* of each is constituted of a *majority*, the presence of which is required to transact business. Neither body can adjourn for more than three days without the consent of the other, nor to any other than the usual place of meeting. The salary is \$7,000 per annum, payable monthly out of the treasury, and an allowance of twenty cents for each mile traveled by a usual route. The meetings of Congress occur on the first Monday in December of each year, but this time may be changed by law, and the President may convene the Congress in an extra session.

The first Senate consisted of 26 members. It is constituted of 92 members at present. Two senators are chosen by the Legislature of each state, for a term of six years. The qualifications are: age, thirty years; citizenship, nine years; and inhabitancy in the State in which chosen. The senators are divided into three classes, one-third going out of office every two years. They may be reelected for an indefinite number of terms. The Senate has concurrent legislative powers with the House, and, besides, has power to confirm appointments made by the President and to consent to treaties. In it is vested the power to elect the Vice President, in case the electoral college fails to make a choice. This occurred only in 1837, when Richard M. Johnson was elected Vice President. It is also a court of impeachment, having power to try those impeached by the House. The Vice President is the presiding officer, besides whom a president pro tem. is chosen by the body.

The House of Representatives is made up of members elected by the voters of the several states, the representation being based upon the population in accordance with the national census taken every ten years. The representation in the first Congress was based on 30,000 inhabitants, the membership consisting of 65. In 1901 Congress fixed the number at 386, an increase of 29 members over the basis of 1890. Each State is entitled to at least one representative. The con-



ditions of eligibility are: age, twenty-five years; citizenship, seven years; and inhabitancy of the State from which they are chosen. The election is held in the even-numbered years, and the term is for two years. Each Territory is represented in the House by a delegate, who may speak on any question, but cannot vote.

Besides having concurrent legislative powers with the Senate, the House has original and exclusive power to originate bills for raising revenues. It has power to impeach officers of the United States, and to elect a President in cases where the electoral college fails to make a choice. This occurred but twice; in 1801, when Jefferson was elected, and in 1825, when John Quincy Adams was chosen. The speaker and the officers of the House are chosen from the members by a general vote. The House more particularly represents the people than does the Senate, while the Senate represents more particularly the states. The plan of electing the Senators was proposed in deference to the view held, in the early history of this country, that states have certain rights greater than the nation, and which were not relinquished to the nation at the time of forming the Union. There is a large class of voters that hold to the advisability of electing both the representatives and Senators by popular vote of the people.

**CONGRESSIONAL LIBRARY.** See Library of Congress.

**CONGRESSIONAL RECORD,** the printed proceedings of the United States Congress. In the early history of the republic, up to 1799, the Senate held its sessions with closed doors and no journal of its proceedings was published, but since that time the record is printed daily. It cannot be said that the Congressional Record is an authentic publication, since members are permitted to revise their speeches after they appear in type, and they are also permitted to have remarks and speeches inserted that were not delivered in session. From 1789 to 1824 the journal was called the *Annals of Congress*; from 1825 to 1837, the *Register of Debates*; and from 1837 to 1874, the *Congressional Globe*.

**CONIFERAE** (kō-nīf'ēr-ē), an important order of plants, including the fir, yew, pine, cypress, larch, juniper, etc. Trees of this group are most abundant in the temperate zones and are very sparsely represented in the tropics. Most of the species have a central shaft extending almost to the top, while the branches grow horizontally and diminish upward, thus giving the tree a conical outline. The leaves are slender and firm, well constructed to endure cold, but are not formed to supply choice foliage. In some of the conifers the leaves are flat and

broad and in others they consist of disklike portions that appress and overlap each other, as in the arbor vitae.

Most species of the Coniferae are *evergreen*, that is they have no regular period of shedding their leaves, which fall from time to time as new growths take their place. To this there are some exceptions, such as the larch, or tamarack; which sheds its leaves annually. The fruit, which in most species is a cone formed of heavy scales, contains a number of seeds. The



LARCH.

A, twig with flowers; B, same with cones.

scales lie firmly against each other until the seeds ripen, when they open and the seed is carried away by the wind. In this class of conifers the seed is fertilized by a yellowish pollen, which becomes effective at the time the seed escapes. Some of the species produce berries, such as the junipers. These and the pines are widely distributed, but the bald cypress and sequoia are greatly restricted. Many fossil conifers occur in good preservation in all the geologic formations from the middle Devonian to the most recent.

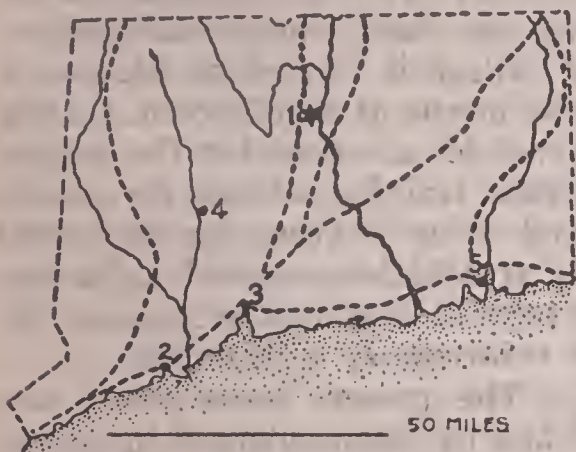
**CONJUNCTION** (kōn-jūnk'shūn), in astronomy, the position of a planet when it is in the same straight line with the earth and the



sun. It is said to be *inferior* when between the earth and the sun, and the conjunction is called *superior* when the planet is outside the earth so the latter is the central body, or is beyond the sun so the latter is between the earth and the planet. The three bodies are never in a truly straight line, on account of the inclination of the planes of the several orbits. When several stars or planets are found together they are said to be in *grand conjunction*. These are of course extremely rare, but such a conjunction, according to Chinese history, is said to have occurred about 2430 B. C., in the reign of Tehuen-hiu. A conjunction of the moon, earth, and sun is called an *eclipse*.

**CONNEAUT** (kōn-nē-āt'), a town of Ash-tabula County, Ohio, in the northeastern corner of the State, on Lake Erie, and on the Lake Shore and Michigan Southern and other railroads. It has steamboat facilities and a considerable trade in coal and farm produce. Near the town, at the mouth of Conneaut Creek, is a lighthouse. The manufactures include brick, canned goods, and machinery. It is one of the oldest towns in Ohio, having been settled in 1796, and was incorporated in 1832. Population, 1900, 7,133.

**CONNECTICUT** (kōn-nēt'ī-küt), one of the original thirteen states of the United States, known popularly as the Nutmeg State. It is



1, Hartford; 2, Bridgeport; 3, New Haven; 4, Waterbury; 5, New London. Chief railroads shown by dotted lines.

included between latitudes  $40^{\circ}59'$  and  $42^{\circ}3'$  north and longitude  $71^{\circ}47'$  and  $70^{\circ}43'$  west. The boundary on the north is formed by Massachusetts, east by Rhode Island, south by Long Island Sound, and west by New York. Its greatest length from east to west is about 104 miles and its greatest breadth is 76 miles, with an average width of 57 miles. The total area is 4,990 square miles, which includes a water surface of 145 square miles. It is the third smallest State in the Union, but in population holds twenty-ninth rank.

**DESCRIPTION.** The surface of Connecticut is diversified, but it is not greatly elevated above the sea at any point. In the northern section are the highest elevations, where the highland region extends into the State from Vermont,

and the surface slopes gradually toward the south. The Berkshire Hills, which extend from the Green Mountains of Vermont into Massachusetts, traverse the northwestern part of the State. In the eastern part the hills are rounded and fertile and in the northwestern section they are often broken and precipitous, with bold bluffs of trap rock. Bear Mountain, the highest elevation, is 2,355 feet above the sea. Other summits include Girdley Mountain, Prospect Mountain, Riga Mountain, and Ivy Mountain. Level plains extend along the streams, and much of the country adjacent to Long Island Sound is level or characterized by low hills.

The principal river is the Connecticut, which crosses from north to south through the center of the State. Three river systems furnish practically all of the drainage, the Thames and its tributaries in the eastern portion, the Connecticut in the central part, and the Housatonic in the western section, and all of them flow into Long Island Sound. The Pawcatuck forms part of the boundary between Connecticut and Rhode Island, the Shepaug is a tributary of the Housatonic, the Farmington is an affluent of the Connecticut, and the Saugatuck drains the larger part of Fairfield County. Many of the streams flow through formations of solid rock and in the highlands the courses are cut deeply. In most places they furnish valuable water power.

The climate of Connecticut is quite uniform, ranging from a mean temperature of  $28^{\circ}$  in winter to about  $68^{\circ}$  in summer. In winter the temperature falls frequently as low as  $10^{\circ}$  to  $15^{\circ}$  below zero, while the extreme heat of summer ranges from  $90^{\circ}$  to  $100^{\circ}$ . Heavy snows fall among the hills and mountains, where the winters are quite severe and of long duration, but the summers are pleasant and all seasons of the year are healthful. The mean annual rainfall is about 52 inches and the precipitation is quite evenly distributed. In the highlands the soil is thin and is some places barren, but it is of value in growing grasses and fruits. The valleys and the southwestern part have a dark soil of much fertility. Fine forests abound along the Connecticut and other streams, and include pine, hickory, walnut, wild cherry, oak, and maple.

**MINING.** Iron ore has been mined since 1732; but the output is not important as compared to the production in Missouri and Minnesota. Tungsten ore is mined near Long Hill and deposits of lead, copper, and nickel are known to occur. Granite is the most abundant of the minerals and is quarried extensively for monu-



ments and building purposes. Large quarries of brownstone are worked at Portland and near Middletown. Limestone, clay, and cobalt are obtained in various localities.

**AGRICULTURE.** Farming is confined largely to the valleys of the rivers, where the soil is mostly fertile, but the hills and highlands are generally broken and stony. Hay is the most extensive crop and is cultivated on an area about three times as large as that utilized in growing all other crops. Tobacco has been an important product since 1640, and is grown chiefly in the valleys of the Connecticut and Housatonic rivers. Vegetables of all kinds thrive abundantly and large interests are devoted to the culture of fruit, especially apples and peaches. All of the cereals can be grown profitably, especially rye, corn, wheat, buckwheat, and oats, but there has been a steady decline on account of more profitable development in other lines, especially dairy and vegetable farming. The dairy products include milk, butter, and cheese, and a ready market is found in New York and other commercial centers of the East. Swine, sheep, and horses are grown, but dairy cows receive the greater share of attention.

**MANUFACTURING.** Manufacturing is the leading industry, in which about twenty per cent. of the people are engaged. The State ranks eleventh in the output of manufactures. About three-fourths of the total ammunition made in the United States comes from Connecticut. The State produces forty per cent. of the hardware, fifty-six per cent. of brass manufactures, sixty-three per cent. of the clocks, sixty-four per cent. of the pins and needles, seventy-six per cent. of the plated ware, and a large proportion of the rubber goods and textile fabrics produced in the United States. In the output of its fisheries it takes third rank among the New England states. A large share of the output is shipped fresh to market, but much interest is shown in curing and canning. Oyster fishing is the largest of the fishing industries and next in order are the lobster, cod, and menhaden fisheries.

**COMMERCE AND TRANSPORTATION.** The export trade of Connecticut is largely through the port of New York City, but foreign imports are entered direct at Hartford, Stonington, Fairfield, New Haven, and New London, all of which are ports of entry. Transportation facilities are furnished by the Connecticut River, which is navigable for large steamers to Hartford, about fifty miles, and river boats ascend to Holyoke by means of the Windsor Locks. Railroad building received attention at an early date, hence few extensions were made within recent years.

The lines include a total of 1,050 miles, most of which are controlled by the New York, New Haven and Hartford Company. The State has a large number of finely improved highways and many electric urban and interurban railways are in successful operation. Safe and commodious harbors are furnished by the numerous inlets on the coast.

**EDUCATION.** The State has long occupied a foremost position in the educational field, and elementary education was provided at public expense from the earliest Colonial period. About five-sixths of all persons of school age attend the public schools, while a nominal compulsory attendance law requires registration in some schools between the ages of four and sixteen. The general supervision and control of the educational interests are intrusted to the State board of education, and local administration is vested in a town committee or a board of education. Support is given jointly by local taxation and by income from the State school fund. Normal schools are located at New Haven and Willimantic.

Connecticut has no State university, but is well provided with representative institutions of higher learning. Yale University, one of the leading institutions of higher learning in America, is located at New Haven. Trinity College at Hartford, Wesleyan University at Middletown, and the Hartford Theological Seminary are among the chief educational centers. An agricultural college is located at Mansfield. A hospital for the insane at Middletown, a State prison at Wethersfield, a school for the feeble-minded at Lakeville, training schools for nurses at Hartford and New Haven, an industrial school for girls at Middletown, and an industrial school for boys at Meridian are among the benevolent and reformatory institutions.

**GOVERNMENT.** The present constitution was adopted in 1818 and has been enlarged by thirty-one amendments. It requires that those who vote must be able to read and write and have resided in the State one year and in the town six months. Executive authority is vested in the governor, lieutenant governor, secretary, treasurer, and comptroller, each elected for two years. A majority vote of each branch of the Legislature is necessary to overcome the veto of the Governor. The Senate consists of thirty-five members and the House of 255 members, both senators and representatives being elected for two years. Regular sessions of the General Assembly, as the Legislature is called, are held biennially, in even years, beginning on the first Tuesday after the first Monday in November. A chief justice and four associate judges con-



stitute the supreme court of errors. Other courts include a superior court of six judges, the courts of common pleas, district courts, and justices of the peace. Local government is administered by the towns and counties.

**INHABITANTS.** The population of the State has shown a steady and uniform growth the past two decades, owing largely to the increase in the demand for labor in manufacturing enterprises. Nearly sixty per cent. of the people reside in cities of over 8,000 population. Immigration has been chiefly from Ireland, Germany, England, and Canada in the order named. Hartford, the capital, is located on the Connecticut River. The leading cities include Bridgeport, New Haven, Waterbury, New London, Meriden, New Britain, Norwalk, Danbury, Norwich, Stamford, Ansonia, Middletown, Willimantic, Rockville, and Bristol. The total population in 1900 was 908,355; in 1910, 1,114,756.

**HISTORY.** The history of Connecticut is closely linked with the entire period since the early settlement of America. It was inhabited originally by Indians numbering about 20,000, the most numerous being the Pequots. The first settlement was made by the Dutch near Hartford in 1633. Two years before that date a grant had been given to Lord Say and Sele for a tract of land extending from Narragansett Bay to the Pacific Ocean. However, this grant, though made by the Earl of Warwick, was not considered legal, but the town of Saybrook was founded under it in 1635. In the meantime a number of emigrants from Massachusetts Bay settled at Wethersfield and Hartford, and New Haven was founded by English Puritans in 1638. The Dutch relinquished their possessions in 1650, and New Haven was annexed to Connecticut in 1662. John Winthrop, Jr., had previously obtained a liberal charter from Charles II., who granted absolute autonomy to the colony, but it was demanded by Sir Edmund Andros in 1687 and was secreted until 1689. In 1708 the Congregational Church was established and secular and religious affairs were long closely associated, but all other denominations were tolerated.

Connecticut furnished about 30,000 men for the Continental army in the American Revolution, and was raided a number of times during the conflict. It was the fifth State to ratify the United States Constitution, in 1788, and strongly opposed the War of 1812, when the celebrated Hartford Convention met in its capitol. The present constitution was adopted in 1818, by the terms of which slavery was abolished. The State furnished 56,000 men for the Federal army in the Civil War, and Buckingham, the

war Governor, was a prominent figure of that period. Hartford and New Haven were jointly the capitals until 1873, when the former was made the sole seat of government.

**CONNECTICUT RIVER,** the longest river in New England, rises in northern New Hampshire, forms the boundary between it and Vermont, flows through Massachusetts and Connecticut, and enters Long Island Sound at Saybrook. It is about 375 miles long and drains an area of about 11,250 square miles. Large steamers ascend to Hartford, a distance of fifty miles, and it is navigable to Holyoke for river boats by means of the Windsor Locks. It furnishes an abundance of water power and has a number of falls, including those at Olcott, 36 feet; Bellow's Falls, 55 feet; Turner's, 41 feet, and Holyoke, 59 feet. The White, Passumpsic, Chickopee, Farmington, and Salmon rivers are its principal tributaries. On its banks are many important towns and it carries a large inland trade.

**CONNECTIVE TISSUE** (kōn-nĕk'tiv), one of the elementary tissues of animals, found in nearly all parts of the body. It originates in the middle layer of the embryo, and includes the adipose, areolar, cartilaginous, osseous, retiform, white fibrous, and yellow elastic connective tissues. *Adipose tissue* is most abundant at the kidneys and under the skin, but is found in most parts of the body. It is penetrated by blood vessels, but the fatty parts do not have the termini of nerve fibers. *Areolar tissue* consists of fine fibers which interlace each other, is widely distributed in the body, and sheathes the nerves, glands, and muscles. *Cartilaginous tissue* furnishes the attachments for ligaments and muscles, incloses the larynx and trachea, and joins the bones to each other. *Osseous tissue* is the chief constituent of the bones. *Retiform tissue* is composed of crossing lines and interstices and serves chiefly in the attachments of organs, such as the retiform coat of the eye. *White fibrous tissue* makes up the ligaments around joints, the tendons of muscles, and the sclerotic coat of the eye, and is found in the pericardium and the periosteum. It varies materially in the number of cells and fibers, and in the main consists of parallel bundles which branch as the connections are made. *Yellow elastic tissue* consists of large and coarse fibers and is very elastic. It occurs in the trachea, veins, skin, and vocal cords. *Neuroglia tissue* is the connective tissue of the nervous system.

**CONNELLSVILLE** (kōn'nĕlz-vīl), a borough of Fayette County, Pennsylvania, on the Youghiogeny River, fifty-four miles southeast of Pittsburg. It is on the Pennsylvania and the



Baltimore and Ohio railroads. Among the noteworthy buildings are the public library, the high school, and a State hospital. The surrounding country has gas and coal deposits and fertile agricultural lands. The products of its industries include flour, tin, brick, hardware, machinery, and railroad cars. About one-half of the coke made in the United States is produced here. It was first settled by Zachariah Connell in 1770 and became a borough in 1806. It has a good trade and modern improvements. Population, 1900, 7,160; in 1910, 12,845.

**CONNERSVILLE** (kǒn'nĕrs-vĭl), county seat of Fayette County, Indiana, sixty-five miles northwest of Cincinnati, Ohio, on the White Water River and on the Cincinnati, Hamilton and Dayton and other railroads. The chief buildings include the courthouse, the public library, and the high school. It is surrounded by a fertile fruit growing and farming country. The leading industries are machine shops, flouring mills, iron foundries, and planing mills. It has a considerable trade in merchandise. Waterworks, sewerage, and electric lighting are among the public utilities. It was incorporated in 1813. Population, 1900, 6,836.

**CONSCIENCE** (kǒn'shĕns), the feeling that enables us to distinguish right from wrong in character and conduct, which commends us when we obey and condemns us when we disobey it. A right conscience is the result of wholesome teaching, and is strengthened by wise exercise and use.

**CONSCIOUSNESS** (kǒn'shŭs-nĕs), the power that the mind has to know its own actions and states. It implies the state of being aware of one's own existence and of one's mental acts and states. Consciousness differs materially in different persons, some possessing much greater powers of consciousness. It is not under the control of the will. We can be conscious only of thinking, willing, and feeling; of acts and states, as remembering, choosing, and perceiving; and the products of these actions—our thoughts, concepts, feelings, etc.

**CONSERVATIVES** (kǒn-sĕrv'ă-tĭvz), a political party of Great Britain. It is nominally the successor of the Tory party, and in leading issues stands opposed to the Liberals. The name was first used about 1832, when a large number of citizens favored the Reform Act of that year, and as compared to the Tories its members were generally classed as more liberal. Balfour and Chamberlain are the chief leaders of the Conservatives in recent years. The leading political parties of Canada are the Liberals and the Conservatives.

**CONSERVATORY** (kǒn-sĕrv'ă-tŏ-rĭ), a n

institution organized to give public instruction in and promote the study of music. Conservatories are of ancient origin and were first established in connection with religious societies for the purpose of improving the character of church music. Originally they were charity schools and were recruited by orphans and foundlings of both sexes. Giovanni di Tappia founded the first famous conservatory in Naples, Italy, in 1537. The Paris Conservatory of Music was established in 1784 and takes rank as the most noted institution of the kind in France. Mendelssohn founded the famous Conservatorium at Leipzig in 1842, and it still takes rank as the leading institution of that class in Germany. Five noted conservatories are maintained in England, of which the Royal Academy of Music, founded in 1822 at London, is the most important. Many institutions of this kind are maintained in Canada and the United States. Those of the former country are represented in Montreal and Toronto. The chief conservatories of the United States include the Peabody Institute at Baltimore, the National Conservatory in New York, the New England Conservatory in Boston, and the Cincinnati College of Music.

**CONSHOCKEN** (kǒn-shŏ-hŏk'ĕn), a borough in Montgomery County, Pennsylvania, on the Schuylkill River, twelve miles northwest of Philadelphia. It is on the Pennsylvania and the Philadelphia and Reading railroads. The chief buildings include the public library and a number of churches and public schools. It has manufactures of cotton goods, flour, ironware, machinery, surgical instruments, and earthenware. Electric lighting and water works are among the improvements. The surrounding country is agricultural. It was founded in 1830 and incorporated in 1852. Population, 1900, 5,762.

**CONSONANT** (kǒn'sŏ-nănt), a letter of the alphabet which cannot be sounded, or but imperfectly, by itself, and only perfectly in conjunction with a vowel. Consonants are divided into *mutes* and *spirants*. Mutes are sounds in the production of which the breath is stopped or checked, as *b* and *p*. Spirants are produced with a partial stoppage of the breath, as in *v* and *f*. A consonant sound differs from a vowel in that it is produced by an obstruction to the breath, while the vowel sound is produced by a continuous passage of the breath.

**CONSPIRACY** (kǒn-spĭr'ă-sĭ), in criminal law, a combination of two or more persons, by one concerted action, to accomplish some criminal or unlawful purpose, or to accomplish some purpose, not in itself criminal or unlawful,



by criminal or unlawful means. Conspiracies of various kinds are defined and their punishments are fixed by the laws of all nations. The grade of punishment differs according to the nature of the intent on the part of the persons who form the conspiracy.

**CONSTANCE** (kōn'stans), **Lake**, a fine sheet of water located between Germany and Switzerland, about 1,295 feet above the sea. The Rhine flows through it from east to west, a distance of forty-three miles. It is about eight miles wide and 960 feet deep, and covers an area of 208 square miles. It is surrounded by beautiful vineyards, orchards, wooded hills, and picturesque castles. There are fine fisheries of salmon, trout, and shellfish. Railroad lines connect its towns in all directions, while steamboats ply upon its surface. It is remarkable for beauty and much sought as a pleasure and health resort.

**CONSTANTINOPLE** (kōn-stān-tī-nō'p'l), called Stamboul by the Turks, the most celebrated city of Turkey in Europe and the capital of the Turkish Empire. It occupies an advantageous site on the Bosphorus, having the Golden Horn, an inlet to the Sea of Marmora, on the north, which affords ample anchorage and facilities for innumerable ships.

Constantinople occupies such an important position in warfare, commerce, and trade that its possession is regarded an international advantage. Its occupation is sufficiently potent to disturb the balance of power in Europe. The site is hilly and undulating. It is beautified by numerous mosques, palaces, cypress groves, monuments, gardens, and towers. The beauty of the Thracian Bosphorus is almost unrivaled. Among its most noted edifices is the Mosque of Saint Sophia, a fine example of Byzantine architecture, which was converted from a Christian church into a mosque by the Turks. The Mosque of Soliman and the Mosque of the Sultana Valide, built by the mother of Mohammed IV., are imposing structures. The palace or Seraglio of the Sultan occupies the extreme portion of the promontory on which the city is located. It and its surroundings consist of pavilions, beautiful gardens, and parks which occupy a large tract. The principal entrance to the palace is a lofty gate called the Bab Humayum, or *sublime porte*, from which the generally known diplomatic phrase originated. Fully 300 mosques are maintained in the city. Many other Turkish and Eastern edifices are distributed throughout various portions of the city, and it has an Oriental instead of an Occidental appearance.

The commerce of the city is very extensive

both by navigation and inland communication. Railroad connections have been made with many of the principal European cities and with portions of Asia through Asia Minor. The trade is largely in the hands of Greeks, Germans, Austrians, Italians, French, and British. The educational interests are greatly inferior to those found farther toward the northwest in Europe, but some degree of elementary education is given, while several higher institutions of learning are under the control of the Porte. An institution for medical research is conducted by Germans, while several other higher institutions disseminate knowledge in law, philosophy, commerce, and industrial arts. Both Turkish and Greek public libraries are maintained, and several periodicals are published in the Turkish and European languages. Many portions of the city have narrow streets, covered with filth, and there are large areas with miserable houses of wood and clay. Among the newer improvements are electric and gas lights, pavements, rapid transit, and a telephone system. The Crimean War and several great fires did much damage to the older portions of the city, which resulted in improvements and buildings on a more modern European style. The language spoken is Turkish, with Greek and other languages in isolated portions. Mohammedanism is the chief religion, but there are several Protestant, Greek Catholic, and Roman Catholic places of worship. The Greek Catholic has the most numerous following of any of the Christian churches in the city. Among the manufactures are tobacco pipes, perfumes, morocco leather, saddlery, fez caps, embroideries, textiles, earthenware, and machinery. Vast forests extend for miles around the city. The suburbs are beautified with numerous cemeteries, many of which have served as burying places for ages.

The city was founded by a colony from Megara about 658 B. C., and was known for years as Byzantium, its ancient name. On account of its commanding position between Europe and Asia Minor, it was the center of Persian, Greek, Roman, and Turkish ambition for centuries. It was occupied by Constantine the Great in 330 A. D., who made it the capital of the Roman Empire, and changed its name to Constantinople, the city of Constantine. The Crusaders occupied it in 1204 and held possession until 1261. The Turks conquered it under Mohammed II. on May 29, 1453, an event marking the extinction of the Byzantine Empire. Since then it has been constantly under Turkish dominion, largely because of the intense jealousy existing between European powers and the strength of



the Ottoman Empire of former years. Population, 1906, 1,031,845.

**CONSTELLATIONS** (kōn-stēl-lā'shūnz), the groups into which astronomers have arranged the fixed stars for convenience in studying magnitude and location. The grouping is not arbitrary, for the reason that the stars may be arranged in as many different groups as inventive imagination may direct. For general convenience the groups are so planned that the several stars occupy points within the limits of an imaginary figure, supposed to be traced on the vault of the heavens. Ancient astronomers agreed upon forty-eight, of which forty-seven are still accepted, the constellation of Antinous being now included in Aquila. At present there are eighty-nine constellations which are generally recognized. Many of the newer groups as classified are located in regions the ancients never beheld. The best known figures include the Great Bear, the Little Bear, the Ram, the Twins, the Great Dog, etc. Eudoxus in 370 B. C. borrowed from Egyptian astronomers the conception of the celestial sphere, brought it to Greece, and first outlined upon it the ecliptic and equator with the more prominent constellations.

The small letters of the Greek alphabet are used to indicate the more prominent stars of the constellations—( $\alpha$ ) represents its brightest star, ( $\beta$ ) the next, ( $\gamma$ ) the third, etc. The Greek letter is followed by the Latin genitive of the name of the constellation. Thus, ( $\alpha$ ) Orionis is the most conspicuous star in the constellation of Orion, ( $\gamma$ ) Virginis is the third star in the order of brightness in Virgo, etc. Constellations embracing more than twenty-four stars that require especial designation are indicated by the letters of the Latin alphabet and, if these are exhausted, the ordinary Arabic numerals follow. The stars visible to the naked eye are divided into six classes, called *magnitudes*, that of the sixth magnitude being the smallest visible without a telescope on clear, moonless nights. The twenty brightest stars of the firmament are of the first magnitude, and the number increases roughly in geometric proportions.

**CONSTITUTION** (kōn-stī-tū'shūn), the organic law of any organized body or association of persons, or the fundamental law of a nation or state. A constitution is the fundamental law of each State of the Union, while the national Constitution is the organic law that binds and holds them all in the national government of the United States. In the states the constitution serves as an engagement between the different portions of society as to the political rights they should enjoy, and the power

which they may respectively exercise. Supreme power cannot be wielded successfully by any class of men without abuse. The history of a multitude of emperors, including such as Nero, Caligula, and Tiberius, shows that uncontrolled power may be made a destructive and harmful element. The real power was in the hands of the masses of society during the French Reign of Terror, and gives evidence to what depth unchecked democracy may descend. The tyranny of popedom in the Middle Ages demonstrates that unlimited power cannot be safely intrusted even in sacred hands.

In State organization no class should be allowed full gratification of its desires, its claims should be conceded only with reference to the rights and counterclaims of others. In a government organized on this basis all classes from the lowest to the highest gain real advantage, and liberty is more secure than if the common people, nobility, or crowned sovereigns had full sway. State and national legislation of the United States is vested in the legislative power of the State and national legislatures; the governors and President have executive power, and all these officers are elected for a specified term, and are replaced in office at regular intervals, or may be removed by conviction after impeachment. The judiciary is restrained by prescription and statutes, and interprets and gives meaning to the law. The *habeas corpus* act guards the rights of the people, and they are further protected by the provisions of both the State and national constitutions. The right of trial by jury serves as a bar to malicious prosecution. When necessary, the constitution of the State or nation may be changed by the consent and ratification of the people at regularly appointed elections. The Constitution of the United States at present consists of seven original articles and fifteen articles of amendment, the last one enfranchising the Negro freedmen. It was framed by representatives of the people, who met in convention at Philadelphia, and adopted it on Sept. 17, 1787. It became the fundamental law of the nation on the first Wednesday of March, 1789.

The constitution of the Dominion of Canada went into effect on July 1, 1867, at which time the country consisted of the four provinces of New Brunswick, Nova Scotia, Ontario, and Quebec. However, provisions had been made for the admission at any time as provinces other colonies or territories. Accordingly, Manitoba was admitted in 1870; British Columbia, in 1871; Prince Edward Island, in 1873; and Alberta and Saskatchewan, in 1905. The constitution is similar to that of Great Britain. The execu-



tive authority is vested in the British crown and carried on in its name by a governor-general and a privy council. Legislative power is vested in a Parliament of two houses, the Senate and the House of Commons. Each province has a separate legislature and a lieutenant-governor. The right of suffrage varies somewhat in the different provinces and territories.

**CONSTITUTION**, a celebrated vessel of the United States navy, sometimes called *Old Ironsides* from the hard lumber used in her construction. This vessel was launched Oct. 20, 1797, but was not fully equipped until the following year, when she was put under Capt. Nicholson for service against the French, and in 1799 was the flagship of Commodore Preble in the War with Tripoli. In 1812 she was put under Capt. Hull, who started from Annapolis and ran into a British fleet of five frigates. For three days she avoided an attack by masterly seamanship and escaped after a spirited chase without damage. On Aug. 19, 1812, she encountered the English frigate *Guerriere* under Capt. Dacres off Cape Race, and after a spirited battle of thirty minutes succeeded in wrecking her antagonist. On Dec. 29 of the same year she encountered the *Java*, a British vessel under Capt. Lambert, in the West Indies. Capt. Bainbridge, who had command, fought two hours and forced the *Java* to surrender. In this battle the Americans lost 34 men, while the British lost 100 killed and 200 wounded. On Dec. 30, 1813, the *Constitution*, under Capt. Stewart, sailed toward the West Indies and the following February captured the *Picton* with sixteen guns. In February, 1815, she captured the *Cyane* with thirty-six guns and the *Levant* with sixteen guns, but the latter was afterward retaken by a British squadron and the *Constitution* barely escaped capture. In 1828 the *Constitution* was reported unseaworthy and the navy department concluded to break her up and sell her old timbers, but the execution of the order was arrested by the opposition of public sentiment created largely by the poem of Oliver Wendell Holmes entitled "Old Ironsides." She was partly rebuilt in 1877 and crossed the Atlantic for the last time the following year, and in 1897 was stored at the navy yard in Boston.

**CONSTITUTIONAL UNION PARTY**, a political organization of the United States. It was organized by the remnants of the Whig party in the South at a convention held in Baltimore on May 9, 1860, at which delegates from twenty states were in attendance. John Bell of Tennessee was nominated for President and Edward Everett of Massachusetts for Vice Pres-

ident. The platform was of a general character, recognizing "no political principle but the Constitution of the country, the union of the states, and the enforcement of laws." In the election it carried Virginia, Kentucky, and Tennessee, but received no support in the northern states. The popular vote cast for its candidates was about 600,000.

**CONSTITUTION OF THE UNITED STATES**. See **United States, Constitution of**.

**CONSUL** (kōn'sūl), the name originally given to the two supreme magistrates in the Roman Republic. They were placed at the head of the senate by joint efforts of the patricians and plebeians in 509 B. C., after King Tarquinius Superbus had been expelled. They were vested with equal authority and elected annually. As a condition of eligibility the age of forty-five years was required. It was further necessary that a candidate previously passed through the lower offices of quaesstor, aedile, and praetor, and that he be in Rome at the time of the election. At first patricians were alone qualified to hold the dignity, but a plebeian was elected in 366 B. C., and in 172 two plebeians were placed in the office. Their power included declaring war, concluding peace, and making alliances, and extended almost to the limits of power granted to preceding kings.

Consul is a term applied to one of three supreme magistrates in France, designated *First*, *Second*, and *Third* consuls, who held office between 1799 and 1804. Napoleon Bonaparte was the First Consul and soon assumed absolute power, being proclaimed emperor on April 10, 1804. At present the term is applied to an officer of his own country who resides in a specified foreign country, with a view of promoting the commercial interests of the nation he represents. On arriving at the foreign country he shows his credentials to the government, and obtains an *exequatur* sanctioning his appointment, and conveying to him all the rights and privileges of the office. He reports annually or at specified times to his own government the state of commerce in the foreign country so far as it affects the interest of his own country. The office of consul is now recognized by all leading nations. It was first instituted in Italy in the middle of the 12th century, and was made an official position in all European countries by the 16th century. There are generally three ranks: *consul general*, *consul*, and *vice consul*.

**CONSUMPTION** (kōn-sūmp'shūn), a wasting disease which affects the vital organs, but which is most common to the lungs. The



greatest number of cases occur between the ages of twenty and fifty, and it is more prevalent in women than in men. The remote origin is often hereditary tendency or constitutional predisposition. The complexion of those inheriting the disease is sallow or white, the veins are conspicuous, the circulation is languid, and the strength is small. Tubercles usually first become seated in the apex of one of the lungs, which cause a dry cough and later a difficulty in breathing. A frothylike saliva and blood are often expectorated. The average duration of the disease is twenty-three months, but death frequently results in nine months, and sometimes in three. There are several types, including the *chronic*, *latent*, and *acute*. Different climates are marked by a fewer or greater number of cases, though it exists in all countries. Florida, Colorado, Alberta, and the Pacific coast are the most favorable regions for persons afflicted with the disease. Dr. Koch, the great German authority, in 1880 announced the doctrine that tubercles are masses of bacilli which destroy the parts affected. He attained success by inoculating the patients with lymph containing specific morbid matter. Other remedies are the inhalation of dry hot air and balsams, and a change of climate. The best preventive is proper sanitation. In crowded workshops the disease is often spread by expectorations. The sputa on the floor dries and rises in the form of dust. This breathed into the lungs causes the bacilli to settle into the tubes and infect the individual. To prevent this, the spittoons should contain water and be emptied daily into sewers flushed by water.

**CONSUMPTION**, in economics, the use or expenditure of wealth. In general all commodities are destroyed in entering into new forms of wealth. It is in this way that wealth is increased by means of adding to the value of things existing, and by destroying forms of wealth that they may be reproduced as commodities of greater value. Consumption is characterized as *voluntary* or *involuntary*. The former implies destruction in one form for the purpose of producing another, or for the purpose of immediate gratification; while the latter implies the natural wear and tear, such as rusting of iron or wearing fabrics or metals away by friction. Consumption, from the standpoint of utility, is defined as *productive* and *unproductive*. Productive consumption is the kind that produces commodities of higher value or commodities of greater utility, while unproductive consumption is the form which is attended by loss and disappointment. The subject of consumption in economics is one of per-

sonal and political interest to every citizen. Upon the care exercised in commerce or in managing the products of labor and industry depends largely the fundamental success of the individual and the state.

**CONTEMPT** (kŭn-tĕm't'), in law, a disregard of the authority of a court or legislative assembly. It may be either *direct*, as by refusal to obey an order of the court, or *constructive*, as when officers of a court are guilty of any corrupt conduct, abuse of process, or culpable neglect of duty. The offending party is liable to punishment for contempt by summary order, without the ordinary form of criminal proceedings, as indictment and trial by jury. The punishment for contempts may be a fine or imprisonment, or both, but, if the contempt consists in the omission to perform an act which is yet in the power of the person to perform, he may be imprisoned until he performs it. All judgments and orders of courts are enforced in this way, except such as are for the payment of money or the delivery of property.

**CONTINENTAL SYSTEM** (kŏn-tĭ-nĕn'tal), the blockade of Great Britain ordered by Napoleon on Nov. 21, 1806, by the decree of Berlin. The object was to exclude England from all intercourse with the continent, hence the ports of France and its allied states were ordered closed against all vessels coming from England or her colonies, and it was directed that all commerce and correspondence from English ports wherever found be seized. The English government retaliated by prohibiting trade with France and declaring all harbors of that country and her allies in a state of blockade. Napoleon immediately issued new decrees from Milan, Trianon, and Fontainebleau, in which Denmark, Russia, and Austria were forced to join France against England and all ports of Europe were closed against English vessels, except those of Spain, Sicily, Sardinia, and Sweden. These decrees caused English goods to be smuggled to a vast extent, but British commerce lost heavily until 1812, when Napoleon declared war against Russia chiefly because her ports had been opened to English commerce, and his fall in 1814 was followed by a reopening of all the ports. The Orders in Council issued by England against Napoleon were similar to those enforced against the United States in 1812, and which were largely responsible for the War of 1812.

**CONTRABAND** (kŏn'trā-bānd), a term applied in commerce to all goods and commodities exported from or imported into any country contrary to law. Commodities imported in opposition or defiance of either of the two na-



tions engaged in war are regarded contrabands of war, and their transportation by neutrals may be prohibited by one of the belligerents. Gen. Butler regarded Negro slaves contrabands of war for the reason that the Negro was an element of strength to the Confederates and aided them in producing munitions of war or rendering assistance in active service.

**CONTRACT** (kōn'trăkt), in law, a bargain or agreement between two or more persons, who bind themselves to do or not to do a particular thing. A contract may be *verbal* or *written*, but in some cases, such as the sale of land or the transfer of title in personal property without a change of possession, the agreement must be in writing and acknowledged before a notary public or some similar officer. Usually contracts are made in express terms, but they may be implied from circumstances or the acts of the parties who are mutually interested.

Contracts made in relation to matters forbidden by law, such as gambling and fighting, are illegal. This is true likewise of contracts whose terms are contrary to public policy, such as restrain trade or limit the rights of a citizen. Contracts that imply or relate to bribery, immorality, and the obstruction of justice are illegal because they pervert the acts of government. A *voidable* contract is one made under duress or misrepresentation, and, though not necessarily illegal, may be set aside. An agreement not enforceable by law is said to be *void*. A contract which ceases to be enforceable by law becomes void when it ceases to be enforceable.

The contract is the foundation of all the business transactions. The common law and the constitution of most governments forbid the passage of laws which act to impair the obligation created by a valid contract, and such laws would be universally condemned as a violation of the fundamental principles of civilized society. Almost an indefinite variety of contracts arise in the affairs of business. However, all depend for their validity upon the capacity of the parties to the contract and upon the fact whether or not the agreement is based upon a sufficient consideration. Those who do not possess the capacity to contract include idiots and lunatics, persons of weak mind, intoxicated persons, minors, and habitual drunkards who are under guardianship. Formerly a married woman could not bind herself in a contract, but in most states she is given an equal standing with the husband. Corporations have capacity to contract only in relation to the objects for which they were formed. Whether or not a proper consideration is the basis of a contract is a

subject for question by a court. Considerations are of three kinds, that is, good, moral, and valuable. An agreement to give or do something in the future, if no payment is made, may be regarded a good consideration, but it does not bind the party who promises and therefore cannot be enforced. However, a transfer based upon the love and affection of a near relative is a valid agreement. A valuable consideration implies that money has been paid for a commodity that is a benefit to the payee.

**CONTRACTION** (kōn-trăk'shŭn). See **Abbreviation**.

**CONVICT LABOR** (kōn'vikt), the system of employing prisoners at penal and reformatory institutions. The primary object in giving employment to prisoners is charitable rather than profitable financially, since those confined to prisons usually prefer to work and are personally benefited by the exercise. Many writers regard idleness in prison life a much more severe punishment than the simple fact of being deprived of personal liberty. Three general schemes to employ prisoners are in vogue, those known as the contract, lease, and public account systems. In the *contract system* it is customary for the state to furnish the tools and materials with the prisoners, who are supervised by a contractor. Usually the contractor divides the proceeds from the sale of commodities manufactured with the state, or the contractor furnishes all of the tools and material to be used under the supervision of the state, receiving an equitable share of the product. In the system of *leasing* prisoners the state turns them over to a contractor, who furnishes ample security for their care and employment, and all of the products are the property of the contractor, who is required to pay a reasonable amount for the privilege of the lease. The *account system* implies that all of the work is to be done by the prisoners under the direct supervision of the state.

The employment of convict labor varies greatly in different sections. In many places the convicts are employed on public enterprises, such as road making and the construction of drains and canals. However, it is more common to have them do work within the prison, such as bookkeeping for the institution, laundry work, baking, and other lines necessarily connected with the prison itself. Additional lines of work include the manufacture of buttons, pottery, brooms, clothing, boots and shoes, and garden and field utensils. Some states work their convicts in stone quarries and coal mines. Labor unions have usually declared against the employment of convict labor in lines where it



comes in direct competition with free labor, since the tendency is to lower the wage scale. This circumstance and the fact that financial success should not be placed above prison discipline are the most potent arguments against the employment of convicts in lines that compete with free laborers in the market.

**COOKERY** (kōōk'ēr-ÿ), the art of preparing food by dressing, compounding, and the application of heat. It originated from the necessities of mankind, since the stomach is too small to contain sufficient vegetable matter to replace the daily waste of the system, hence it is required that foods be prepared and concentrated. Food is rendered more palatable and more easily digestible by cooking, since it loosens the fibers and solidifies the fibrin and connective tissues of meats. It develops the flavor and lessens cohesion, thus improving both the vegetable and animal foods. The art of cooking is as old as the human race, but cooking schools are comparatively of a recent date. Schools of this kind were first established in Europe, where they were introduced as an addition to boarding schools. In America, both in Canada and the United States, many private cooking schools are maintained, and in some of the cities cookery is made a branch of study in the public schools. These institutions study the theory of nutrition and the comparative values of foods, as well as to teach the practical application of methods in cookery. They aid to instill habits of economy in preparing the food for table use, and at the same time promote interest in the scientific preparation of healthful foods.

Foods are usually divided into meats and vegetables, and with the former are included fish and eggs. To prepare meats for table use, they are either baked, boiled, braised, broiled, fried, or roasted. The albumen on the outside of meats coagulates as soon as it comes in contact with heat, hence the best soups are made by placing the meat in slightly warmed water and letting it boil slowly, so the nutritious elements will pass largely into the soup, while meat intended for table use without soup should be placed in very hot water or in an oven highly heated so the nutritious parts will remain largely within it. Vegetables are prepared for the table chiefly by baking, boiling, steaming, or frying, though many varieties are eaten in a raw state. Cookery includes the baking of bread and other foods prepared from ground cereals. All foods should be slightly seasoned at the time of preparation, and additional seasoning may be added at the time of service by each of the guests to suit the taste. When foods are not

properly cooked, either too much or too little, they are less pleasurable and possess a smaller degree of nutritive qualities. See **Bread**.

**COOK INLET**, a bay of Alaska, extending inland about 200 miles from Shelikof Strait. Near its entrance is the northern extremity of the Alaska Peninsula, which is separated by it from the Kenai Peninsula. In the vicinity are lofty mountains and highlands, some of which are characterized by glaciers. Navigation is more or less dangerous on account of severe storms and high tides that sweep up the bay from the Pacific Ocean. Cook Inlet is so named from Capt. Cook, who explored it in 1778, thinking it a passage to the Arctic Ocean. It receives the inflow from the Sushitna and several other rivers.

**COOK ISLANDS**, an archipelago in the Pacific, located northeast of New Zealand and southwest of the Society Islands. They consist of six larger and a number of smaller islands and reefs, and the total area is 142 square miles. The largest island, Raratonga, has an area of thirty-one square miles. Coffee, copra, and fruits are the chief products. These islands were annexed for administrative purposes to New Zealand in 1900. They were named after Capt. Cook, who discovered the group in 1773. Population, 1906, 8,450.

**COOK STRAIT**, a channel of New Zealand, which is separated by it into the two parts known as North Island and South Island. It was discovered by Capt. Cook in 1770 and named in his honor. Wellington, situated on its northern shore, has a fine harbor and is the chief commercial center on its banks.

**COOPERAGE** (kōōp'ēr-āj), the ancient art of making vessels of pieces of wood held together by hoops. The products are very numerous, including tubs, pails, casks, barrels, and firkins. The staves are upright pieces forming the sides of a barrel or cask, at each end of which is a head, and the whole is held together by metal or wooden hoops or bands. Barrels whose staves are widest in the middle are said to bulge in the center and taper toward the ends. Those having straight staves form a cylinder, or they are larger at one of the ends than at the other. Cooperage is known as wet or dry, the former producing vessels for holding liquids, while the latter is concerned in the manufacture of an inferior product to hold dry goods, such as crockery and chinaware. The best barrels are made of white oak, which must be thoroughly seasoned before the work is done, and the parts are held together by strong steel bands or hoops, which are put on hot so the contraction on cooling binds the work together more firmly. For-



merly much of the work in cooperage was done by hand, but now the sawing and cutting is wholly by machinery.

**COÖPERATION** (kō-öp-ēr-ā'shūn), in economics, the association of a number of persons or societies for mutual profit in banking, manufacturing, or any of the industrial arts. It is a form of partnership in which the profits are wholly divided among those interested, in proportion to the contribution of each to the products. The enterprises of this character are usually divided into the three classes of *coöperative distribution*, *coöperative production*, and *coöperative societies for banking and loaning*. However, in a wider sense all production is coöperative, since it is mutually dependent upon nature, labor, and capital.

Robert Owen, the English social reformer, was one of the early advocates of this system in America, though it had long been in vogue in several European countries. The National Assembly of France voted \$600,000 at the time of the Revolution of 1848 to encourage coöperation among the workmen. About 300 coöperative societies were organized under this appropriation as well as others receiving no government aid, with more or less success. A large number sprang into existence about the same time in Germany, Belgium, Italy, and England, most of which were organized for coöperation in distribution, but some with the view of furthering production. Coöperation in distribution is designed chiefly to save the retail profits by dispensing with middlemen. This line is well represented in Canada and the United States by coöperative retail stores and jobbing houses.

Among the difficulties to contend with in coöperative enterprises are the reverses to which all business is liable that requires reserve capital in order to tide it safely over obstacles, as panics or eras of excessive production. If the capital employed is only sufficient to conduct the business when the times are prosperous, a failure may result in panics, or at times when there is a stringency of money in the financial centers. In ordinary business the employer must be a competent man to manage successfully. He should have skill sufficient to put capital and labor together so as to render them profitably productive, and must be an organizer and overseer. It is required that he call into use good financial ability, ready discernment, judgment in buying and selling, and an accurate knowledge of the wants of the public. An employer may be without capital of his own, but he must have the necessary elements to successfully supervise and direct the energy and application of the employees. It is often impossible to secure these

essentials in coöperative associations, from which cause many attempts to establish and conduct them on a stable and permanent basis have failed. Where all the members are qualified to do a certain portion of the work and a competent manager and supervisor is available, the system, once permanently established, may prove highly beneficial and render the most wholesome returns to all those interested in the enterprise.

**COOPER'S CREEK**, a river of Australia, formed in Queensland by the confluence of the Thomson and Victoria rivers. It flows in a general southwesterly direction through an arid region and discharges into Lake Eyre, which has no outlet to the sea. The river is low during the dry season and in places the water sinks out of sight, but in the rainy times it rises fully twenty feet and is about two miles wide.

**COOPER UNION**, an institution of New York City, established in 1859 by Peter Cooper for the advancement of science and art. Instruction is free for the working classes, who have access to courses in art, science, and social and political economy through the medium of individual teaching and lectures. This institution is housed in a large building on the Bowery, at a point where that street divides into Third and Fourth avenues, and was established at a cost of \$630,000. It remained practically without endowment until 1900, when Andrew Carnegie made a gift of \$600,000. The annual income at present approximates \$100,000, while the endowments are \$2,125,000, and the total value of all property is \$3,250,000. Instruction is given both to day and evening classes, so as to meet the convenience of working people, and the average enrollment is about 3,000 students. The success of this laudable institution must in a large measure be ascribed to its founder and those who constituted its original board of trustees. These included Peter Cooper, Wilson G. Hunt, Daniel F. Tiemann, Abram S. Hewitt, Edward Cooper, and John E. Parsons.

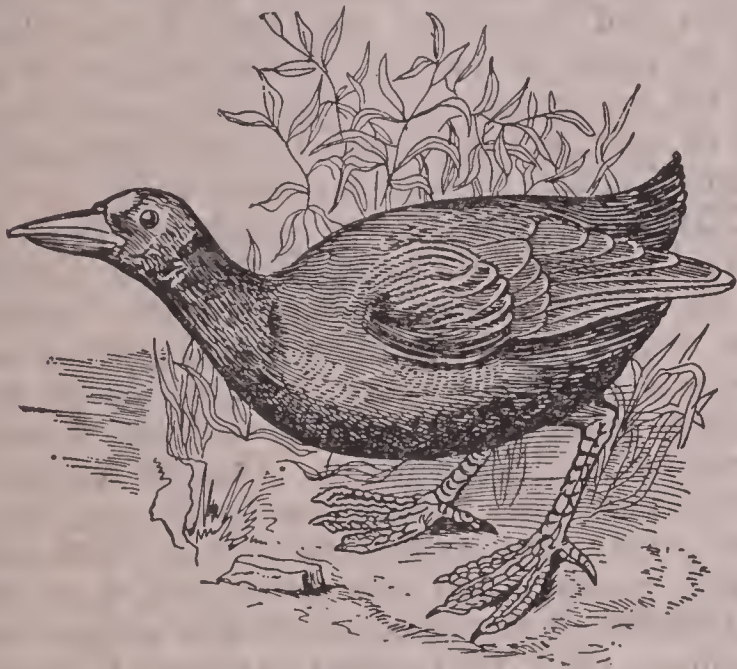
**COOSA RIVER** (kōō'sā), a river of the United States, formed in northwestern Georgia by the confluence of the Etowah and Oostanaula rivers. It has a general course toward the southwest into Alabama, where it flows through the southern extremity of the Appalachian Range, and near Montgomery is joined by the Tallapoosa River to form the Alabama River. It is about 340 miles long and the lower part of its course is navigable.

**COOS BAY** (kō-ōs'), an inlet of the Pacific Ocean, on the western shore of Oregon. It is about 15 miles long and one mile wide, and receives the inflow from the Coos River. Near



its entrance is Cape Arago, and on its banks are the cities of Marshfield and Empire City.

**COOT** (kōōt), a bird of the rail family, native to America and Eurasia, frequenting the coasts and inland waters. A number of the species are widely distributed, migrating to the colder zones in the spring. The common name by which most of the species are known is mud hen. The American coot has a black head and neck and a white bill and frontal plate, and is about fifteen inches long. The general color is brown or dark slate. Its wings measure fully 25 inches from tip to tip, and its weight is from one to two pounds. It is widely distributed in



· AMERICAN COOT.

North America from the West Indies to the Saskatchewan. The favorite resorts are the reed-lined borders of ponds, lakes, and rivers. Its skill to run, swim, and fly is well developed. The food consists chiefly of seeds, worms, insects, fish, grasses, and other substances found in shallow water. Its nest is made in the reeds, in which from seven to ten ash-gray eggs, with small black spots, are laid. The young are skilled in swimming shortly after being hatched. While its flesh is eaten, it is not preferred as an article of food.

**COPAIBA** (kō-pā'bà), or **Copaiva**, a valuable product obtained by making incisions in the stems of certain trees native to the tropical parts of America. It consists of a resin, known as the *resin of copaiba*, and a volatile oil called the *oil of copaiba*. The product has an acrid taste and a peculiar odor, and is valuable in medicine for treating chronic catarrh and other diseases. Castor oil is frequently used to adulterate the balsam of copaiba.

**COPENHAGEN** (kō-pen-hā'gēn), the capital of Denmark, situated on the islands of Zealand and Amager, which are separated by the

Kalvebod Strand, an inlet from the Sound. The portion situated on the island of Amager is called Christianshavn. An excellent harbor is located in the Kalvebod Strand, which is deep and well protected. The principal part of the city is well fortified with old and new fortifications, the strongest portion being the citadel of Frederickshavn.

The principal streets radiate from the Kongens Nystrov, an irregular square, in which is a fine equestrian statue of Christian V. Among the chief buildings are the Church of Our Lady, the Church of Our Redeemer, the Holmen's Church, the Palace of Charlottenborg, the Royal Academy of Art, and the Exchange Building. Many of the larger structures are decorated with works of art by Thorwaldsen, notably the Church of Our Lady, which contains a kneeling angel holding a shell for a font. The national capital, royal castle, and many other edifices are substantial in construction and beautiful in style. The royal library contains 750,000 volumes, while the National University, founded in 1497, has a library of 350,000 volumes and is attended by 2,000 students. Several botanical gardens, boulevards, and public parks beautify the city.

Copenhagen is the focus of many railroad lines that connect it in all directions. Electric street railways furnish convenient urban and suburban passage. It has gas and electric lights, stone and asphalt pavements, and an elaborate system of sanitary sewerage. In many parts of the city are fine equestrian monuments and fountains. The public schools and educational systems are efficiently organized and ably supervised and rank among the finest in the world. The manufactures include fabrics, machinery, clothing, toys, scientific apparatus, steamboats, musical instruments, leather, and earthenware. It is noted as a publishing center of books and periodicals. The commerce, both by railroad and ocean navigation, is extensive, and has long taken high rank among the most important of Europe.

The history of Copenhagen may be said to begin with the 12th century, when it was a small fishing village. It was fortified in 1167 and soon became of commercial importance, owing to its good harbor. In 1443 it became the capital of Denmark. At present it is the center of Danish art, literature, and education. Population, 1906, 426,540.

**COPIAPÓ** (kō-pē-à-pō'), a city of Chile, capital of the province of Atacama, 50 miles southeast of Caldera, its port on the Pacific Ocean. It is the focus of several railroads and is surrounded by a farming and mining country. Among the public utilities are a library, electric lighting, and a provincial high school.



It has large smelting works and machine shops. In one of the public places is a statue of Juan Godoy, who discovered the silver mines in its vicinity. The city was founded in 1707. Population, 1908, 10,510.

**COPPER** (kōp'pēr), a reddish ductile metal. It is the most ductile of the metals next to gold, silver, and platinum; the most elastic, except steel; and the most sonorous, except aluminum. Next to silver it is the most powerful conductor of heat and electricity. Several alloys are formed from copper. Brass is an alloy of one-third zinc and two-thirds copper. Bell-metal, gun-metal, and bronze are alloys of copper and tin. It forms a number of compounds and salts, all of which are poisonous. Copper was known in prehistoric times, the copper age preceding the bronze age. It was used in ancient Assyria and is mentioned in the Old Testament in Ezra viii., 27. The Greeks and Romans brought it in large quantities from Cyprus, where it was mined near Famagusta.

The United States ranks as the largest copper producing country of the world. The annual output was reported in 1907 at 898,750,640 pounds, which is about the average amount produced per year. This is about half of the entire annual output of the world. The three most important copper producing states are Montana, Michigan, and Arizona, in the order named. The principal sources of copper, aside from the United States, are Spain, Germany, Chile, South Africa, Mexico, and British Columbia, but it is found more or less widely distributed in all countries. It occurs native and with the minerals *cuprite*, *azurite*, *malachite*, *bornite*, *tenorite*, *chalcocite*, *chalcopyrite*, etc. In the upper peninsula of Michigan, on Lake Superior, it occurs largely as native copper. In Montana the ores yield about seven per cent. of copper and paying quantities of silver and gold, while the richest in quality found in Arizona yield about ten per cent. of copper. The use of copper is widening continually. Besides its use in electrotyping, engraving, and for household utensils, it is employed largely in shipbuilding, telephones, electrical appliances, cables, trolley wires, and cartridges. The world's supply of copper in recent years greatly exceeds that of former times, but the building of electric railways and electrical apparatus has developed a constantly increasing demand.

**COPPERAS** (kōp'pēr-ās), the hydrated protosulphate of iron, sometimes called *green vitriol*. It is found in a natural state, resulting from the decomposition of pyritous iron, and is prepared upon a large scale for various uses in art. The manufactured product is generally

contaminated with various mixtures, such as the salts of zinc, magnesia, alumina, and copper, and the oxide of iron. Copperas is used in medicine as a tonic, for producing black dyes, for making ink and Prussian blue, and for many purposes in dye works.

**COPPERHEAD** (kōp'pēr-hēd), a venomous serpent of North America, classed with the rattlesnake family. It is without rattles, but has loreal plates on the head. The full-grown copperhead is about three feet long, is a sluggish animal, and has a light copper color with darker transverse bars. It is more abundant in the southern than in the northern states, and locally is known under the names of moccasin, red adder, and cottonmouth. The bite is often fatal.

**COPPERHEAD**, a nickname given to a political faction during the Civil War, which was generally considered to be in secret sympathy with the South. The name was applied from the copperhead, a poisonous serpent that gives no warning of his intended attack, therefore typical of a concealed foe.

**COPPERMINE RIVER**, a river of North America, in Canada. Its source is in Point Lake and it has a general course toward the north, discharging into Coronation Gulf, an inlet from the Arctic Ocean. It is about 300 miles long, but is not valuable for navigation, having a large number of falls and torrents in its course.

**COPRA**, the dried kernal of the cocoanut, from which cocoanut oil is expressed. About 25 pounds of oil are obtained from 500 pounds of copra. See **Cocoanut**.

**COPTS** (kōpts), the descendants of the ancient Egyptians. They make up the remnant of the once numerous church of Egypt that maintained the celebrated school of Alexandria. Writers generally agree that they were converted to Christianity by Saint Mark, though they hold that one nature, not two, existed in Christ. The Greeks tyrannized over them, which caused them to submit to the Mohammedans, and to aid them in conquering Alexandria in the year 640 A. D. There are still about 250,000 Copts in Egypt, most of whom reside in its upper provinces. Their dress is similar to the apparel of the Mohammedans, and they are of middle height and dark complexion, and have curly hair. Their language bears the same relation to that of the ancient Egyptians that the Italian does to the Latin. The nucleus of the language came from the ancients, but the spoken tongue is very different from the early spoken tongue on account of the foreign words which were inserted by long contact with the Greeks, Arabs, and Moors. In the 10th century Arabic was used largely in-



stead of the Egyptian, since which time the language has been more or less transitory. The Copts speak a dialect of their own, but learn the Arabic and use it largely. They maintain several convents and a number of secondary monasteries, and support a patriarch, bishops, presbyters, archdeacons, and other minor church dignitaries.

• **COPYING MACHINE**, a device for duplicating letters and manuscripts. Machines of this class may be divided into two kinds, those used in copying writing done by hand or by a typewriter and those in which the copy and the original are made at the same time. In the former it is customary to use a book containing leaves of thin paper, so the letters or manuscripts can be indexed in alphabetical order, and pressure for copying is furnished by a letterpress. The ink used is made specially for the purpose, or common ink may be thickened by adding sugar or some other substance to prevent it from drying rapidly, and when letters written on a machine are to be copied it is necessary to use a copying ribbon. The general method of copying is to place the written manuscript in the copying book, with a piece of oiled paper beneath, then turn a leaf of the book over the writing to be copied, which is covered with a damp sheet of blotting or unsized paper, and over this is placed another piece of oiled paper to protect the book from absorbing moisture, after which it is placed in the letterpress, and the writing is transferred to the page of the book which lies between the writing and the damp sheet. Pressure is obtained by a screw or lever. Several letters can be copied on the same page or even on a number of pages at the same time. The copying books used most extensively contain 1,000 leaves, and when filled they are marked on the back and placed in the library of records.

More recently it has become customary to write and copy at the same time, which may be done either by hand or with the typewriter when carbon paper is placed between the sheet containing the original and that on which the copy is to be preserved. This method has an advantage where a large amount of business correspondence is necessary with one person or company, especially where it runs through a period of several years. In that case the copies are attached to the letters to which reply is made, hence it is possible to file in a systematic order both the letter received and the reply sent in answer to the same. By using a typewriter it is possible to obtain from one to five carbon copies from one writing.

Thomas A. Edison is the inventor of the

*mimeograph*, by which an indefinite number of copies of either hand or machine writing may be obtained. The work is done by placing a sheet of thin paper, coated on one side with a film of paraffin wax, over a plate of steel, known as the *baseboard*, and writing the copy with a fine-pointed steel stylus, using care that the impressions are made entirely over the steel plate, whose surface is corrugated much like a very fine file. When the stencil, or written page, is prepared, it is placed in a frame, which holds it tight and smooth, a sheet of paper is laid on the baseboard, the frame containing the stencil is turned over it, and an ink roller is passed over the surface of the latter, the pressure of which forces the ink through the stencil and produces the writing on the sheet beneath. Stencils prepared by the typewriter are likewise on paraffin paper, the type producing the perforations. A newer form of the mimeograph consists of a device with a revolving cylinder, on which the stencil is attached and the ink on the inner side is forced through and produces the writing on a sheet of paper placed on the baseboard beneath. It is possible to procure several hundred copies from the same stencil by either method.

The *blue print process* is used extensively in copying plans and drawings prepared by architects and engineers. Another device, the *hektograph*, may be used in obtaining from fifty to one hundred copies, but the original writing is done wholly by hand. It consists of a pad or tablet prepared with glycerin and gelatin. The original writing is done with an aniline ink, to which a small per cent. of glycerin is added, and is written on ordinary paper, and this is placed face down upon the hektograph, which receives the copy as soon as the writing comes in close touch with it. To reproduce the writing, a sheet of paper is pressed carefully down upon the hektograph, which transfers a copy to the sheet of paper. The writing is reproduced by slight portions of the ink adhering to the surface, and the number that may be obtained depends upon the care exercised.

**COPYRIGHT** (kōp'ŷ-rīt), the exclusive privilege secured by law to authors and their heirs or assigns to publish and sell their productions for a certain time. In the United States the copyright law requires the author, in order to secure a copyright, to file in the office of the librarian of Congress, or deposit in the mail within the United States, addressed to the librarian of Congress at Washington, D. C., a copy of the title of the book, or description of engraving or article, before publication. He is required to send two copies of the production



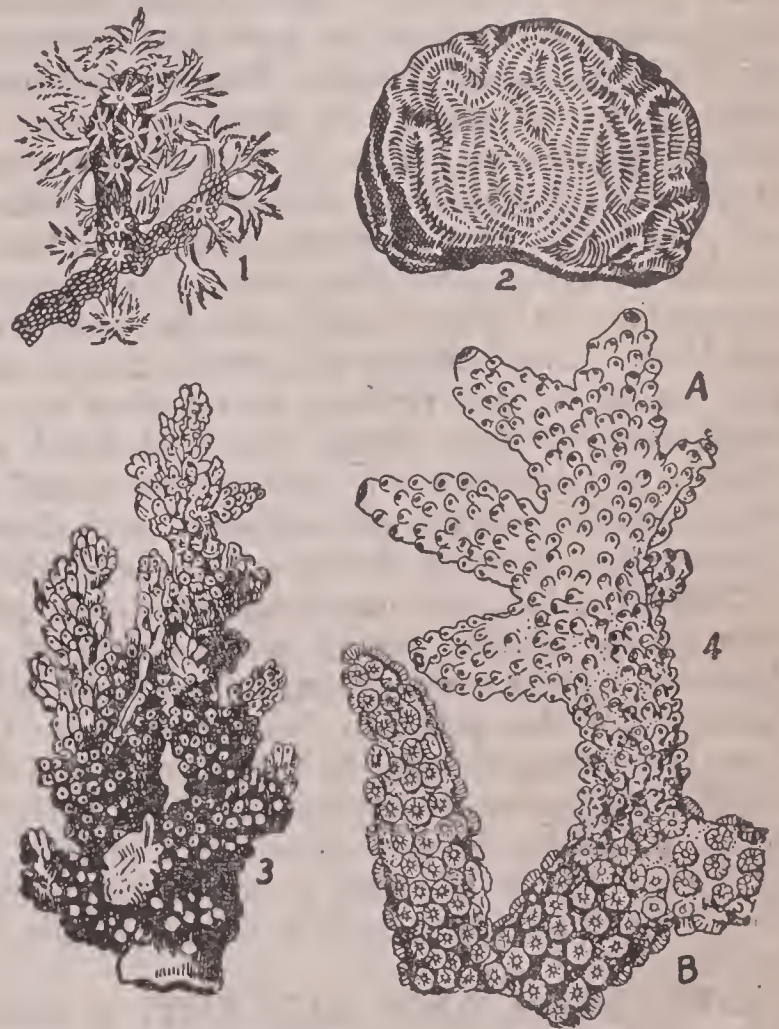
to the same office not later than the day of publication and to pay a fee of fifty cents. A certificate of the copyright is issued on the payment of an additional fee of fifty cents. In Canada the fee is the same, but one copy of the production must be filed in the library of the Parliament of Canada, and one copy in the British Museum, London. The copyright, both in the British possessions and the United States, extends for twenty-eight years, and, if at the end of that time the author is still living, he may obtain its extension for fourteen years longer; or, if dead, his living representatives may obtain its extension, making in all forty-two years. However, in Canada the author or proprietor must publish a notice of the extension in the *Canadian Gazette*. The productions that may be copyrighted include books, engravings, paintings, photographs, maps, blank forms, and many others produced by authors, painters, draughtsmen, etc.

In 1878 a movement began in Paris to promote the *international copyright*, whereby authors and artists hoped to secure protection in various countries. A conference met at Bern, Switzerland, in 1885, at which representatives were present from France, Germany, Spain, Great Britain, Sweden, Norway, Switzerland, Belgium, Italy, Portugal, Denmark, and Mexico to consider the copyright interests of those nations. Great Britain confirmed the Bern convention in 1887 and the United States Congress enacted a law in 1891 by whose terms international copyrights are recognized. The provisions include that the entire manufacture of the foreign copyrighted work must be done within the country where it is to be protected.

**COQUIMBO** (kō-kēm'bō), a seaport of Chile, in the province of Coquimbo, 10 miles south of La Serena, with which it is connected by a railway. The surrounding country is agricultural and mining. It has a good harbor and a large export trade, chiefly in copper, gold, silver, and fruits. The principal buildings include a theater, a number of schools, and extensive warehouses. Population, 1906, 8,530.

**CORAL** (kōr'al), the hard structure or skeleton secreted by the tissues of various marine polyps. These organisms so nearly resemble plants that they were long classed with plant life. They propagate themselves by a kind of budding as well as by the production of eggs and young similar to other animals. They are usually compound, many individuals being united into a colony. The coral assumes various forms, being branched fanlike, brainlike, featherlike, or chainlike. The hard coral formations seen on the market are composed of the lime of the

ocean, which is incorporated among the tissues of the body, and in this form the remains of these animals make up vast calcareous deposits in the warm seas. The calcareous deposition begins when the polyp is still newly formed, and adheres to a rock or some other object, to which it becomes affixed and on which the coral is built up or grows. In general the deposits of the former generations form the base to which the growing young life is attached. The reforming coral polyps grow only in regions where the winter temperature of the water is never lower than 68° Fahr., but there are several spe-



1, Red Coral; 2, Brain Coral; 3, Tree Coral; 4, Madre-pore Coral. A, Skeleton; B, Living Corals.

cies that grow in colder water. The region where reef-bearing corals live extends 1,800 miles on each side of the Equator, except in the vicinity of Bermuda, which lies in the warm waters of the Gulf Stream. The calcareous remains of polyps form coral reefs. They are classed as fringing, barrier, and encircling reefs, according to the particular manner in which they form coral islands.

Coral islands begin as a *fringing reef* or narrow belt of coral rock, lying near the shore of an ordinary island. *Barrier reefs* are wider than fringing reefs and lie at a greater distance from the shore. An *encircling reef* is similar to a fringing reef and usually encircles the island, forming an *atoll*. A *lagoon* is formed by the



island sinking, the coral polyps building upward from the reefs, which eventually leave an open space of water or lagoon in the center. Polyps do not grow at a depth exceeding one hundred feet, nor above the surface of the water. The action of waves breaks the delicate coral structures, and these, together with shells from various shellfish, are ground into fragments and thrown by waves over the general level of the water. In this way reefs and coral islands are formed, but they seldom exceed twelve feet in height.

The islands formed by the coral remains become covered with trees and plants, the seeds being conveyed through the agency of winds and birds from adjacent islands. Reptiles and small quadrupeds are carried to them by trunks of trees floating in the water. Thus, divers forms of life are brought to and extended on the island and reefs. Various products made of different species of polyps are the coral of commerce. Among the valuable classes are the pink, red, and black. The industry of coral fishing is carried on in various regions, particularly in the Mediterranean Sea. Many forms of coral are capable of taking on a polish and are useful in manufacturing ornaments, charms, and divers commodities useful in domestic and social life.

**CORAL SEA**, the name applied to the portion of the Pacific Ocean lying northeast of Australia. It is bounded on the north by New Guinea and the Solomon Islands, east by the New Hebrides, south by New Caledonia and the Pacific, and west by Australia. The extreme depth, according to soundings made in 1874, is 14,700 feet. It is so named from the large number of coral reefs and islands located within its confines.

**CORCORAN ART GALLERY**, a collection of works of art at Washington, D. C., founded by William Wilson Corcoran and opened to the public in 1869. The Corcoran donations, including the lot and building, amounted to \$1,600,000. The building is located on New York avenue, opposite the executive grounds, and has a length of 265 feet. It is constructed of beautiful white marble in the Neo-Greek style, after the plans of Ernest Flagg, of New York. The collections include sculptures, ceramics, paintings, and portraits, and a school of art is maintained to further interest and skill in painting and sculpturing. The famous collections include Hiram Powers's "Greek Slave" and Vincenzo Velas's "Last Days of Napoleon." Visitors are required to pay a small admission toward a charity fund and are admitted only on special days.

**CORDILLERA** (kôr-dî'l'ěr-à), a word of

Spanish origin, applied generally to a ridge or chain of mountains. In America it is the name of the vast mountain system which extends along the Pacific coast of North and South America, from the northern part of Alaska to the island of Tierra del Fuego. The Cordilleras of these continents include the Andes of South America and the mountain ranges of North America known as the Rocky Mountains, the Sierra Nevada, the Sierra Madre, and a number of chains in Canada and Alaska.

**CORDOVA** (kôr'dô-và), or **Córdoba**, a city of Spain, on the Guadalquivir, capital of the province of Cordova. It is situated at the base of the Sierra de Cordova, at an altitude of 325 feet, and has railroad and electric railway facilities. The cathedral, built as a mosque in the 8th century, is in the Moorish style of architecture. In the central piazza is an equestrian statue of Gen. Paz. Other noteworthy features include the university, the government palace, the public library, and the observatory. The vineyards, parks, and boulevards are very beautiful, though some of its streets are quite narrow. It is the seat of extensive manufactures and has a brisk trade in Cordovan leather, silk, cereals, clothing, and silver filigree. The Romans founded Cordova in 132 B. C., later it fell into the hands of the Goths, and subsequently became a possession of the Moors. It was the leading city of the Moorish kings from the 9th to the 12th century, and they built many mosques, palaces, and public places. Population, 1906, 60,148.

**CORDOVA**, or **Córdoba**, an important railroad and commercial city in the interior of Argentina, capital of the province of the same name. It is surrounded by a fertile country, which has productive mineral interests. The city is an important railroad junction between Rosario, on the Paraná, and Tucumán. Its manufactures embrace machinery, cigars, flour, clothing, and furniture. Waterworks, pavements, electric lights, and street railways are among the improvements. It was founded by the Spanish in 1573. The university was built by the Jesuits in 1613 and in 1871 it was the seat of the first national exposition of Argentina. Population, 1906, 56,457.

**CORDUROY** (kôr'dû-roi), a kind of cotton material in which the pile is cut like that in velvet, but the surface is corded or ribbed. The pile weft is bound to the cloth, causing the ribs which are separated by a but or division. Corduroy is used extensively in making wearing apparel for men.

**CORDUROY ROAD**, a highway built in marshy places by laying small logs side by side. It is so named from its rough or ribbed surface.



Corduroy roads are constructed only in sparsely settled regions, chiefly in the swamps and marshes found in many of the forests, and are used principally in hauling timbers and lumber.

**COREA** (kō-rē'ā), or **Korea**, a country in the eastern part of Asia, located between the parallels of 34° 17' and 43° north, and between the meridians of 124° 38' and 130° and 33' east. It is bounded on the north by Manchuria, east by the Japan Sea, south by Corea Strait, and west by the Yellow Sea. The country occupies mainly a peninsula, separated from Japan by Corea Strait and partly from Manchuria by the Yalu River. The length from north to south is about 600 miles; breadth, 135 miles; and area, 82,100 square miles.

**DESCRIPTION.** The surface is generally mountainous, with numerous fertile valleys and a productive sea coast. The highest mountains are in the northern part, where the elevations have a height ranging from 3,500 to 8,000 feet, and an elevated ridge extends the entire length of the peninsula, lying chiefly along the eastern seaboard. Most of the northern part and all of the mountains are well wooded, but the hills and fertile plains of the west and south have few trees.

Corea has few large rivers and the drainage is chiefly toward the south and west. The Yalu, on its northern boundary; the Ta-tung, in the central part, and the Keum, in the southern section, are the principal rivers, all of which discharge into the Yellow Sea. The Tuman, in the eastern part, is the only river of note that flows into the Sea of Japan. All sections of the country have an abundant rainfall, which has an annual average of 36 inches, and most of the precipitation is during the rainy season between May and September. The climate, like that of Japan, is equable and healthful. In summer the average temperature is 75°, while the range is from 5° in winter to 90° in summer.

Though Corea does not possess an extensive flora, it is quite rich in valuable forests. Among the chief species are fir, lime, pine, oak, birch, ash, bamboo, mulberry, and hornbeam. Forestry is promoted as an enterprise and the government has a monopoly in ginseng. Many wild animals are abundant, especially the fox, badger, deer, otter, and squirrel. The birds include the crane, ibis, hawk, egret, heron, oriole, cuckoo, kingfisher, duck, and goose. Water fowls are abundant along the coast.

**MINING.** The mining industry is carried on chiefly under concessions granted to companies organized by capitalists in Great Britain, Germany, Russia, and the United States. Coal de-

posits are worked in the west central parts, and gold is obtained by placer mining as well as from the ore. The value of the output of gold is about \$2,500,000 annually. Copper is found in many sections and most of the output is exported. Other minerals worked more or less extensively are iron, galena, granite, limestone, and sandstone. Most of the coal obtained is bituminous, but profitable veins of lignite and anthracite coal are worked.

**AGRICULTURE.** Farming is the principal occupation, and rice is the most valuable crop. Most of the land is held in small estates and the soil is tilled with a great deal of care, every available portion being worked to good advantage. Barley, oats, and millet are grown chiefly in the northern part, and tobacco, wheat, maize, hemp and cotton comprise the principal crops in the south. All kinds of vegetables and many varieties of fruit are grown extensively. Cattle raising has had a small share of attention, but this enterprise is being introduced, and milk, butter, and cheese, though largely unknown in Corea, are coming into use as articles of food. Oxen of large size are grown for the market and as animals of burden and draft, and the native horse is a small animal, not much larger than a Shetland pony. Goats, hogs, and poultry receive more or less attention.

**MANUFACTURING.** The Coreans possess little skill in manufacturing when compared to the Chinese and Japanese. Formerly they possessed considerable ability in this enterprise, and it is largely due to them that the arts and sciences of China were introduced to the people of Japan. Paper is at present one of the chief manufactures. Next in order are products made from hemp and grass, such as mats and cordage. Split bamboo screen, inlaid woodwork, brassware, coarse cotton and silk clothing, hats, and umbrellas are among the general manufactures. The Coreans make a fine grade of thread and a large variety of silk and cotton textiles. Little attention is given to the manufacture of modern machinery, but a large variety of implements and utensils used in gardening and farming are produced. The fisheries yield many articles of food and for export. Among the chief catches are the salmon, halibut, herring, shark, sardine, and whale, all of which enter more or less prominently into manufacturing enterprises, such as curing and canning. The meat of the whale is esteemed as an article of food among the native Coreans.

**COMMERCE AND TRANSPORTATION.** Corea was long tributary to China, hence its trade with foreign countries remained limited many centuries. Formerly it was almost entirely with



China and Japan, but eight of its seaports were opened to the commerce of the world prior to 1900. The imports somewhat exceed the exports. Among the chief imports are kerosene, tobacco, metals, and machinery; while the exports include copper, rice, hides, ginseng, whale flesh, and paper. Few highways have been improved in a first-class condition and travel is still largely in Sedan chairs and on horseback. The rivers are used largely for transportation. Railroads were unknown until 1901, when a line was constructed between Seoul and Chemulpo, a distance of twenty-five miles. A railway was built soon after from Seoul to Fusan, on the Corea Strait, a distance of 285 miles, and another line extends from Seoul to Wiju, at the mouth of the Yula. The total lines in operation do not exceed 1,000 miles, but there is a large mileage of telephone and telegraph lines, and electric railways penetrate from Seoul into the adjacent country.

**GOVERNMENT.** Corea paid tribute to China until 1895, when it became an absolute monarchy, but the Portsmouth Treaty, in 1905, made it tributary to Japan. The government is administered by a governor general resident at Seoul, the capital, but all diplomatic business is transacted from Tokio, the seat of the Japanese government. The country is divided for local administration into thirteen provinces and 339 *kun* or prefectures. In methods of education it remained distinctly Chinese until 1895, when a new public school system was inaugurated, and schools provide work from the primary department to the university at Seoul. A number of the higher institutions maintain departments for languages, including those under the instruction of Japanese, Chinese, German, Russian, English, and French. A number of mission schools are maintained by many of the Christian denominations.

**INHABITANTS.** Corea is populated largely with a class of people of Mongolian descent, who seem to have sprung from intermarriages of the Ainos, Japanese, and Chinese. Some writers class the Coreans immediately between the Chinese and Japanese, but they are somewhat taller and more robust and have a lighter complexion than either of these races, hence some think that they contain a mixture of Caucasian blood. Polygamy is practised to a limited extent, but is not authorized as an institution, and the women live in seclusion. Colored clothing and hats of horsehair are worn by the nobility, while the common people make use largely of white and uncolored clothing. Buddhism is the chief religion, but in practice it is more or less perverted by Shamanism, and has developed into a form

of ancestor and animal worship. The Protestant and Roman Catholic churches find Corea a prolific field for missionary work. Seoul, the capital, is located near the mouth of the Han River. Fusan, on Corea Strait, is important as a port of entry. Other cities include Chemulpo, Pingyang, and Kai-Ku. Population, 1908, 13,560,108.

**HISTORY.** The early history of Corea is shrouded in doubt and mystery. The nation is thought to have been founded about 1120 B. C., but little is known of it until 108 B. C., when it was made a part of the Chinese Empire. It was divided into principalities about the beginning of the Christian Era, but remained dependent upon China until about 960 A. D., when one of the principalities became independent and soon after annexed the others. It continued to remain an independent kingdom about 300 years, in which Buddhism was introduced and the arts and sciences made strides of advancement. In 1392 the dynasty was overthrown and the priests were banished, and the country was successively invaded by armies of China and Japan, each seeking to secure a preponderance of influence. Japan retained Fusan as a trade center many centuries, but the country was nominally a Chinese dependency until 1895, when it became an independent monarchy.

The first treaty with foreign nations was concluded in 1876, when the ports of Gensan and Fusan were opened to trade, and all the treaties now in force date since that year. The Sino-Japanese War of 1894-95 was caused by a contest of the two nations to control the trade and political tendencies of the country, but the defeat of the Chinese army at Pingyang and the destruction of their fleet in the naval battle off the Yula River decided the fortunes of war in favor of Japan. The treaty that followed made Corea independent, but the Treaty of Portsmouth, concluded after the close of the Russo-Japanese War, in 1905, made Corea tributary to Japan. Japanese occupation is stimulating internal improvement, widening educational influences, and enlarging the commercial and manufacturing enterprises.

**CORENTYN** (*kō-rěn-těn'*), a river of South America, forming nearly all of the boundary between Dutch and British Guiana. It rises near the boundary of Brazil, in the Tumuc Humac Mountains, has a northerly course, and discharges into the Atlantic Ocean. It is about 400 miles long and is navigable for large steamers only 40 miles, but small vessels navigate it about 150 miles. In its middle course are a number of large rapids and waterfalls.

**CORFU** (*kōr-fōō'*), the most northerly of



the Ionian Islands, located at the entrance of the Adriatic Sea. The area is 428 square miles. It has a mountainous surface, which is diversified by a number of fertile valleys, and the most elevated point is Pantokrator, 2,995 feet above the sea. Much of the soil possesses fertility and produces a fine quality of cereals, grapes, and fruits. Mineral salt is abundant. It was settled by a Corinthian colony in the 8th century B. C. and was a loyal supporter of ancient Greece. In 229 B. C. it was made a part of the Roman Empire. Since 1863 it has belonged to Greece. The capital, Corfu, is a fine city. It contains the government buildings, a cathedral, the university, a public library, and free schools. It has a good harbor and a considerable commerce. Population, 1906, of the city, 21,690; of the island, 128,548.

**CORIANDER** (kō-rī-ān'dēr), a plant native to many parts of Europe, belonging to the parsley family. When the fresh plant is bruised, it has an unpleasant odor, but when dried the smell and taste are agreeable. It has a branching stem from one to three feet high, and is cultivated for its fruit, which is the coriander of market. It is used in medicine as a carminative, and in cookery and confectionery as an aromatic. The plant has been naturalized in some parts of Canada and the United States.

**CORINTH** (kōr'inth), county seat of Alcorn County, Mississippi, ninety miles southeast of Memphis, Tenn., on the Memphis and Charleston and the Baltimore and Ohio railroads. In the Civil War it was regarded an important point and was held successively by both armies. The Confederates evacuated it on May 30, 1862, and it was occupied by Gen. Rosecrans with a force of 20,000 men until Oct. 3 of the same year, when it was attacked by the Confederates under Generals Van Dorn and Price, who were repulsed. The Confederates lost 3,648 men and the Union army, 2,359. At present it has a growing trade in farm produce and merchandise. The chief buildings include a library, several churches and schools, and a number of county buildings. It has manufactures of brooms, woodenware, and machinery. Population, 1900, 3,661.

**CORINTH**, a famous city of antiquity, on the Isthmus of Corinth, a neck of land uniting the Peloponnesus with northern Greece. Owing to its beauty and commercial importance, it was called "The Star of Greece." It had three harbors and was important mainly because of its location between the Adriatic and Aegean seas. Among the cities of Greece it was highly renowned, commanded a point of advantage between the trade from Africa and that of

Western Europe, and was fortified by walls of stone, on which stood its citadel. Its ancient splendor and magnificence are evidenced only by a few ruins. It was the seat of the Isthmian games, which attracted much attention during Grecian power. Corinth was founded by Sisyphus, an Aeolian, about 1350 B. C. The government was under an oligarchy and a king at different times; Periander was its greatest king and fostered its growth and prosperity. The rise of Athens caused the Peloponnesian War. Later the Corinthian War in conjunction with Thebes, Athens, and Argos was waged against Sparta, and it became the head of the Achaean League. Alexander the Great was elected leader of the Greeks at Corinth against the Persians.

The Romans destroyed Corinth in 146 B. C., but Julius Caesar rebuilt it and made it a prosperous trading center a hundred years later. It was the residence of Saint Paul for a year and a half, who founded here a Christian church, and later wrote his two letters to the Corinthians. After the fall of Rome it was taken by the Slavs, Franks, Turks, and Venetians, and later again by the Turks. It was freed from the Sultan in 1822, but was destroyed by an earthquake in 1858. The city has been rebuilt and is enjoying considerable trade, owing to the canal cut through the isthmus, which is the seat of a large commerce. It has several railroad connections. The new city is more properly called New Corinth. During its greatest prosperity it had 300,000 inhabitants. Population, 1906, 5,265.

**CORINTH, Gulf of**, an inlet of the Mediterranean Sea, between the Peloponnesus and northern Greece, about eighty miles long. It is beautifully located, has a large number of bays, and the Isthmus of Corinth is toward the east. The gulf has the appearance of an inland lake. It is sometimes called the Gulf of Lepanto.

**CORINTH, Isthmus of**, an isthmus connecting the Peloponnesus with northern Greece. It is from four to eight miles in width. A ship canal 3.91 miles long, twenty-six feet deep, and sixty-nine feet wide at the bottom has been constructed across it. The canal was opened to commerce in 1893. It saves a long detour in the coasting trade and avoids rounding Cape Matapan. The canal is located along the route on which work was prosecuted in the reign of Emperor Nero in the year 67 A. D. This canal is at sea level and without locks.

**CORINTHIANS, Epistles to the**, two canonical books of the New Testament, commonly called the First Corinthians and the Second Corinthians, both written by Saint Paul. The



*First Corinthians* was written at Ephesus in the year 57 to the Church at Corinth, which Paul had founded in 50, and is a rebuke for vanity, self-seeking, party spirit, impropriety at public meetings, and disrespect to the apostle's authority. It emphasizes the doctrine of the resurrection. In the *Second Corinthians* the apostle makes a summary of his true authority, but it is earnest as well as conciliatory in its statements. Both books have been almost universally received as genuine letters of Paul, and in this respect they rank with the epistles to the Romans and the Galatians.

**CORK**, a city of Ireland, on the Lee River, in the County of Cork. A part of the city is on an island, which is joined to the mainland by nine bridges, but the principal site is on the river banks. Though about fifteen miles from the sea, it has a vast commerce and excellent railroad connections with the interior. The exports consist largely of eggs, ham, butter, cereals, bacon, and live stock. Among the manufacturing enterprises are foundries, distilleries, tanneries, breweries, and immense shipyards. The city contains a number of excellent institutions of learning, among them Queen's College, founded in 1849. It has fine Roman Catholic and Protestant cathedrals, a customhouse, and other public buildings. The public park is a finely improved tract of 240 acres and includes a race course. Cork is well fortified and has ample wharfs and facilities for the anchorage of vessels. A part of the trade is carried by way of the fine harbor at Queenstown, about eleven miles below the city. Gas and electric lights, waterworks, pavements, and rapid transit are among the improvements. The Danes built walls around a portion of the city in the 9th century. It was surrendered to Henry II. in 1172. Two members represent Cork in Parliament. Population, 1906, 78,122.

**CORK**, the light, porous outer layer of bark of the cork oak. It is a very elastic tissue, consisting of thin-walled and nearly cubical cells. The *cork tree* or *cork oak* is abundant in Portugal, Spain, Northern Africa, and most countries bordering on the Mediterranean. It attains a height of from twenty to sixty feet and a diameter of three feet, and has oblong, evergreen leaves. The acorns, which ripen from September to January, depending upon the climate, are edible. Specimens are often seen in which the trunk has a circumference of fifteen feet, owing partly to the thick bark and the great age, which sometimes is from 300 to 400 years. When the tree reaches an age of from fifteen to twenty-five years, the bark is taken off. The first cutting is coarse, but the product improves

by successively taking off the bark. A crop is taken off about every eight years, the third being of the finest quality. It is removed with an ax, by which cuts are made both lengthwise and crosswise of the tree, and care is used not to damage the inner bark, else the tree will die. Cork is used extensively for artificial limbs, shoe soles, life belts, net floats, and stopples for bottles and flasks. For the purpose of manufacturing corks, machines are utilized by which many thousands can be cut in a day. The machines and instruments used are of superior material and have a sharp edge so they cut easily. This is necessary, owing to the elasticity of the article.

**CORMORANT** (kôr'mō-rant), the name of a large web-footed sea bird of the pelican family. Vast numbers of these birds frequent



CORMORANT.

islands in most parts of the world. They have a long neck, hooked bill, short wings, and stiff and rounded tail. The European species is larger than a goose, occupies cliffs by the sea, and feeds on fish and small quadrupeds. It builds its nests on rocky shores and in trees. The species of America and Australia are very numerous. Some species have been trained to fish, for which purpose they are still domesticated and used in China. The common plan is to fasten a string around the neck to prevent the bird swallowing the fish that it catches. Later it learns to bring the fish to its master without this precaution being necessary. The cormorants of the Columbia River and the eastern coast of North America are highly prized for their beautiful plumage.

**CORN, Indian, or Maize**, a well-known plant of the grass family, one of the most important cereals grown in the Temperate Zone. It is cultivated extensively as a food and for many purposes in manufacturing. The stem grows from three to twenty feet in height; the average in corn-producing districts is about ten feet. The



stem is filled with a pithy, fibrous structure, is divided by nodes at regular intervals, and its outside covering is of a siliceous formation. It sends out brace roots from the second or third nodes to aid in supporting the stalk when reaching its larger size. The ears are developed within the leaf-sheaf at one or two of the nodes, about four feet from the ground. They consist of a *cob* with from eight to twenty regular rows of grains. The grains of the species which are grown most extensively are yellow or white, but some are red or a mixture of red with white or yellow. Threads of corn-silk

corn-producing states of the Union, though a number of others take high rank. The Mississippi valley is the greatest corn-producing region in the world. It is grown profitably in many parts of Canada, but the largest yield is in Ontario, where the annual crop is about 25,000,000 bushels. Corn is planted by machinery in the months of April or May and is cultivated until about the first of July, and the crop is gathered in October and November. It yields from fifteen to ninety bushels per acre.

Many species of corn are grown and all are more or less useful for various purposes. *Pop corn* is a small species which is used for roasting, and is so named because the kernels break open when they are exposed to a brisk heat. This is due to the fact that they are enclosed by a tough covering, which prevents the steam from escaping, causing the kernels to burst open and turn the inner side outward. *Sweet corn* is used largely for eating before maturity and for canning on a very large scale. *Flint corn* is a hardy, yellow species which is grown in the regions where the seasons are short, since it matures early and is quite hardy. The common corn, known as *dent corn*, is the staple species for general use. It is used for meal, corn bread, cakes, and hominy. Alcohol, whisky, starch, and other staple products are manufactured from it. The cob is used for making pipes and as a fuel. However, the most important use of corn is for feed for hogs, horses, cattle, and other domestic animals, for which purpose the stalks as well as the grain are used. Since the adoption of the newer process of grinding grain by roller mills, corn meal has been used as an adulteration in wheat flour. The government of the United States sent commissions to Europe at different times for the purpose of stimulating the consumption of corn as a food among the laboring classes of the densely populated states. Corn is native to America. It was introduced by Columbus into Europe, though it is believed that the maize plant was known in Africa and Asia prior to that time.

**CORNCRAKE**, a name applied to the land rail of England, chiefly because its cry is *crek-crek*. The color is reddish-brown, or brown-gray, and it haunts the corn and grass land in early summer. The crane is a wader about seven inches long. Several species of American birds, especially the short-billed rails, are frequently called crakes.

**CORNEL** (*kôr'něl*), the name applied to various plants of the genus *Cornus*, which include about twenty species of shrubs and small trees. The *Cornus mas*, familiarly known as



CORN OR MAIZE.

are attached to the germs of the grains, which serve to carry pollen from the *tassel* above to the embryo. Corn is considered of greater value as a nutritious food than rye, buckwheat, or barley.

The annual production of corn in the United States exceeds 2,260,000,000 bushels, which is about twice as much as is produced in all the other countries of the world combined. The value of this enormous product is about \$780,000,000, nearly twice the value of the gold output of the world, and more than the total value of the product of gold and silver. The states of Iowa, Illinois, Kansas, Nebraska, Texas, Ohio, Oklahoma, and Missouri are the leading



cornel or cornelian cherry, has oval leaves and yellow flowers, and was formerly cultivated as a fruit tree. The fruit is fleshy, oblong in shape, and is eaten raw or used in making preserves. In some sections it is gathered green and pickled like olives. The *cornelian cherry* is native to Europe. The species common to the United States grow in damp woods and their fruit is not properly edible. About eighteen species are found in North America, some of which thrive as far north as central Canada. These plants are known locally as dogwood.

**CORNELL COLLEGE**, an institution of learning at Mount Vernon, Iowa, organized in 1857. It is under the direction of the Methodist Episcopal Church, and carries classical, scientific, philosophical, and civil engineering courses. The Bowman, Chapel, College, Conservatory, and Science halls are the principal buildings. The library contains 25,500 volumes. It is coeducational. Cornell College is noted for its high moral and intellectual standards. It has a faculty of thirty-six instructors and about 750 students.

**CORNELL UNIVERSITY**, a coeducational institution of higher learning on Lake Cayuga, near Ithaca, N. Y. It is situated on a hill 300 feet high with a view twenty miles down Lake Cayuga and seventeen miles up Enfield valley. This institution was founded in 1865 as a result of the Federal Land Grant Act of 1862, by which large tracts of public lands were assigned to the states for educational purposes, and received a gift of \$500,000 and 207 acres of land for use as a site from Ezra Cornell (q. v.), in whose honor it was named. Through the skillful management of western lands by Mr. Cornell and Henry W. Sage and through gifts the property of the university has been increased to about \$12,500,000. It has nineteen main buildings, which include the Rockefeller Hall of physics, the Morse Hall of chemistry, the buildings of the New York State College of Agriculture, the Goldwin Smith Hall of Humanities, the University Library with 340,000 volumes, the Law Library with more than 37,000 volumes, and numerous workshops and machine shops. About 150 State scholarships (free tuition) are awarded annually to residents of the State of New York by competitive examination. Eighteen undergraduate scholarships valued at \$400 each and forty graduated scholarships and fellowships of the total value of about \$16,000 are distributed annually. The faculty consists of 483 professors and teachers. In the years 1906-07 it had an attendance of 4,225 students for all departments, which is about the average annual enrollment.

**CORNET** (kôr'nĕt), a metallic wind instrument of the trumpet class, furnished with valves and stoppers. The name formerly applied to it was *cornopean*. Its tone is very agreeable and it is used largely in military bands and orchestras. A number of classes and forms are in general use, of which the *cornet-à-piston*, a French term signifying a cornet with pistons, is the best known. It is so named from the small pistons which are moved by the fingers in playing.

**CORN HARVESTER**, a machine for harvesting corn, fitted with a cutting apparatus and a device for binding the stalks into bundles or sheaves. The cutting apparatus differs from that of a reaping machine in that the knives move more slowly, and a balance wheel is utilized to maintain their uniformity in speed. The device used in binding is quite like that of an ordinary harvester, and it is usually fitted to bind the sheaves with sisal or manila twine. The machine ordinarily employed cuts one row of standing corn. The stalks are carried to the binding frame, where the bundles or sheaves are bound and then pushed to the side of the machine and dropped on the ground in such a position that the horses will not step upon them when the next row of corn is cut. Corn cut in this way is bound in small bundles or sheaves, which are afterward set up to form shocks. Other corn harvesters are employed when the grain has matured, and these both husk the corn and gather the leaves and husks for fodder, or they merely strip the ears of their leaves and by an elevator carry them into a wagon, leaving the stalks and husks on the field as waste material.

**CORNING** (kôr'nĭng), a city of Steuben County, New York, on the Chemung River, about seventeen miles northwest of Elmira. It is on the Erie, the Lackawanna, and the New York Central railroads. The noteworthy buildings include the public library, the city hall, the high school, and the Saint Mary's Orphan Asylum. Among the manufactures are railroad cars, flint glass, cigars, machinery, and clothing. It has electric lights and street railways, waterworks, and other modern municipal facilities. It was incorporated as a village in 1849 and as a city in 1890. Population, 1905, 13,515; in 1910, 13,730.

**CORN LAWS**, the laws enacted by the British Parliament for the regulation of the trade in grains, both the exports and imports. The exportation of grain was prohibited in many European countries during feudal times with the view of causing a lower price in food products, but this policy worked a hardship upon



the agricultural classes of England, and Parliament passed a law in 1436 which permitted exportation when the price of grain fell below a certain limit, though duties were still charged upon the exports. Subsequently the law was amended so as to provide a sliding scale of charges on imports, and these remained in force until the popular agitation of 1846, when Sir Robert Peel declared himself in favor of a repeal of the corn laws. The agitation was very intense under the leadership of Bright and Cobden, who were supported by the Anti-Corn Law League, and in June of that year an act was passed which provided for the gradual abolition of duties. The importation of grain was made entirely free in 1869. It has been a matter of controversy between protectionists and free traders whether the effect of the repeal measure has proved beneficial, and the former point to a decline in agriculture as a consequence of the policy, but the loss is probably more than equaled by the growth in commerce and manufacturing enterprises.

**CORNWALL** (kôrn'wəl), a port of entry and the capital of Stormont County, Ontario, sixty-six miles southwest of Montreal. It is on the Saint Lawrence River, the Cornwall Canal, and the Ottawa and New York Railway. Among the noteworthy features are the county courthouse, the high school, and the Lacrosse Club building. The manufactures include cotton and woolen fabrics, flour, paper, and machinery. It has public waterworks and other improvements. Population, 1901, 6,704.

**COROLLA** (kô-rôl'lä), the inner circle or set of leaves of flowers, usually bright colored. It is composed of leaves called *petals*, which surround the part that bears the fruit. Some flowers have a whorl of leaflike organs intervening between the corolla and the stamens, which are considered an appendage of the former and are prominent in some flowers, as in the daffodil.

**CORONA** (kô-rô'nà), in astronomy, a halo surrounding the moon when it is seen projected against the disk of the sun in a total eclipse of the latter luminary. Some scientists suppose it to be the atmosphere of the sun, which at other times is invisible, but this view is not generally accepted, since an atmosphere in the ordinary sense could not exist at so great a distance above the surface of the sun. Astronomers now generally regard it to be the prototype of the terrestrial auroras.

**CORONATION** (kôr-ô-nâ'shŭn), the ceremony or act of crowning a sovereign, as a king or emperor, at which he is invested with royalty. See **Crown**.

**CORONATION CHAIR**, the throne used at the coronation of kings in England since the time of Edward I. It is kept in Westminster Abbey, where the coronation ceremony takes place. This chair has the famous *Lia Fail*, the Stone of Destiny, beneath the seat, which was used in crowning the kings of Scotland. According to tradition, it is the stone that was used by Jacob as a pillow (Gen. xxviii., 11), and was taken by Tarra to Ireland in the 5th century, whence it was brought to Scotland and afterward to England.

**CORONATION GULF**, an inlet of the Arctic Ocean, located between Mackenzie and Victoria Land. It receives the inflow of the Copermine River from the south, and extends as Bathurst Inlet toward the southeast. Dease Strait connects it with Victoria Strait on the northeast, and northwest of it is Dolphin and Union Strait. Within its confines are many islands.

**CORPORATION** (kôr-pô-râ'shŭn), a corporate body empowered by law to act as a single individual and having a common seal. There are two classes of corporations—aggregate and sole. An *aggregate corporation* consists of two or more persons incorporated according to law in a society which is kept up by a succession of members, either perpetually or until it is dissolved by mutual consent or limitation. A *sole corporation* consists of a single individual and his successors, organized to perpetuate an office or function which cannot be done in the personal or bodily capacity of any man. For instance, the title to certain church property in Massachusetts is vested in a sole corporation composed of the pastor of the church. In transferring land to a corporation of this class the deed or instrument of conveyance must include the words "and his successors." The office of king or bishop in England is a sole corporation, for the reason that the office is regarded perpetual, and continues to exist though the possessor may die.

Aggregate corporations are under general law of two classes—public and private. *Private corporations* are organized for the purpose of conducting business, societies, coöperative associations, manufacturing, hospitals, colleges, and other enterprises. Organized in this way, the members forming the corporation are individually exempt from liability of the corporation, only the property of the corporation being subject for indebtedness of the organization. However, in some instances the personal liability extends to the amount of the capital stock owned by the individual stockholder. A corporation may sue and be sued as a single indi-



vidual. The great railroad, telegraph, telephone, banking, insurance, and other companies are organized on a corporate basis. The several states and provinces have laws regulating the formation of corporations. They supervise their organization and fix a minimum to be paid upon the capital stock at the time the organization is formed. Private corporations adopt articles when effecting an organization, in which the capital, indebtedness, privileges, and powers are limited by agreement.

*Public corporations* are those organized for the government of towns, cities, counties, provinces, and states. Another class of public corporations are those that have for their object the improvement and maintenance of public parks, cemeteries, and similar institutions. It is customary to adopt written by-laws for the government of corporations by the board of directors, who are elected by the members of the corporation. These by-laws may be changed under certain conditions, but must comply with the provisions and requirements of the articles of incorporation. The business of a corporation is managed primarily by the board of directors, who act principally through the officers, including the president, vice president, secretary, treasurer, etc.

**CORPUS CHRISTI** (kôr'pūs krīs'tī), a festival in the Roman Catholic Church held in honor of the body of Christ. It is observed on the Thursday after Trinity Sunday. It was first celebrated in 1241 at Liège by the canons of Saint Martin and was recommended in a bull issued by Pope Urban IV. in 1263, which was afterward confirmed by the council of Vienna. The name is also applied to a college at Cambridge, England.

**CORPUS CHRISTI**, a city and the county seat of Nueces County, Texas, on Corpus Christi Bay, about 200 miles southwest of Galveston. It is on the San Antonio and Aransas Pass and the Mexican National railroads, has a good harbor, and is the seat of a large trade in fish, oysters, cotton, and cereals. The noteworthy buildings include the county courthouse, the high school, and the customhouse. It has a canning factory, machine shops, and cigar and tobacco factories. Corpus Christi was settled in 1849 and incorporated in 1876. Population, 1900, 4,703; in 1910, 8,299.

**CORRELATION** (kôr-rê-lā'shūn), in pedagogy, the mutual or reciprocal relation of studies, or the act of bringing under relations of union, correspondence, or interaction. Both Froebel and Herbart regarded unity as the important law in education and both wrote much on the subject, making it a fundamental law in

their systems. Recent educators have generally supported this principle, and have sought to direct teaching with the view of more fully utilizing the law of association. - For instance, the reading lessons are chosen with a view of throwing added light upon contemporaneous lessons in history, botany, and geography. In this way these and similar lessons are made more serviceable in the school course.

**CORROSIVE SUBLIMATE** (kôr-rō'siv sūb'li-māt), the bichloride of mercury, prepared by heating mercuric sulphate with dry sodium chloride. It is a white crystalline solid, very poisonous, and is used to preserve both vegetable and animal substances. Surgeons employ it as an antiseptic spray and to clean and sterilize their operating instruments.

**CORRY** (kôr'rī), a city of Erie County, Pennsylvania, ninety miles southwest of Buffalo, N. Y., on the Erie and the Pennsylvania railroads. The noteworthy features include the State fish hatchery, the high school, and a number of mineral springs. It has flouring mills, iron mills, and door, lumber, and sash factories. In the vicinity are valuable deposits of oil, coal, and natural gas. The surrounding country is agricultural. Corry was settled in 1860. Population, 1900, 5,369.

**CORSAIR** (kôr'sâr), a pirate or the vessel used by pirates, applied chiefly to the freebooters of the Barbary States. The Corsairs were commissioned by princes to attack the merchant ships of foreign nations and for many years were a scourge on the Mediterranean. In 1800 Capt. Bainbridge sailed to Algiers to pay a tribute to the dey on behalf of the United States, but war was declared against Tripoli the following year and their capital was bombarded in 1804. Algiers declared war against the United States in 1815 on account of a disagreement in regard to the tributes paid, but Commodore Decatur appeared with a large fleet and compelled the dey to sign a treaty. Subsequently the Corsairs were annihilated by the European governments.

**CORSICA** (kôr'sī-kā), or **Corse**, an island in the Mediterranean, belonging to France, and forming a department of the same name. It is 110 miles long and 52 miles wide. The area is 3,367 square miles. It is traversed by a number of rugged ranges of hills and mountains, but has tracts of merchantable forests. Monte Rotondo, the culminating peak, has an elevation of 8,620 feet and is crowned with perpetual snow. Many of the rivers have their sources in the mountain ranges, the principal streams being the Golo and the Tavignano; the former is navigable for boats. The soil is fer-



tile in the river valleys and on the coast region, and produces many kinds of cereals, grasses, and fruits. Mineral oil and timber are the chief sources of wealth. The minerals include marble, iron, lead and petroleum. Large interests are vested in rearing sheep, horses, cattle, mules, and goats. The fisheries are a source of considerable profit. Ajaccio, celebrated as the birthplace of Napoleon, is the seat of government. Bastia is an important city.

Corsica was colonized by the Phoenicians and named Cynos. It was conquered by the Romans, who gave it the present name. After the decline of Rome it passed to the Goths, was conquered by the Saracens, and taken by the Genoese in the 15th century. France secured dominion over it in 1766. It became independent in 1794 and two years later was again made a part of France, to which country it still belongs. The industries are not in a high state of development, but several railroads have been constructed and other modern improvements are causing a change toward greater production, both in agriculture and manufacture. Population, 1906, 291,160.

**CORSICANA** (kôr-sĩ-kä'ná), a city in Texas, county seat of Navarro County, fifty-two miles southeast of Dallas, on the Saint Louis Southwestern and the Houston and Texas Central railroads. It is surrounded by a fertile agricultural country, which is rich in petroleum, gas, and coal. Among the chief buildings are the public library, the State orphan asylum, the courthouse, and the Odd Fellows' widows and orphans' home. The manufacturing industries include iron foundries, flouring mills, oil mills, machine shops, and cotton compresses. It has good public schools, pavements, electric lights, street railways, and many fine edifices. Population, 1900, 9,313; in 1910, 9,749.

**CORTES** (kôr'tēs), the national legislature of Spain and Portugal, consisting of an upper house and a chamber of deputies. The upper chamber in both countries is composed partly of hereditary peers and partly of elective members. The deputies of the lower chamber are elected in Portugal for a term of four years and in Spain for five years.

**CORTLAND** (kört'land), county seat of Cortland County, New York, about thirty-six miles south of Syracuse, on the Lehigh Valley and the Lackawanna railroads. The chief buildings include the courthouse, the public library, an academy, and a State normal school. Among the manufactures are stoves, furniture, carriages and wagons, wire, wall paper, and earthenware. The municipal utilities include waterworks, street lighting, pavements, and

street railways. It was settled in 1792 and incorporated in 1829. Population, 1910, 11,504.

**CORUNDUM** (kō-rŭn'dŭm), an alumina mineral found native in a crystalline state. This class of minerals includes a number that are highly prized as gems. Pure corundum ranks next to the diamond in hardness and its value depends upon the color. Sapphire is a blue species; ruby is red, emerald is green, amethyst is purple, and topaz is yellow. The star sapphire, known also as the *asteriated* sapphire, presents a six-rayed opalescent star. Species that have a dark color and possess opaque qualities are known in the market as corundum, while those of a granular formation are designated emery. Deposits of emery occur in Canada, at Chester, Mass., and in Asia Minor. Other species of corundum are widely distributed in all the continents.

**COSHOCTON** (kō-shōk'tŭn), county seat of Coshocton County, Ohio, on the Muskingum River, twenty-five miles north of Zanesville. It is on the Wheeling and Lake Erie and the Pennsylvania railroads and on the Ohio Canal. The chief buildings include the public library, the courthouse, and several fine churches. It has electric lights, waterworks, and manufactures of ironware, paper, and machinery. The first settlement was made in 1811 and it was incorporated in 1833. Population, 1900, 6,473.

**COSMOGONY** (kōz-mōg'ō-nŷ), from the Greek *kosmos*, world; and *gonē*, generation; an investigation of the origin or creation of the universe. The theories of this science are represented under three general classes: 1. The world as having existed in its present form from eternity. 2. The matter but not the form of the world as having existed from eternity. 3. Both the matter and form of the world having been created by a spiritual cause. The theory that the universe has existed in substantially its present form from eternity has long been accepted by some writers. It was embraced by a number of ancients and was supported by Aristotle. The theory that the matter but not the form of the world existed from eternity prevailed quite generally among various ancient philosophers. They proceeded to reason that no substance or body could have been made out of nothing, and thought that the elements existed in a state or condition known as *chaos*. Under modifications and changes covering long periods of time, the elements of the chaos were united and began to take on the form and conditions now manifest. After many periods or ages the present form resulted. The advocates of this theory held and still hold that changes go on continually, and that they are as rapid in



modern times as they were in any period of the history of the world. This theory in various modified forms was held by the Assyrians, Babylonians, Phoenicians, Egyptians, and other ancient peoples.

The theory that a spiritual cause brought the world into existence is held by the Jews, Christians, and other classes, and is taught in the book of Genesis in these words: "In the beginning God created the heavens and the earth." This theory differs from the second in that it does not hold to the eternity of matter. Having been created in the beginning, it is held that destruction and annihilation will cause it to cease existence in the end. On the contrary, the theory that matter is eternal presumes its continual endurance in the future as well as its existence forever in the past. The elements always existing may change in form by various combinations and movements, but cannot be destroyed or annihilated.

**COSSACKS** (kös'säks), a race of people which became known in Western Europe in the 10th century, when they inhabited the eastern and southeastern parts of Russia. They are thought to be a mixture of Tartar and Caucasian races, though their origin is not clearly established. They bear a close resemblance to the Russians. Their government was originally a kind of democracy with a chief or *hetman* as their ruler. They maintained both civil and military organizations, and were noted for their skill and daring in warfare. In the 15th century they fought against the Turks and Tartars, and were employed by Poland and Muscovy to guard the outposts of Russia. Later their democratic institutions gradually disappeared, when they were absorbed by the Russian dominion, under which government they pay no taxes, but instead render military services. The period in which they are subject to military duty extends from the age of eighteen to fifty, and each man is obliged to furnish his own horse.

Cossack cavalry has rendered the Russian Empire valuable services in many emergencies. The Cossacks were effective during the retreat of Napoleon after the burning of Moscow, when they inflicted serious damage to his army, as well as in the wars against Turkey and on numerous other occasions. They have rendered excellent services as scouts and skirmishers. In military service they wear a distinct uniform of dark green. Their principal rendezvous, called Tcherkask, was located on the Don in 1570, but, owing to overflows, New Tcherkask was founded in 1805, which is now the capital of the province of the Don Cossacks and constitutes a government of Russia. It has an

area of 63,532 square miles and a population of 3,125,718. In industry and intelligence the Cossacks have been described as superior to the average Russian, and they constitute a sober as well as a gallant people.

**COSTA RICA** (kös'tä rē'kä), a republic of Central America, located between Nicaragua and Panama. It is bounded on the north chiefly by Nicaragua, east by the Caribbean Sea, south-east by Panama, and west by the Pacific. The area is 21,500 square miles. Much of the surface is elevated and mountainous. The Talamanca Range of the cordillera of the Isthmus of Panama traverses the interior and includes a number of lofty volcanic peaks, reaching an elevation of 12,700 feet. Irazú and Turrialba, the former 11,500 and the latter 11,350 feet high, are active volcanoes. The western coast is indented by several extensive inlets, of which the gulfs of Dulce and Nicoya are the most important. Columbus discovered the region on his fourth voyage. It became free from Spain in 1821, and has since been a republic. A number of rivers drain the interior, among them the Trinidad, San Juan, Macho, and Dulce. A large portion of the surface along the coasts and in the valleys is exceedingly fertile. Owing to various altitudes, the climate is divided into three zones. The torrid zone lies below 3,000 feet; the temperate, between 3,000 and 7,500 feet; and the colder zone, above 7,500 feet, where frosts are frequent.

The principal industry is agriculture, the two most important products being coffee and bananas, but all cereals and fruits are successfully cultivated. There are productions of gold, silver, iron, copper, coal, and mineral oil. The foreign trade is largely with the United States, Germany, and Great Britain. The exports exceed the imports, the former having a value of \$9,550,500 and the latter, \$7,850,500. Railroads have been constructed by the government and under grants to European capitalists. Tramways and street railways are maintained in the larger cities, while the telegraph and telephone lines have a large mileage. San José is the capital. Other commercial cities are Cartago, Alajuela, Puntarenas, and Heredia. Limón and Puntarenas are the most important seaports.

The government of Costa Rica is vested in a president, whose term is four years, a legislature of one department, and a national judiciary. Education is compulsory. The common schools are supplemented by several institutions of higher learning. Roman Catholic is the state religion, but all denominations are granted liberty of conscience. About 3,200 Protestants and 350 Buddhists are in the country. Immigration,





### HARVESTING MACHINES.

The above shows a modern harvesting machine (a header) at work, as seen in the wheat fields of the western part of Canada and the United States.









PRICE-CAMPBELL COTTON-HARVESTING MACHINE.

One of these machines can pick 500 pounds of cotton per hour in an average field.







manufacturing, and agriculture are encouraged by a public policy under governmental supervision. In general the social and economic conditions are decidedly the best found in the Central American republics. Spanish is the official language, but only a portion of the people are of purely European descent.

Columbus visited the region included in Costa Rica in 1502. The first permanent settlement was made in 1530. It became free from Spain in 1821 and was a part of the Republic of Mexico until 1823, when it became a part of the United States of Central America. Since 1848 it has been an independent republic, with the exception of a brief time in 1897, when it was a constituent member of the Greater Republic of Central America. The foreigners number 6,295 and are chiefly from Spain and Germany. Population, 1906, 344,995.

**COTOPAXI** (kō-tō-päks'è), the most celebrated volcano in the world. It is located in the Andes of Ecuador, about thirty-two miles from Quito. The earliest eruptions on record occurred in 1532 and many have since been noted. Among the most remarkable are those of 1744, 1768, and 1864. During several of the eruptions the sounds were heard at a distance of 500 miles and ashes were carried 125 miles. Outbursts are attended by smoke and flames and large quantities of ashes are expelled. The volcano is crowned with perpetual snow. It was first ascended by Wilhelm Reiss in 1872, who estimated the height of the northwest peak at 19,500 feet and the peak toward the southwest at 19,430 feet.

**COTTON** (kōt't'n), the name applied to the fibers that surround the seeds of the plants belonging to the genus *Gossypium*, commonly called cotton plants. These plants are native to tropical regions, but they are cultivated extensively within the belt lying between latitudes 35° north and 35° south of the Equator. They are shrublike, have lobed leaves, mostly yellowish flowers, and a celled capsule which bursts open when ripe and liberates a quantity of black seeds covered with the cellular fibers. Several species are grown in the United States. The short fiber cotton has fibers about an inch long and the long fiber, about two inches. The former is known as *upland* and the latter as *Sea Island* cotton. In quality the Sea Island cotton is the best. It is cultivated upon the lowlands in a number of the Southern States and on the islands adjacent to the coast.

Cotton has been grown since immemorable times in history. It is spoken of in the writings of Herodotus as growing in India and its fibers being used in the manufacture of cloth. It is

mentioned by Aristobulus, one of Alexander's generals, and is referred to a number of times by Pliny. The Arabians made cotton goods in the time of Mohammed, about 627 A. D., and his followers introduced them into Africa and Spain. By the 14th century they had spread to Italy, and afterward came into use in the whole of Europe. Cotton fiber is mentioned in English history as early as 1436, when it was used on a small scale, but in 1736 it began to be made into cloth by machinery invented by Louis Paul. Cotton goods are among the leading staples of the world, and are manufactured extensively in most of the large industrial centers.



Cotton, showing flowers and bolls.

In the United States the leading manufacturing centers are at Manchester and other cities of New England.

The cotton plant was found native by Columbus in the West Indies and in South America. The early Mexicans used cotton cloth extensively. Cotton seed was brought to Georgia in 1786 and the first cotton mill in America was erected two years later at Beverly, Mass. The United States produces about 13,500,000 bales of cotton annually, which is about two-thirds of the world's product. In 1906 the world's crop was reputed at 19,942,500 bales. The bales are made by machinery and are held in position by hoops. They weigh about 515 pounds. Texas is the leading cotton State. Others taking high



rank are Mississippi, Georgia, Alabama, North Carolina, South Carolina, Louisiana, and Arkansas, though it is produced in large quantities in a number of other states. The principal supply of cotton, outside of the United States, is secured in India, Egypt, Russia, China, Brazil, Mexico, the West Indies, and the Asiatic islands of the Pacific Ocean.

Cotton is cultivated in fields like corn, the method differing somewhat. The ground is plowed in the spring and the seeds are drilled or planted about three feet apart, the plants appearing above the ground in about eight days. The young plants are cultivated and weeded, this being required two or three different times. After the plants flower no further cultivation is needed, and the seeds ripen after a period of about seventy days. Cotton is gathered within eight days after coming to maturity in order to prevent tarnishing. The gathering is done by picking the cotton fibers from the pods or bolls by hand into baskets or bags hung from the shoulders of the pickers, which is done several times during the picking season, as the bolls do not all ripen at the same time. The crop is spread out to dry as soon as it is secured. When sufficiently dried, the cotton is passed through machinery by which it is separated from the seeds. It was formerly separated from the seeds by hand. The invention of the cotton gin in 1793 by Eli Whitney greatly revolutionized, cheapened, and lessened the labor. By this machine it is separated rapidly from the seeds by means of teeth projecting through slits in the side of the chamber in which the seed cotton is placed. It is then baled and made ready for shipment to the manufacturer.

At the factory it is spun into cotton cloth, or it is mixed more or less with silk, wool, linen, and alpaca to form various fabrics. The early cotton-spinning machines were of rude construction. Among the earliest are Hargreaves' spinning jenny and a water frame made by Arkwright. In 1779 Crompton invented a machine propelled by a mule, while in 1785 the Cartwright power loom and Watt's steam engine were applied to cotton spinning and weaving. The machinery employed at the present time for cleaning, pressing, spinning, and weaving cotton has reached a high state of perfection. It is propelled largely by water, steam, or electric power. The consumption of cotton in manufacture in the United States is very extensive, and large exportations of the raw material as well as manufactured products are made to all portions of the world. Raw cotton is exported chiefly to Great Britain, Germany, France, Italy, and Canada. The exports of manufac-

tured goods aggregate about \$27,500,000 per annum, while the domestic consumption is much larger.

The cotton stalks are used in the manufacture of pulp, from which a good grade of writing paper is made. A fine class of oil is manufactured from cotton seed. It is useful for food and enters largely into the production of lard and fine grades of manufactured butter. Cotton-seed cake is a valuable food for domestic animals. The cotton acreage of the United States is about 28,000,000. In 1907 the total number of active spindles in the world was reputed at 123,332,971, of which 26,395,191 were in the United States. The chief uses of cotton goods are for wearing apparel, bedding, and carpets. Among the principal pests to the cotton plant are the boll moth and the boll weevil. The *boll moth* deposits its eggs on the under side of the leaves, where they hatch in about three days, and the larva, known as the *boll worm*, is very destructive to the plant. The cotton boll weevil is a beetle with an elongated head. It punctures the bolls of the cotton plant to lay its eggs within, where they produce white maggots, which do much damage. Another pest, the *redbug*, or *cottonstainer*, is suctorial and drains the sap from the bolls.

**COTTON FAMINE**, the name applied to the failure of the cotton industry in England, which occurred in 1861-65, when the Civil War was raging in the United States. The war caused the supply of raw cotton to be shut off and thus compelled the closing of the manufactories. About 300,000 English laborers were thrown out of employment and 2,000,000 people reduced to the verge of starvation. The government relieved the distress somewhat by granting charitable aid.

**COTTON GIN**, a machine for separating the seeds from cotton fibers. It was invented by Eli Whitney in 1793. See **Cotton; Whitney, Eli**.

**COTTON SEED**, the seed product of the cotton plant. From it the cotton batting, cotton-seed oil, and cotton-seed meal are manufactured. The cotton batting is made from the lint that clings to the seed after passing through the cotton gin, while the other two products are made from the seeds proper. Cotton-seed meal is a valuable food product for horses and cattle, while the cotton-seed oil, known in the market as cottolene, is wholesome as food for table use. Cotton-seed oil is employed extensively as a substitute for lard, linseed oil, and sperm oil. It is used for lubricating, soap making, treating leather, and divers other purposes. The annual value of cotton-seed oil exported from the



United States aggregates \$15,000,000, while the value of lint and oil cake is almost as large.

**COTYLEDON** (kōt-ī-lē'dŭn), the first leaf, or one of the first two leaves, developed in a plant. In exogens two such leaves are present in the embryo in every plant, while in endogens there is but one. The two cotyledons on exogens are always opposite, while in endogens the second leaf developed is alternate with the first. From these well-known characteristics have been developed the three primary divisions of the vegetable kingdom—the dicotyledons, monocotyledons, and acotyledons.

**COUGAR** (kōō'gär), the name given to the puma in Brazil, formerly called the American lion, and now often mentioned as the American panther. Formerly it was found throughout a vast region of both North and South America, but it has been destroyed in all of the former, except in its most southerly portions.

**COUGH** (kəf), a sudden and violent expulsion of air from the chest, caused by the relapse action of nervous or gastric disorder, or by irritation in the air passage. Coughing occurs when the source of irritation is in or below the posterior fauces, and sneezing when the irritating cause acts on the nasal mucous membrane. It may be dry, as in the first stage of pleurisy; or humid, as in certain stages of pneumonia and in advanced consumption. The act of coughing may be single and with distant intervals, or long continued, as in whooping cough and bronchial catarrh. In croup and whooping cough it has a metallic ring. As a general rule coughing may be taken as a symptom of disease.

**COUNCIL BLUFFS**, a city in Iowa, county seat of Pottawattamie County, on the Missouri River, opposite Omaha, Neb. It is on the Chicago and Northwestern, the Illinois Central, the Chicago Great Western, the Union Pacific, the Chicago, Milwaukee and Saint Paul, the Chicago, Burlington and Quincy, and other railroads. Next to Sioux City, it is the most important city of western Iowa, and is connected by several bridges and electric street railways with Omaha, Neb., across the Missouri River. The chief buildings include the county courthouse, the Carnegie Library, the Grand Hotel, the Federal building, the high school, and the Iowa School for the Deaf. Bayliss and Fairmont parks are popular public grounds. The manufactures include agricultural implements, machinery, carriages, engines, ironware, clothing, and earthenware. Its location at the western termini of a large number of railroads and connection with principal Pacific coast lines makes it an important jobbing and commercial

city. It has good municipal facilities, such as street railways, electric lights, pavements, waterworks, and sewerage. The city was named from a council held on its site by Lewis and Clark with the Indians in 1804. It was settled in 1846, when it was known as Kaneshville, but it was incorporated as Council Bluffs in 1850. Population, 1905, 25,231; in 1910, 29,292.

**COUNTERFEITING** (koun'tēr-fīt-īng), to make something in imitation of an article of value without legal authority and with a fraudulent intent. The act of uttering counterfeit coin, bank notes, or other currency is a felony punishable by fine or imprisonment. The government, as a safeguard against counterfeiting, has its paper currency engraved with designs that can be reproduced only at great expense. In addition, several secret marks and combinations of letters and figures are employed and paper and ink of a peculiar kind are used. The counterfeiting of coins consists of imitating the genuine by using a cheaper or comparatively worthless metal.

**COUNTERSIGN** (koun'tēr-sīn), the signature of a secretary or other public officer to attest that a writing has been signed by a superior. In military affairs the countersign is a watchword given daily by the commander of an army, in order that the soldiers on guard may distinguish whether those wishing to pass are friends or enemies. Those who are unable to give the countersign are not permitted to pass.

**COUNTY** (koun'tŷ), a name derived from a tract of land subject to a count or earl, and now applied to a division next smaller than a state or province. The name *parish* is applied to these divisions in some states and *shire* is the term used in England. A county has such officers as sheriff, attorney, auditor, treasurer, coroner, clerk, and commissioners, and in some cases a judge. In most states or provinces the roads, poor, local elections, and other interests are under supervision of the county. The county is divided into townships or parishes.

**COUPÉ** (kōō-pā'), a four-wheeled vehicle with a low body, drawn by one horse and provided with a seat for two passengers within and a separate outer seat for the driver. Coupés are closed carriages and are sometimes called cabs and broughams. In continental Europe the name is applied to a compartment in a railway carriage.

**COURT FOOL**, the name given in ancient and medieval times to the professional jesters employed at the courts of nobles. It was their duty to enliven the wealthy nobles, particularly at table, by jests and witty sayings. A jester employed by the King of Persia is mentioned in



the writings of Plutarch, but the office of court fool attained its highest reputation in the Middle Ages, when it was customary to employ them, not only for court service, but they became an adjunct in the apartments occupied by the queens and dauphins. The English kings had court jesters up to the time when the last Stuarts ceased to reign, after which the practice of employing them was abandoned. Court fools were clothed in peculiar costumes, made up of gay colors and unusual ornamentation, and they were permitted to use free speech in ridiculing the follies and vices of their contemporaries. They were abolished in France about the time of the Revolution, and ceased to be an adjunct in the courts of Germany and Russia about the same time. Shakespeare uses the court fool in "As You Like It" and "King Lear."

**COURT-MARTIAL** (kōrt-mār'shāl), a court authorized in the military and naval service, with jurisdiction to try all offenders in the army or navy. Such a court has no jurisdiction over a citizen who is not employed in the military service. It is made up of from five to thirteen commissioned officers and is presided over by a judge advocate.

**COURTS**, the tribunals established by law for the administration of public justice. They are composed of one or more judges or justices, and such other officers as the law authorizes. The courts are designated as either *civil* or *criminal*, depending upon the character of the business which they transact. In the civil courts all civil cases are tried, while criminal courts have jurisdiction of public offenses, as felonies and misdemeanors. In some instances the so-called *district courts* have jurisdiction of both civil and criminal cases. Each State of the United States has a supreme court made up of a number of justices, while the United States Supreme Court has the highest jurisdiction regarding cases which involve questions of national jurisdiction. The cases that may be tried in the United States Supreme Court involve issues between states, between individuals and the United States, and between the United States and a particular State. Most of the State supreme courts consist of from five to seven justices, while the United States Supreme Court consists of a Chief Justice and eight associates. In the states they are in most instances elected by popular vote, while those of the United States Supreme Court are appointed by the President with the consent of the Senate.

The Supreme Court of the Dominion of Canada as at present organized was constituted by a statute enacted in 1906. It is composed of a Chief Justice and five puisne judges, and has

appellate civil and criminal jurisdiction throughout the Dominion. Each Province has a supreme court, which is presided over by a supreme judge and a number of puisne judges. Locally, as in the United States, there are *district* and *county* courts and courts presided over by the *justices of the peace*. The towns and cities have *municipal* or *police* courts. In England the House of Lords constitutes the high court as well as the supreme legislative body.

**COVENANT** (kūv'ē-nānt), a stipulation in writing between two or more parties whereby the truth of certain facts is set forth, or an agreement is made to bind one or more of the parties to do or not to do some specific act. The Old and New Testaments contain a number of references to covenants between God and man, which were made by God on certain conditions of repentance, obedience, and faith on the part of man. After the deluge a covenant was made with Noah, and another was concluded for Abraham and his posterity, which was renewed to Isaac. The covenants of the Scriptures which are especially recognized by evangelical writers are the *Covenants of Works* and the *Covenants of Redemption*. All of the former are substantially promises of blessings upon the basis of obedience, while the latter are the New Testament promises of blessings upon the basis of faith in Jesus Christ.

**COVENANTERS** (kūv-ē-nānt'ērz), a term applied to a large portion of the people of Scotland in the 16th and 17th centuries, who bound themselves by covenants to defend the Presbyterian Church against the Episcopal and Catholic churches of Great Britain. Four of these covenants were made. The first was subscribed at Edinburgh Dec. 3, 1557; the second, at Perth, May 31, 1559; the third was the National Covenant and was signed at Edinburgh, Feb. 28, 1638; and the fourth was written by Alexander Henderson and accepted by the Scottish general assembly on Aug. 17, 1643. The last-mentioned covenant was subscribed to by the English Parliament at London on Sept. 25, 1643, and was regarded a league between Scotland and England. Obligation to it was abolished in 1661 and its renewal was prohibited, for the reason that the liberty of the church was deemed safe.

**COVENT GARDEN** (kūv'ent), a square of London, famous for its extensive market of flowers and fruits. It formerly belonged to the abbot and monks of Westminster. In 1831 the Duke of Bedford, the proprietor of the ground, erected the present buildings. These buildings include a flower market roofed with glass and a market house which covers three acres of



ground. Near it is the Covent Garden Theater, built in 1859, which occupies the site of the former Royal Italian Opera House.

**COVENTRY** (kūv'ēn-trĭ), a city in the County of Warwick, England, eighty-five miles northwest of London. It was the seat of Parliament during the reign of early monarchs and the residence of a number of them at various times. Saint Michael's church, built in the period between 1230-1395, has a spire 200 feet high. Another excellent edifice is Saint Mary's Hall, erected in the 14th century. It has exquisite tapestry, stained windows, and fine frescoes. A Benedictine monastery was founded at Coventry by Earl Leofric and his wife, Lady Godiva, in 1043. The city is noted for its many historical events, including the story of the trial by battle between the dukes of Norfolk and Hereford, an account of which is given by Shakespeare in his *Richard II.* Mary, Queen of Scots, was imprisoned here for some time. The city has railroad connections with the principal cities of Great Britain and manufactures of ribbons, bicycles, watches, textiles, and machinery. Among the public utilities are sewerage, public baths, a public library, and electric street railways. It is a brisk market for produce and live stock. Population, 1907, 77,627.

**COVENTRY**, a town of Rhode Island, in Kent County, twelve miles southwest of Providence, on the New York, New Haven and Hartford Railroad. It is finely situated on the Pawtuxet River and has a brisk trade in produce and merchandise. The manufactures include woolen and cotton goods, cigars, clothing, and machinery. Coventry was the home of Nathaniel Greene. It was incorporated in 1741. Population, 1905, 5,698; in 1910, 5,848.

**COVINGTON** (kūv'ing-tŭn), a city in Kentucky, county seat of Kenton County, at the confluence of the Licking and Ohio rivers, opposite Cincinnati. It is on the Chesapeake and Ohio, the Kentucky Central, and the Louisville and Nashville railroads, and has connections with other cities by a number of electric railways. The chief buildings include the county courthouse, the public library, the post office, the city hall, and the Roman Catholic cathedral. It has a German orphan asylum, a hospital and foundling asylum, and the Notre Dame Academy. Among the principal industries are flouring mills, breweries, distilleries, tobacco and cigar works, and carriage, wagon, and machine shops. It has a number of pork packing houses, silk factories, and glass works. The city has an extensive electric street railway system, sewerage, electric and gas lights, paved streets, waterworks, and a large trade. Two

bridges cross the Ohio River, one of which is a suspension bridge, 2,255 feet long, erected at a cost of \$2,000,000. Covington was settled in 1812 and incorporated in 1834. Population, 1900, 42,938; in 1910, 53,270.

**COW**, the female of the genus *bos* or ox, of which the bull is the male. It has been bred so as to obtain marked differences in color, size, and utility. Among the best kinds of beef cattle are the Galloway; for general purposes, the Hereford, Durham, and Holstein; and for dairying purposes, the Ayrshire, Jersey, and Guernsey. See **Cattle**.

**COWBIRD**, or **Cow Bunting**, a bird of North America, belonging to the blackbird family. It deposits its eggs, like the cuckoos, in the nests of other birds. Here they are incubated and the young are reared by their foster parents. The cowbird is brownish-black, about



COWBIRD.

seven inches long, and migrates toward the south to spend the winter. In the spring it moves northward into Canada as far as Hudson Bay and in autumn, usually in September, large flocks are seen associated with other blackbirds. It has a tendency to go with cattle, probably to secure the worms and insects which attend the animal.

**COWHAGE** (kou'hāj), or **Cowitch**, the hairs on the pod of a tropical climbing plant of the bean family, native to the East and West Indies. The hairs are brownish in color, stiff, brittle, and short, and easily penetrate the skin when coming in contact with it. They produce an intolerable itching, which, instead of being relieved by rubbing, is greatly increased. Cowhage is employed in medicine as a mechanical vermifuge, being taken in syrup and honey. The plant belongs to the genus *Mucuna*, but is commonly called cowhage.

**COW PARSNIP** (pārs'nĭp), a large plant of the parsnip family, native to the Northern Hemisphere. It is cultivated in the temperate



regions of Europe. In Scotland, where it is a rank weed, it is called *kiesh*. The tall branching stems grow to a height of two to five feet and bear white flowers in broad umbels, and the herbage is used as fodder. About fifty species have been classified, of which the *Siberian* is the largest, but its stem is quite coarse. Several species are common to Canada and the United States, and locally they are called *wild celery*. The Eskimos peel the leaf stalks and use them as food.

**COWPENS** (kou'pěnz), a village of Spartanburg County, South Carolina, near which the Americans under Gen. Morgan defeated the British under Col. Tarleton, Jan. 17, 1781. Cornwallis sent Tarleton with 1,110 men against Morgan, when the latter took a strong position at Cowpens under the slope of a hill. His militia was stationed in front, the regulars on higher ground, and at the top of the slope was Col. Washington with the cavalry. The British made the attack and met with a deadly volley, after which the regulars opened a stormy fire and followed by a bayonet charge. At the same time the American cavalry struck the right flank of the British and the militia formed again behind the lines and effected a rout. The British lost 230 killed and 600 prisoners, while the American loss was only seventy-two. This battle was one of the most brilliant of the war, when considered in point of tactics.

**COWPOX**, an acute contagious disease affecting the teats and udder of cows, characterized by slight fever and an eruption of the skin of the affected parts. The matter contained in the vesicles is the vaccine virus used to inoculate the human system as a security against smallpox. It was first introduced for this purpose by Dr. Jenner (q. v.).

**COWRY** (kou'ry), or **Cowrie**, a kind of mollusks found chiefly in the warm seas of the Eastern Hemisphere. Several of the species are noted for the beauty of their shells, which are used extensively in many parts of Southern Asia for money and as ornaments. They differ in value according to the size and the coloring of their surface. Many tons of cowries are gathered annually in the islands southeast of Asia, particularly in the Philippine Islands and the East Indies. Specimens with beautiful markings upon their smoothly polished surface are popular for ornaments to the dress and habitations of both civilized and uncivilized nations.

**COWSLIP**, the name of several species of plants which belong to the same genus as the primrose and oxlip. There is a close resemblance between the cowslip and the oxlip. The

flowers are delicate, possess marked beauty and fragrance, and are general favorites. In color they are greatly variegated, including white, yellow, and rose-colored bloom. The cowslip has a spreading flower cluster, in this respect differing from the common primrose. Its clusters of flowers have been called *fairy cups* for the reason that they were long thought to be the haunts of fairies. Many species of cowslips are well-known plants in Europe and America. One of the American species is known as the *shooting star*.

**COW TREE**, a class of trees native to the tropical regions, so called from the milky juice which is used as a food. The milky product is not the juice of the plant, but is derived from certain cells found in the stems, known in botany as the laticiferous vessels. It has the appearance of the milk of a cow and is wholesome as a food, and the natives use it in the regions where the trees are indigenous. The cow tree of Guiana and Venezuela grows to a height of 80 to 100 feet and has leathery leaves of a large size. The product is obtained by making incisions in the trunk of the tree.

**COYOTE** (kī'ō-tě), the prairie wolf common to the plains of the United States and the central part of Canada. In size it ranges between the fox and the ordinary wolf. It has a sharp snout and coarse, yellowish-gray fur mixed with black. The coyote is about forty inches long, with a tail sixteen inches. It has a prolonged howling cry.

**CRAB**, a class of ten-footed crustacean decapoda, of which the edible crab is a type. They have a short tail, which is folded under the body, short feelers, and a wide shield on the back for protection. In the mouth are several pairs of strong jaws, and the stomach is studded with hard projections that serve for grinding the food. A colorless lymph is propelled to the gills by the action of the heart, the liver is a rich yellow substance, and the edible portions are contained in the front claws, which are much larger than the other legs. Among the widely distributed species are the *oyster crab*, the *hermit crab*, the *blue crab*, and the *spider crab*. The crab is found in the waters near the shore, though there are several species that live on land. A species called the *swimming crab* is a fast runner, burrows in the ground, and is fond of fruits. The claws of the males are much larger than those of the females, and for this reason the former bring the higher price in the market. In a natural state the color is reddish-brown above and whitish beneath; the reddish color seen when in the market is produced by boiling.



The larger crabs in warm climates often weigh about ten or twelve pounds. They are caught in immense numbers off the coast, both in Canada and the United States, and are sold on the market as a delicacy. The front pair of limbs does not serve for locomotion, but answers the



HERMIT CRAB.

Oyster Crab.

purpose of defense and for strong claws and pincers. All species of crabs molt periodically, that is, they throw off their calcareous covering. In the molting period the crab is quite helpless for several days, after which a new covering takes the place of the old one. Their claws are easily lost, but grow anew after a short time. The eyes are movable and they are capable of seeing well and at great distances. The land crabs go into the water to spawn. Some species live in fresh water, though the larger crabs are found in the sea and salt waters. Their food consists of dead and living animal matter, but some subsist on vegetable substances, such as the *racer crabs* of the West Indies, which live on the juices of the sugar cane. Crab fishing is an important industry in most countries, particularly in the densely populated regions, where many laborers are employed in crab and other shell-fish fisheries.

**CRACOW** (krā'kō), or Kraków, a city in Austria-Hungary, on the Vistula River, 256 miles northeast of Vienna. The streets are well improved by grading and stone and asphalt pavements. It has an important river navigation and railroad trade and a line of important manufactures. Among the ancient and noted buildings are a Gothic cathedral, a library with over 300,000 volumes, and several monuments of Polish kings. The monument of Kosciusko is located near the city, on an eminence, and is 120 feet high. It is the seat of a famous university with 2,500 students. The manufactures

include clothing, cigars, textiles, leather, machinery, and earthenware. Cracow is well fortified by strong walls. It was the ancient capital of Poland and the residence of the Polish kings. Since 1846 it has belonged to the crown of Austria. Population, 1907, 104,836.

**CRANBERRY** (krān'bēr-rÿ), a plant common to the swampy regions of the Temperate and Arctic zones. The plant is a creeping vine with ovate, evergreen leaves, a terminal single-flowered peduncle, and a berry of a dark red color, about one-fourth of an inch in diameter. Several species are cultivated for the market. They thrive best in natural bogs or swamps that can be drained and flooded by ditches when desired. They are propagated by cuttings set in rows about fourteen inches apart, and the ground is covered by about three inches of sand to retain the moisture of the soil below and permit of greater ease in cultivation. The berries are gathered by hand. Their principal use is for pies and preserves. They are exported in large quantities from the United States, Canada, and Russia.

**CRANE** (krān), any bird of the genus *grus*. It differs from the storks and herons in having its hind toe higher than the front ones and in caring less about wet and marshy regions. All the species have long legs and a long neck, powerful wings, and a prominent bill, and are of considerable size. The length of the body is about forty-five inches. The plumage is usually ash-gray, but in some species it is white or bluish. Cranes are migratory, passing north in the spring in large wedge-formed flocks, led by



CROWNED CRANE.

single leaders, or in a long single line, and issue a discordant cry. They usually alight for food in daytime and fly continuously by night until their destination is reached. Their nests are made in rushes, in which two eggs are laid. The young are quite helpless and need to be fed



for several days. The food consists of insects, worms, roots, snakes, seeds, and small quadrupeds. Their means of defense lies in the bill, which serves as a dagger. The flesh of some species is regarded an excellent food, for which they are hunted. The *crowned crane* inhabits the northern and western portions of Africa. It has a tuft of slender yellow feathers on the head, which it is able to move at will, and is of a bluish, ash-gray color. The *demoiselle crane* has two tufts of feathers formed by an elongation of the ear coverts, and inhabits Central Asia and Africa. The *whooping crane* and *sandhill crane* are native to North America.

**CRANIAL NERVES.** See **Nerves.**

**CRANIUM** (krā'nī-ŭm), the bony case containing the brain. It is composed of eight bones, the occipital, ethmoid, sphenoid, frontal, two parietal, and two temporal. These bones form a spheroidal inclosure which offers substantial resistance to external violence. The cranium and face constitute the skull (q. v.).

**CRANNOGS** (krā'nōgs), the fortified lake dwellings found in Ireland and Scotland. These fortifications were constructed in about the 9th century, and were discovered in 1813 by George Chalmers, the author of "Caledonia." Several hundred have been located. The weapons and utensils found in them are of stone, bronze, and iron. They consist mostly of swords, knives, axes, daggers, spears, and whetstones.

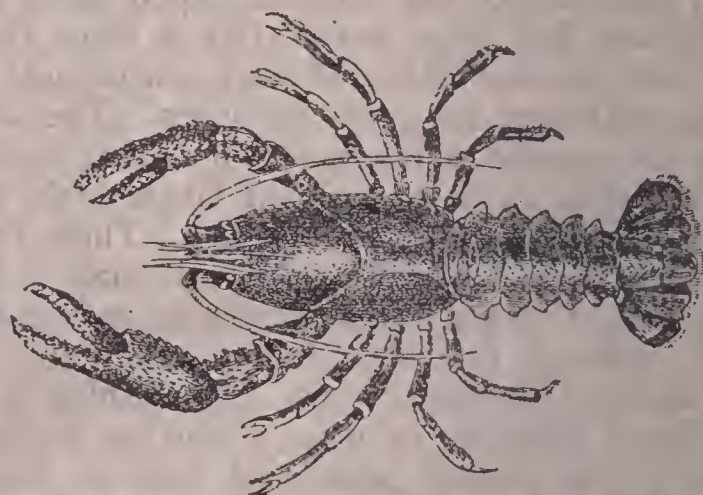
**CRANSTON** (krā'stŭn), a town of Rhode Island, in Providence County, on the New York, New Haven and Hartford Railroad. It is a popular residential center of Providence business men, has a number of libraries, and is well supplied with public utilities. Among the public institutions are an almshouse, an insane asylum, a State prison, and an industrial school for boys and girls. The manufactures include cotton and woolen goods, clothing, machinery, and spirituous liquors. The first settlement at Cranston was made in 1638 and its incorporation dates from 1754. Population, 1910, 21,171.

**CRAPE** (krāp), or **Crêpe**, a delicate transparent fabric, made of raw silk which has been tightly twisted. It is either crisped or smooth, but all kinds of crapes are woven and dyed with the silk in the raw state. The silk used in making crisped crape is spun harder than for the single, or smooth kinds. Gum water is used to stiffen all classes after they are finished. The colors are black and dark brown, and the former is used extensively as mourning apparel. Many countries of continental Europe excel in the manufacture of crape, especially France and Italy. The crapes made by the Chinese and Japanese are white or highly col-

ored, when intended for mourning, but the varieties used in trimming hats and for ladies scarfs are made in standard colors.

**CRATER** (krā'tēr), the bowl-shaped depression forming the outlet of a volcanic vent. It is generally circular in form and surrounded by a cone of débris. A fissure in the earth is the beginning, through which great volumes of steam and other gases are evolved, the shattered lava forming the volcanic cone. There may be several openings, or the escape may be by long fissure instead of the usual form. The craters of extinct volcanoes often form lakes. The most remarkable one is Crater Lake, in Klamath County, Oregon. It is 6,240 feet above the sea, 2,000 feet deep, and surrounded by great cliffs from 1,200 to 2,000 feet above its surface. Springs are the source of its water supply and it has no outlet to the sea.

**CRAWFISH** (krā'fīsh), or **Crayfish**, the name of several species of fresh-water crustaceous animals resembling the lobster in appearance. About thirty species are native to America, where they are popularly called *crabs*. They have a long tail, ten jointed feet, and prominent feelers. The body is divided into two parts, the trunk and a long, six-jointed tail. The eggs are fastened to the legs of the mother, from which the young escape and molt several times before reaching maturity, which requires



CRAWFISH.

from three to four years. It is thought the molting occurs largely because the shell does not enlarge with the growing body. When the shell comes off the animal is quite helpless and exposed to many dangers, often causing fatal results. Large numbers of crawfish may be seen in sluggish streams and bodies of fresh water. They burrow in the ground near the water, and during the winter live in a semi-dormant state. Their food consists of worms, insects, small carrion, and the tender forms of vegetation, and they even attack each other for food. They are widely distributed on the conti-



nents and islands. The larger species are considered dainty food; the tail and claws being the edible parts. The burrowing habits of some cause damage to levees and milldams on a number of streams, particularly on the Mississippi.

**CRAWFORDSVILLE**, county seat of Montgomery County, Indiana, about thirty miles northwest of Indianapolis, on the Big Four, the Terre Haute and Indianapolis, and other railroads. It is surrounded by a fine farming country. The noteworthy features include the courthouse, the public high school, and Wabash College. Among the manufactures are flour, ironware, boilers, clothing, cigars, buggies, machinery, and furniture. It has sewerage and waterworks systems. The first settlement was made in 1822 and it was incorporated in 1865. Population, 1900, 6,649.

**CRAYON** (krā'ŭn), a pencil made of chalk, charcoal, or pipeclay, colored with various pigments and used for drawing on paper or other materials. Chalk is used largely in the manufacture of blackboard crayons, such as are in common use in schools, and lampblack and pipeclay supply the chief materials in making black crayons. Litmus, turmeric, and saffron are among the vegetable colors used as materials in making pastel, a mixture of chalk and coloring pigments. Crayon painting is practiced to some extent as an art, its chief advantage being in the facility with which it is executed and the richness in outline and coloring.

**CREAM**, the light yellow substance which rises to the surface of milk after standing a brief time. It is rich in fat, which ranges from ten to seventy per cent. Good cream for household use contains from eighteen to thirty per cent. of fat. Milk is creamed by two methods, that is by setting and by a separator. In the former the milk is usually placed in shallow pans and the cream rises gradually to the surface by gravity, owing to the fact that the fat globules of the cream are lighter than the water and other constituents of the milk. It requires about twenty-four hours for the cream to rise, but the milk must be set immediately after it is drawn, and the loss of fat by this method ranges from ten to twenty per cent. A better way is to put the milk in cans about eighteen inches deep, which are placed in cold water with a temperature of about forty degrees, which causes the cream to rise more rapidly and completely than under a higher temperature. The cream separator has superseded the shallow and deep setting of milk to a large extent, even among farmers, and is in general use in creameries. In this machine the cream is separated from the milk by centrifugal force, the work being done by a

bowl or drum which revolves at the rate of 5,500 to 8,000 times per minute. A good separator well operated separates practically all of the cream from the milk, not more than 0.1 per cent. remaining in the skim milk.

**CREAMERY** (krēm'ēr-ŷ), a factory at which butter is made from the milk or cream of cows. Creameries are now operated in practically all sections of the country where dairy farming is profitable. In farming communities they are conducted largely on the coöperative plan, under which the patrons themselves build and operate the plant and share equally in the profits. Under this form of organization the company may or may not buy milk or cream in addition to the product obtained from the stockholders, though usually more or less of the material is purchased. Another form of operating creameries is the plan under which a company or corporation purchases all the material, which is gathered by teams sent out from the plant or is delivered direct from the farms. The value of cream and milk is determined by a tester at the time the products are delivered. Skim milk is a by-product and is either sold or returned to the patrons, who use it to feed pigs and calves. Butter is the chief product obtained from creameries, but in some localities the milk is condensed and canned, and in others cheese is made as a by-product. Colleges of agriculture and government experiment stations have been potent factors in stimulating interest in the manufacture of butter of a high quality.

**CREAM OF TARTAR**, a bitartrate of potassium, which is obtained from a variety of food products, especially from the tamarinds and grapes. It is contained in the crude tartar or argol which collects as a crystalline deposit upon the bottom and sides of wine casks during the fermentation of the wine. To prepare it for commercial purposes, the argol is dissolved in hot water and the coloring matter is removed by clay or egg albumen, after which the cream of tartar is separated by crystallization. The commercial product is a white crystalline compound, is soluble in water, and contains a small per cent. of calcium tartrate. It is used in making baking powder, in medicine as a purgative, and for various purposes in the arts.

**CRÉCY** (krēs'sī), a small town in the department of Somme, France, about 100 miles north of Paris. It is celebrated on account of a battle on Aug. 26, 1346, between Edward III. with 30,000 men and an army of 100,000 French led by the Count of Alençon. The battle resulted in a victory for the English. About 30,000 French were slain, among them the blind King of Bohemia, who was assisting the French



army. This battle was one of the earliest in which the English used cannon.

**CREDIT** (krĕd'it), in economics, the trust or confidence placed by one individual in another, when he assigns money or other property in loan without stipulating for immediate payment. It is a postponement of the payment of a debt to a future time. Credit is given by the party that lends and obtained by the one who borrows. The credit system is based on the confidence the people have in the general solvency, honesty, and resources of others. It is a very important factor in the exchange and production of wealth. The man who is able and willing to work often has few resources, but, with credit extended to him, his ability becomes enlarged and his usefulness is correspondingly widened. Many men have much ability as organizers, but without borrowed capital they are unable to engage in commercial or industrial enterprises. Thus, the noncapitalist is generally benefited by an extension of credit, and the quality and quantity of his productions become vastly enhanced. On the other hand, the capitalist is likewise benefited by the credit system. Without it all his resources would remain in his own hands, and he would incur undue liability in endeavoring to manage all of them himself. Professional men and women, estates, and aged people often have means that they cannot well invest or manage in their own enterprises, but by the credit system others may be assisted while they themselves obtain profit. Banking, railroad construction, the development of a new country, and the material business interests are all more or less dependent upon a general credit system.

Another form of trust is the public credit of a nation. It is based upon the confidence the people have in the expressed or implied promises the government makes to meet public obligations or payments. National credit is represented in bonds, postal money orders, and the credit element in the paper currency and subsidiary coins. No nation has been able to remain out of debt for a long time, or to successfully manage its affairs without drawing upon future possibilities. This element in the credit system applies equally to the subdivisions of the governments, as in the states or provinces, counties, and municipalities. For this reason the public confidence is vital as an element in the success of a state as well as in the enterprises of an individual.

**CRÉDIT MOBILIER** (krā-dĕ' mō-bĕ-lyā'), the name applied to a financial institution organized under the laws of France in 1852. Its purpose was to promote industrial enterprises of

various kinds, among them the building of canals, construction of railroads, sinking of mines, and other vast projects. By the terms of the law the institution was authorized to hold shares in public companies and to meet payments by resorting to its own obligations. The operations conducted by this association assumed a very extensive scale. In 1854 large subscriptions were made to the Grand Central Railroad Company and the General Omnibus Company of Paris, and several large loans were negotiated with the government. At first a dividend of twelve per cent. was paid. In 1855 the dividend was forty per cent., while the next year it was reduced to twenty-two per cent., and the following year to five per cent. Owing to public mistrust, the speculative features were greatly curbed and the operations were lessened until the scheme failed totally.

**CRÉDIT MOBILIER**, a joint-stock company organized in the United States, in 1863, and which gave rise to a great congressional scandal known by the same name. The scandal was the result of attempts at bribery and corruption in connection with the construction of the Union Pacific Railroad from Omaha to the Pacific coast. The company at the time of organizing had a capital of \$2,500,000. The charter of this company was sold in 1867 to a company which undertook the construction of the railroad, and the capital stock was increased to \$37,500,000. In 1872 it was found that several members of Congress and the Vice President had been granted a number of shares of stock. This caused an investigation to be made by the House of Representatives. Oakes Ames, a wealthy Congressman from Massachusetts, Schuyler Colfax, Vice President of the United States, and several representatives were implicated in the charges. Resolutions of censure were passed by Congress against Ames and James Brooks of New York. The scandal died out shortly after and subsequent inquiries cleared the reputation of a number who were charged with bribery. The proposed railroad line was constructed and is in successful operation, being one of the highly important railroads in the United States.

**CREE** (krē), a tribe of the Algonquin Indians, one of the largest and most powerful branches of that family. It was chiefly confined to British America, inhabiting the country in the vicinity of Lake Winnipeg and the Saskatchewan River. The two main divisions are known as the Plains and the Wood Crees. Their language and customs were related to those of the Ojibwas. They are now confined to reservations and number about 10,000.



**CREED** (krēd), the statement or profession of fundamental points of belief of a religious body, or of the Christian Church at large. Many creeds sprang up at different periods in the development of Christianity, largely from the fact that Christ taught the simple truth in a concrete and informal manner; hence creeds may be said to have resulted from arguments and controversies as the teachings of Christ were drawn out into more precise and extended statements. The leading creeds include the following:

*The Apostles' Creed*, so named from the belief that the Apostles composed it, is accepted as a summary of the Christian faith by most churches. It is thought to date back to about 150 A. D., but it came down to us in its present form from the latter part of the 4th century.

*The Nicene Creed* was adopted by the Council of Nice in 325 and was promulgated to counteract Arianism. It is accepted as authority by the Roman and Greek churches and admitted by many of the Protestant denominations. It sets up the doctrine that Christ is of the *same substance* with the Father, and was supplemented in 381 by the Council of Constantinople, which emphasized the *divinity* of the Holy Ghost. This creed as modified by the Council of Constantinople is essentially identical with the form in which it appears in the Anglican prayer books.

*The Athanasian Creed*, which dates from the 6th century, was so named from Saint Athanasius, who supported the doctrine of the Holy Trinity and the *incarnation* of the Son of God. It is held as a creed of the Roman and Greek churches and is still read by the Protestant Episcopal Church of England, but is omitted from the services of the latter church in America.

*The Creed of Chalcedon*, adopted by the Council of Chalcedon in the latter part of the 5th century, embraces the Nicene Creed and supplements it with the doctrine of the person of Christ. The Council of Trent formulated a statement of the doctrines of the Roman Catholic Church, and it was published as a bull by Pius IV. in 1564. This bull enforces the doctrines of *transubstantiation*.

*The Augsburg Confession*, adopted in 1530, embodies the fundamental doctrines of the Lutheran Church, which approves of the Apostles', Nicene, and Athanasian creeds. In addition it has the Catechisms of Luther, the Articles of Schmalcald, and a number of other confessions. The Church of England has the *Thirty-nine Articles*, and the Presbyterians support the *Westminster Confession of Faith*, one of the most elaborate of the creeds. The creeds named are

the most important, and they constitute in a more or less modified form the basis of belief in the various churches. "Creeds of Christendom," published in three volumes, edited by Philip Schaff, is a reliable history of the confessions.

**CREEK** (krēk), an Indian tribe which was originally resident on the Coosa, Flint, Chattahoochee, and Alabama rivers and in the peninsula of Florida. The Creeks were first met by De Soto in 1540, and came completely under English influence after the overthrow of the French power in America. They joined the British in the Revolution and made an attack on Wayne's army in 1782. In 1790 they made a friendly treaty, but renewed hostilities two years later. Another treaty was made in 1796 and some land was ceded in 1805. They joined the English in the War of 1812, made an attack on Fort Mimms, Aug. 30, 1813, and massacred 400 people. After suffering numerous defeats they were completely overthrown by Gen. Jackson at Horseshoe Bend, March 27, 1814. A treaty followed in which some land was ceded, and early in the 19th century a portion of the tribe removed to Louisiana and later to Texas. In 1825 a treaty ceding some lands was agreed upon, but later it was repudiated.

Soon after the Creeks became divided into two factions, one favoring and one opposing emigration. A portion aided the Seminoles in 1836 against the government, and the remainder made an attack upon the frontier towns of Alabama and Georgia. Gen. Scott was sent against them, subduing them after numerous battles, and they were subsequently removed to a reservation between the Arkansas and Canadian rivers. In the Civil War a portion aided the Union and the others sided with the Confederates. A large tract of land was ceded by them to the government in 1866. This tribe of Indians held out against the teaching of the government for many years, but lately education has taken a firm foothold. Among the young people are many men and women who have taken readily to the common school and higher courses of study. They are skillful in the industries and are making rapid progress in the arts.

**CREEPER** (krēp'ēr), a general name of any bird that seeks its food by running or creeping in the branches of trees. The common creeper of North America is quick and restless in its movements, has a curved bill and rigid tail, and searches for insects and their eggs among the crevices in the bark. The upper part of the body is reddish-brown, the head is darker, and the rump is lighter. It is widely distrib-



uted and is often seen in company with the smaller woodpeckers and nuthatches. A species native to South America is known as the



TREE CREEPER.

tree creeper, and is somewhat larger than the common creeper of North America.

**CREMATION** (krê-mā'shūn), the act of burning a corpse instead of burying it. This process was practiced quite extensively among the Greeks and Romans. The Hindus long disposed of their dead to some extent by a ceremony called *mass*. Sir Henry Thompson, an eminent physician, advocated its introduction into England in 1873 on sanitary grounds, but made little progress, owing to public sentiment against the innovation. Lately it was introduced in many European countries and the annual cremations have increased steadily. In 1907 they reached 2,067. The first American crematory was established at Washington, Pa., in 1876, but there are now large crematories in New York, San Francisco, Boston, Chicago, Detroit, Saint Louis, Philadelphia, Buffalo, and many other cities. The number cremated in the United States in seven years, beginning in 1876, was twenty-five, but since then the custom has been making steady growth. In 1907 the number of cremations performed in that country was 2,682.

The retort of a crematory, in which the corpse is placed, is built of fire brick. Bodies to be cremated are placed over a fuel chamber in an inclosure heated through holes. The construction is of such a character that no flames reach the body, and the volatile matter passes through highly heated chambers and dissipates in the atmosphere. Coke and coal

gas are used chiefly for fuel. The body is entirely cremated in from one to three hours, depending upon the size, during which time it is subjected to a temperature from about 2,000° to 2,500° Fahr. In some of the newer crematories the construction is somewhat different, the doors being packed air-tight with asbestos, in which the body may be wholly incinerated in about fifty minutes. Crematory societies have been organized in European and American cities, who make it an object to look after and care for the cremation of corpses. After incineration, the ashes are placed in urns in buildings expensively designed and decorated. These urns are carefully sealed, labeled, and placed in niches for future reference, or are incased within the monument in the cemetery.

**CREMONA** (krê-mō'nà), a city of Italy, in a province of the same name, 47 miles southeast of Milan. It is finely situated on the Po River and a number of railroads, and has a considerable trade in merchandise and manufactures. The streets are wide and well improved with paving and sewerage. Electric lights, waterworks, a public library, two theaters, and electric railways are among the public utilities. It is the seat of a bishop and has several fine churches and palaces. Among the manufactures are porcelain, earthenware, mustard, cotton and silk textiles, and machinery. The Amati family, manufacturers of violins, resided at Cremona. It was colonized by the Romans in 218 B. C., was destroyed by Vespasian in 70 A. D., and was afterward captured by the Lombards. Population, 1906, 40,510.

**CREOLE** (krê'ōl), the name given to the descendants of French and Spaniards born in America and the West Indies. The application of the term has recently been widened to include all descendants of Europeans born in tropical America and the West India Islands. The Creole dialect is a mixture of different languages, including the native languages and Spanish, French, and English. Creoles are not a strong, robust race of people.

**CREOSOTE** (krê'ō-sōt), an oily, colorless liquid obtained chiefly from wood tar and coal tar. It was first made in 1832 by Reichenbach, who obtained it by the destructive distillation of wood. Creosote has a specific gravity of 1.037 at 68°, evaporates without residue, has a burning taste, and mixes readily with ether, alcohol, and chloroform. It is used in the preservation of meats, in the treatment of tuberculosis, and for various purposes in medicine and surgery.

**CRESCENT** (krês'sent), the name applied



to the moon in its first quarter, when its disk is enlarging and its horns are acute. A representation of the half-moon with upturned horns, called a crescent, was used by the ancients, especially the Egyptians and Greeks, as a symbol for their moon goddesses. The Byzantine Empire adopted the crescent as an emblem. After the capture of Constantinople by the Turks in 1543, it became the permanent emblem of the Turks and the Turkish Empire. Many of the churches in Russia have a crescent on the dome, surmounted with the cross, signifying that the Russian Church has a Byzantine origin.

**CRESS** (krēs), the name of several species of plants with acrid or pungent leaves, most of which belong to the mustard family. They are widely distributed in the temperate and northern parts of the earth. The water cresses are the most common species. They grow abundantly on the banks of small streams and ponds and are eaten as a salad. The *Virginia cress* is cultivated as a salad in Great Britain and many parts of North America. It is easily cultivated and thrives best in a damp or moist soil.

**CRESTON** (krēs'tūn), a city in Iowa, county seat of Union County, about 70 miles southwest of Des Moines, on the Chicago, Burlington and Quincy Railroad. It is surrounded by a farming country and has extensive railroad shops. The chief buildings include the courthouse, the high school, and a number of fine churches. It has manufactures of cigars, vehicles, and machinery. The public utilities include sewerage and waterworks systems. It was settled in 1868 and incorporated in 1869. Population, 1905, 8,382.

**CRETACEOUS PERIOD** (krē-tā'shūs), the division of geologic time which immediately follows the Jurassic and precedes the Eocene. It is so named from the chalk beds of England and France, where the term was first used, but the Cretaceous system is constituted only in part of chalk formations. Cretaceous rocks are found abundantly in North America. They extend from the mouth of the Mackenzie River southward into Mexico, occupy a great part of the Atlantic coastal plain from New York to Florida, whence they stretch westward to Texas and points near the Pacific Ocean, and are found in a large scope of the country from the mouth of the Ohio River to the Gulf of Mexico. Deposits of coal occur in the Cretaceous system west of the one hundredth meridian, which coal area embraces many sections of the Rocky Mountains. In some places they contain much greensand or marl, which is used

extensively for fertilizing land in New Jersey and elsewhere. The thickness of the deposits vary materially, being about 400 feet in New Jersey, 2,000 feet in the Missouri basin, and 12,000 feet in many sections of the Rocky Mountains. This system is rich in both plant and animal fossils. The plants include palms, maple, willow, poplar, oak, and birch. Among the fossil animals are the crocodile, sponges, fish, sea serpents, birds with teeth, dinosaurs, and sea saurians.

**CRETE** (krēt), or **Candia**, one of the largest islands in the Mediterranean Sea, located south of the Aegean Sea and the Archipelago. It is about 150 miles long, from six to thirty-five miles wide, and has an area of 3,500 square miles. The surface is mountainous, including several well-defined ranges, of which Mount Ida is the culminating peak, 8,050 feet above the level of the sea. The mountain ranges extend the entire length of the island. They are covered with forests and penetrated by a number of fertile valleys. Much of the coast plain is exceedingly fertile. The southern coast has few harbors, but the northern coast is indented by several inlets, including the Bay of Suda. Many of the valleys are irrigated by numerous springs, and are covered by a luxuriant vegetation. Crete has a mild climate, cool in summer on account of northern winds, and distinguished in winter by numerous showers of rain. The industries are not in a high state of development at the present time. It has valuable deposits of iron, building stone, cobalt, manganese, and granite. Agriculture is the principal occupation, yielding cereals, cotton, and fruits, while the silk industry is securing a strong foothold. The fisheries yield valuable products; the vineyards produce largely, and from the forests cork and essential oils are obtained. Among the domestic animals are horses, cattle, poultry, and sheep. However, the manufactures and transportation are insignificant. Fabrics, machinery, utensils, and spirituous beverages are the principal products of manufacture. Most of the harbors of former ages are silted up and in poor condition.

The history of Crete has its beginning in the period of Grecian mythology. Saturn, Minos, and Zeus are spoken of in Grecian fables among its kings. It was once a republic, then became the seat of Silician pirates, and was conquered by the Romans in 67 B. C. The apostle Paul visited Crete and established a church in it. In 823 A. D. it passed to the Saracens, but was returned to the Greeks in 962 by virtue of the conquest of Nicephorus Phocas II. It was given by the Byzantines to Boniface of Montferrat, who sold it to the Venetians in 1204, unde



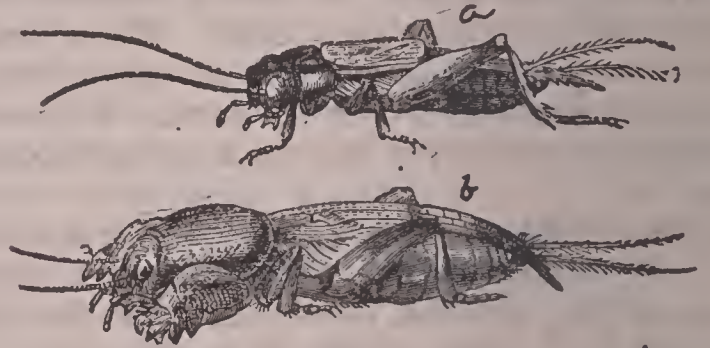
whose dominion it remained until the latter part of the 17th century, when it fell to the Turks after a struggle of nearly twenty years. An insurrection occurred in 1868 against Turkish rule, but it was suppressed after a desperate struggle. Another insurrection broke out in 1877, which was followed by a declaration of union in 1878 with Greece. Peace was finally concluded by a concession of partial self-government under Mukhtar Pasha. Religious differences between the Cretans, whose religion is Greek Catholic, and the Mohammedans, led to difficulties which culminated in new troubles in 1884 and terminated in a war in 1897, in which the Cretans had the support of Greece. A number of European powers interceded and effected a blockade of the island with their fleets, but war was prosecuted between Turkey and Greece on the continent. While the conflict terminated in the success of Turkish arms, the interests of Crete were protected by the powers.

On Nov. 26, 1898, Prince George of Greece was announced as high commissioner of Crete by a number of European powers, who had agreed upon his nomination. He assumed the duties of his office in December of the same year. The arrangements acknowledged the suzerainty of the Sultan, guaranteed freedom of religion and security of life and property, and established a native army. In 1908 the Cretans again declared the union of the island with Greece. The language spoken is Greek. During its greatest prosperity Crete had a population of 1,200,000 and at the time of the Venetian dominion, about 900,000. Canea, the capital and largest city, has a population of 24,856. Candia is important as a port. In 1906 the island had a population of 312,514, of which 33,395 were Moslems and the remainder were mostly Greek Christians.

**CRIBBAGE** (krīb'bāj), a game at cards played by two, three, or four persons with a full pack of 52 cards. A game called five-card cribbage, played by two persons, is the most popular amusement of this class. In playing the cards have a value as marked, except that the ace counts one and the face cards each ten. The points are scored by *pegs* on a board perforated with the necessary number of holes, called the *cribbage board*, and sixty-one points constitute the game. The advantage lies with the dealer, who makes up a third hand for himself, called the *crib*, partly out of the hand of his opponent, who at the commencement of the game is entitled to score three points for having lost the deal, which is determined by the players cutting for deal. The rules depend somewhat upon the game played. Three-handed cribbage

is played by three persons on a triangular board, and in four-handed cribbage two persons play in partnership against the others.

**CRICKET** (krīk'ēt), a genus of insects which resemble certain kinds of locusts and include numerous species, among them the house, mole, field, and wingless crickets. The wings are straight, and, when not in use, are folded in a longitudinal position along the back. The jaws move transversely, like those of beetles, while the head is thick and the feelers are long, and they possess remarkable power of leaping and making a rasping sound. However, the organs of sound are possessed only by the males, and they are used to attract or excite the females. A large class of these insects, known as *field crickets*, are seen in vast numbers about harvest time. The *house cricket* is about one inch long, has a yellowish-brown color, and the feelers are about as long as the body. It has



CRICKET.

A, house cricket; B, mole cricket.

been associated with the fireplace of the home, largely on account of the noise made by the wing covers of the male, and feeds on crumbs, finding safety in cracks and crevices of the walls. In the daytime it remains secluded, but comes out at night in search of food, when its familiar noise is heard. The *mole cricket* has large fore legs developed for burrowing. Crickets are widely distributed in America and the other grand divisions. The *Sicilian cricket*, native to Sicily, issues the loudest noise.

**CRICKET**, a popular athletic game, the national game of Great Britain. It is played on a smooth greensward with bats, balls, and wickets. The players form two sides of eleven each. A ball, two bats, and two sets of wickets and bails are required to play the game. The *wickets* consist of thick wooden stumps, twenty-seven inches high, and are placed on the ground in sets of three, at a distance of twenty-two yards apart. On the top of each set of stumps are placed two small pieces of wood, called *bails*. The rival sides toss for first innings, and the director of the side that is to play first places two of his men at the wicket as *batters*, while a *bowler*, a *wicket-keeper*, a *long-stop*,



and *fielders* are placed in their several positions by the director of the opposite side. After these arrangements have been made and the *markers* or *scorers* are at their post, the *umpires* take their places and the game begins. The relative merits of the rival sides are decided by the total number of runs made by each eleven batters during two innings, the side whose players score the most being the winner. The bowler's object is to direct his ball by a swift movement of the arm toward the opposite wickets, at which one of the batsmen stands, and, if possible, to strike down the stumps or knock off the bails; while the object of the batsman, on the other hand, is to protect his wickets from the bowler's attack, by either stopping the ball when it reaches him or driving it out to the field.

**CRIME**, a grave offense against social order, morality, and law. The term cannot be defined in the same way in all ages and all countries, for the reason that the social and legal requirements differ widely. It has been made the object of statistical investigation for many years. Some writers regard crime as a disease, while others think that the environments and hereditary tendencies are largely instrumental in placing individuals in the list of criminals. The bureau of education in the United States made an investigation of the subject a few years ago and reported that eighty-two per cent. of the criminals examined were in good health, while eleven per cent. were in fair health at the time of committing the offense. Lord Brougham stated in 1860 that "criminal statistics are to the legislator what the charts and the compass are to the navigator." The object of study has been largely to ascertain the effects of criminal legislation, and to learn the real nature of crime, its extent, increase or decrease, and the influences that determine it.

The different conditions existing in various countries, together with the environments of the individuals, such as religious tendencies, climatic influences, form of government, scarcity of food and clothing, and social surroundings, have a marked influence on all material factors that enter into the production of the criminal type. On examining 82,329 prisoners it was found that two per cent. of the offenses were against the government; twenty-three, against society; twenty-one, against the person; forty-six, against property; and eight, of a miscellaneous character. Of the offenses committed in the United States it was found in a recent examination that fifty-six per cent. were committed by persons of foreign birth, and that climatic and geographical conditions influence in various respects. Those engaged as laborers

seem to show a greater disposition to commit crime against the person of others than against property, while the reverse is true of those engaged in trades and commerce. Males show a greater tendency to crime than females, which is partly accounted for by the fact that upon the former devolve more largely the means of getting a livelihood. However, the statistical reports on the relative tendency to crime in the sexes must be taken with some allowance, because in females crimes are often condoned. Education shows a marked tendency toward overcoming crime, since the illiterate commit more numerous the higher crimes. An investigation made in Germany in 1905 demonstrates that married men respect property more generally than single men. They do not often commit the crimes against property, such as fraud and robbery, and are less prone to commit offenses against morality and human life. The same investigation demonstrated that widowers commit more crimes between the ages of thirty and fifty than either the married or unmarried men, but their tendency to crime decreases with their advancing years.

Poverty, ignorance, and idleness are the three most prolific sources of crime. Individuals rarely steal when they have an intelligent conception of life, remunerative employment, and a natural bent to industry. The best reforms then would seem to lie in wholesome economical legislation, universal education, and such restrictions that each offender may receive approximately exact justice. Recent writers quite generally agree that punishments should not have retribution for their object, but the penalty should be calculated as to its efficacy in removing from society the cause of danger. A thorough system of right education induces habits of industry in the young, while remunerative employment is a preventive against falling into the necessity of violating law in order to subsist. The education must go beyond the schoolroom; it must be furthered by libraries, public policy, and the sum of effective external circumstances which influence the character of society.

**CRIMEA** (krĭ-mě'á), a peninsula in the southern portion of Russia, between the Sea of Azov and the Black Sea, and attached to the mainland by the Isthmus of Perekop. It is about 200 miles from east to west and has an area of 10,000 square miles. For governmental purposes it belongs to the Russian province of Taurida. The southern coast is elevated, while the remaining parts belong to the regions of the steppes. It is watered by numerous small streams, of which the Salghir and Alma rivers are the most noted. The climate is pleasant in



summer, but quite severe and changeable in the winter season. Among the products are flax, hemp, tobacco, cereals, and many varieties of fruits. In the mountain districts are limited areas of excellent forests, which yield good building material. The domestic animals consist of horses, cattle, swine, and fine-wooled sheep.

The chief city and part of the Crimea is Sebastopol, from which a railroad line extends through the central portion and connects with all parts of western and northern Russia. Owing to its location on the boundary between Europe and Asia, it has been the seat of many military contentions. It belonged to the Cimmerians in early history, passed over to the Greeks, and later became a part of Rome. After the decline of Rome, it was occupied by barbarian tribes, and in 1237 it was overrun by the Mongols under Genghis Kahn. The Genoese captured and fortified Kaffa in 1261. They occupied large portions of it until 1475, when they were expelled by Mahomet II., who made it a dependent khanate. The Russians took possession of it in 1783, and it has been under their dominion with more or less restriction since that time.

The Crimean War occurred between Russia and the allied forces of France, Turkey, and England in 1854-56. The war was caused by Russia's attempt to secure preponderance in the eastern part of Europe by crowding the Turks out of the Continent, occupying Constantinople, and making Servia, Bosnia, and Bulgaria principalities of the Russian Danube territory. Russia took this step with the avowed purpose of securing a protectorate over the Greek Church, which brought the issues to a crisis. In the war which followed were fought the battles of Alma, Tchernaya, Balaklava, and Inkerman. The contest terminated by the loss to the Russians of their strongest fortress, Sebastopol. The last-named fortress had been greatly strengthened by Catharine II. in 1786 with the view of overawing the Turks. After its fall, a treaty of peace was concluded at Paris, April 27, 1856, by the terms of which the Ottoman Empire was guaranteed independence. The Crimea has a population of 583,962, about half of which is Russian. The others include principally Tartars, Greeks, Jews, Germans, and Bulgarians.

**CRIMEAN WAR.** See **Crimea.**

**CRINOIDEA** (krī-noid'ē-ā), the name of a group of sea animals, so called from the fact that their body resembles the form of a water lily. They consist of an expanded or spreading disk upon the end of a long, slender, jointed stem, which is attached to the bottom of the sea during practically the entire period of their life. At present the species are limited to a small

number, but formerly, especially during the Carboniferous Age, they were very numerous, which is evident by the large number of fossil remains found in the deposits of that period. The first traces of their remains are found in the Silurian system, and most of the species appear to have become extinct with the formation of the more recent carboniferous rock. The animals of this class now living feed on spores of algae, minute crustaceans, and other food forms common to the sea. They are very sensitive to a change of temperature, inhabit the deeper water, and when disturbed fall on the bottom of the sea or swim away by movements of the arms. Their arms drop off when the animal is placed in an uncomfortable position, but are restored through a process of regeneration, if the main body survives.

**CRINOLINE** (krīn'ō-līn), a stiff fabric formerly made of horsehair, but now of various material, used for stiffening a collar, skirt, or other parts of a garment. The same name is applied to a hoopskirt, which has been fashionable at various periods. The hoopskirts worn in 1740 were three feet across the hips.

**CRIPPLE CREEK**, county seat of Teller County, Colorado, about ninety-five miles southwest of Denver, on the Midland Terminal, the Florence and Cripple Creek, and other railroads. It has a healthful climate and is surrounded by a picturesque country. The chief buildings include the high school, the courthouse, the public library, and several fine churches. It has extensive systems of street lighting and public waterworks. The industries consist chiefly of machine shops and enterprises connected with mining. Cripple Creek is among the most interesting and remarkable of the newer mining towns of the West. Gold was discovered in its vicinity in 1886, but the more productive veins were not found until 1891, when Robert Womack and others opened up a very productive lode. It was soon after developed by the Gold King Mining Company, and within a very short time the town had a population of 9,000. The output in 1891 was \$20,000, but this was enlarged annually until the normal output reached about \$18,000,000. A fire did considerable damage in 1896, but it was soon rebuilt and improved. In the vicinity are a number of other mining towns, including Altman, Anaconda, Lawrence, and Victor. Population, 1900, 10,147.

**CRITIC** (krī'tīk), one who possesses literary qualifications to judge of the qualities of anything by some standard, criterion, or canon. The term is applied particularly to one who reviews and judges productions of literature and art.

**CRITICISM** (krī'tī-sīz'm), **Higher**, the term



applied to the criticism of the origin, form, and value of the Bible and other books, in distinction from the *lower criticism*, which is concerned with their text. A few attempts at this criticism were made in the early centuries of the Christian era, but extensive work along this line is wholly modern. The first work of any extent was published by Jean Astruc in a book entitled "Conjectures Concerning the Original Memoirs used by Moses in Composing the Book of Genesis," which appeared in print at Brussels in 1753. The literature on this subject is now almost without limit. The most complete discussion is contained in the "Higher Criticism," by A. C. Zenas, New York.

**CRITTENDEN COMPROMISE**, a measure introduced by John Jordan Crittenden, in 1860, in the United States Senate. The proposition was in the form of a constitutional amendment which would permanently divide the Union into a free state and a slave state, the boundary being the line of 36° 30'. It provided that the United States was to pay the owner for any fugitive slaves, that the Federal government could not limit or prohibit the interstate slave trade, and that slavery was to be retained in the slave states and in the District of Columbia. The proposition caused much discussion in both branches of Congress and throughout the country. On Jan. 14, 1861, it was defeated in the House by a vote of 113 to 80, and on Mar. 2, 1861, in the Senate by a vote of 20 to 19.

**CROATIA AND SLAVONIA** (krō-ā'shī-ā, slā-vō'nī-ā), a province of Austria-Hungary, constituting one of the crown lands of Hungary. It is bounded on the north by Styria and Carniola, on the east and northeast by Hungary, on the south by Servia, Bosnia, and Dalmatia, and on the west and southwest by Istria and the Adriatic Sea. Croatia occupies the southwestern and Slavonia the northeastern part. The Drave river separates it from Hungary, and through the central part flows the Save river, which separates Croatia from Slavonia. The area is 16,675 square miles.

Most of the surface is mountainous, being cut up by ranges of the Julian and Styrian Alps, which attain heights of from 2,000 to 4,000 feet. Croatia contains the Agram Highlands, the Kapella, and the Croatian Karst. A fertile coast plain and productive valleys characterize the surface of Slavonia. Currents of the Adriatic sweep across the coast land of Croatia, hence its climate is raw and changeable, and numerous swamps make the climate of Slavonia somewhat unhealthful. The minerals consist chiefly of coal, copper, sulphur, and marble. Glass, paper, sugar, silk and cotton textiles, spirituous

liquors, and machinery are the principal manufactures. About thirty-five per cent. of the surface is arable land and a considerable portion is utilized for meadows and in forestry. Corn and wheat are the chief cereals and cattle and hogs are grown in large numbers. Fruit, especially grapes, and vegetables, are important products. Transportation is furnished by the Drave and Save rivers and a number of railroads. Fiume, on the Adriatic, is a port of entry and has railroad connection with the principal cities of the country. Porto Ré, Zengg, and Agram are commercial centers.

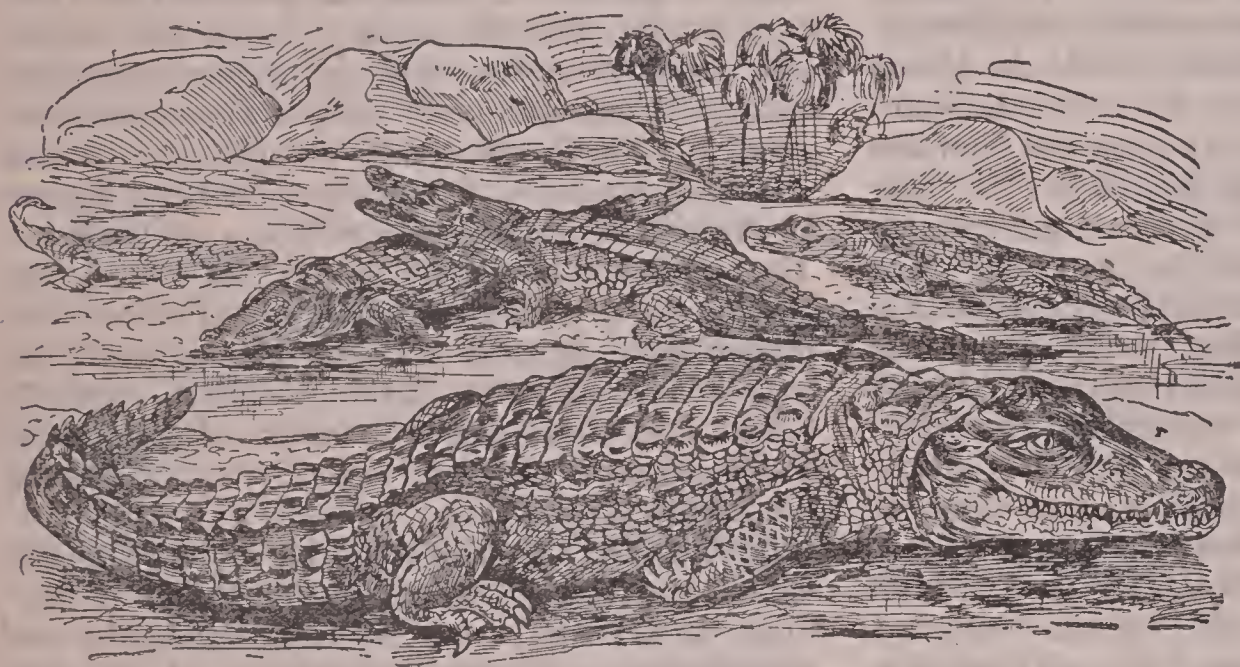
Both Croatia and Slavonia were a part of ancient Pannonia, a province of Rome. They comprised border territory in the conflict between Christianity and Mohammedanism for many centuries. Croatia was annexed to Hungary in the eleventh century, but it has continued a policy looking toward greater independence. The *Ausgleich* of 1867 was partially applied to both Croatia and Slavonia, and its ban, the chief executive, is appointed by the Emperor of Austria in the capacity of King of Hungary. The inhabitants consist largely of Serbs and Croats, with a small mixture of Germans and Hungarians. A large majority of the people belong to the Roman Catholic church, but the Greek Orthodox and a number of Protestant denominations are well represented. Population, 1906, 2,425,512.

**CROCODILE** (krök'ō-dīl), a large reptile which resembles a great lizard, found in portions of Africa, Asia, the Sunda Islands, and the Moluccas. Crocodiles are one of four living representatives of the order *Crocodylia*. The other three are lizards, serpents, and the class including turtles and tortoises. The group of crocodiles includes the crocodiles, alligators, and gavials. The alligators are native only to America, while the gavials belong exclusively to Asia and are found principally in India. All the animals constituting the *Crocodylia* are oviparous; that is, they produce eggs and hatch their young outside the body. They are characterized by long jaws and four short limbs; the fore feet have five toes and the hind feet four, the latter being webbed. Square bony plates cover the skin; the tail is long and compressed laterally. The tear glands are large, the heart is four-chambered, and the nostrils are located at the end of the snout, with capacity to close against ingress of water.

Crocodiles live mostly in water, but they are seen frequently on the sand in the warm sun. Their movement in the water is quick and well directed, while on land they move forward rapidly, but are slow to turn their bodies. The



best way to elude them on land is to turn rapidly and repeatedly in making a retreat from them. Their food consists of flesh, such as fish, quadrupeds, and carrion, and is preferred in a state of putrefaction. The eggs, about the size of goose eggs, are laid in the banks under covering and hatched by the warmth of the sun. The female of some species guards the eggs and shows marks of tenderness to the offspring. Crocodiles sometimes attain a length of thirty feet and attain a great age. The older individuals do not hesitate to attack larger animals and man. They are accompanied by a little bird, much like the cowbird associated with cattle. This bird consumes the insects and worms that fix themselves to their bodies and warns them in times of danger. They were held sacred by the



AFRICAN CROCODILE.

ancient Egyptians. At present they are not found on the Nile, except near its head waters.

**CROCUS** (krō'kūs), a genus of plants native to the eastern part of Europe and to Asia Minor. Several of the species bloom profusely. The flowers are violet, purple, yellow, white, striped, or saffron-colored. They are extensively cultivated in gardens; a sandy soil is best for prolific growth. According to their period of flowering, they are divided into the *vernal* and the *autumnal* crocuses. The dried stigma and style of several species form a powerful aromatic and are used to color an orange-yellow.

**CRONSTADT.** See **Kronstadt.**

**CROOKES TUBES,** the sealed vessels from which the air has been exhausted to the extent that a high vacuum is obtained, and which have electrodes at opposite ends. They are so named from the inventor, Sir William Crookes, and are used to secure various effects of electrical discharge. By a high vacuum is meant one in which the gaseous pressure is not

more than one-millionth of that of the atmosphere. Tubes somewhat similar were invented by Geissler, known as the *Geissler tubes*. They are of various forms and are supplied with platinum terminals and filled with different gases at different pressures. When the current of an electric machine is sent through them, it gives rise to many beautiful luminous effects. They are used in the spectrum analysis of gases and in the production of cathode rays.

**CROOKSTON,** a city in Minnesota, county seat of Polk County; on Red Lake River, in the valley of the Red River of the North. It is on the Northern Pacific and the Great Northern railroads. The surrounding country is fertile, producing hay and cereals. The chief buildings include the courthouse, public library, a gymnasium, a business college, and the high school. Among the manufactures are flour, clothing, machinery, and farming implements. It has systems of waterworks and electric lights. It was settled in 1872 and incorporated in 1879. Population, 1905, 6,794.

**CROQUET** (krō-kā'), a popular open air game played by two or more persons with balls and mallets. The ground should measure 36 by 72 feet and be raised two inches at the border.

Near each end of the ground is a *stake*, and nine *wickets* are set at convenient points between them. The game consists of driving a ball from the stake at the head of the ground through the wickets on the right hand side and to the stake at the foot of the ground, whence the ball is driven to the point of the beginning by way of the wickets to the left hand. When a ball has made the circuit of the field but has not touched the stake at the head of the ground, it is called a *rover* and may play on every other ball in the field in one turn. A complete croquet set consists of eight balls, painted in agreement with eight mallets, but in practice two or more persons play the game. The player loses his turn when he fails to drive the ball through a wicket, hence the game may be of considerable duration. Croquet is a very old game, but its popularity is of comparatively recent date. Interest in it is promoted in England and America by national and international associations.

**CROSS,** a figure produced by the intersection

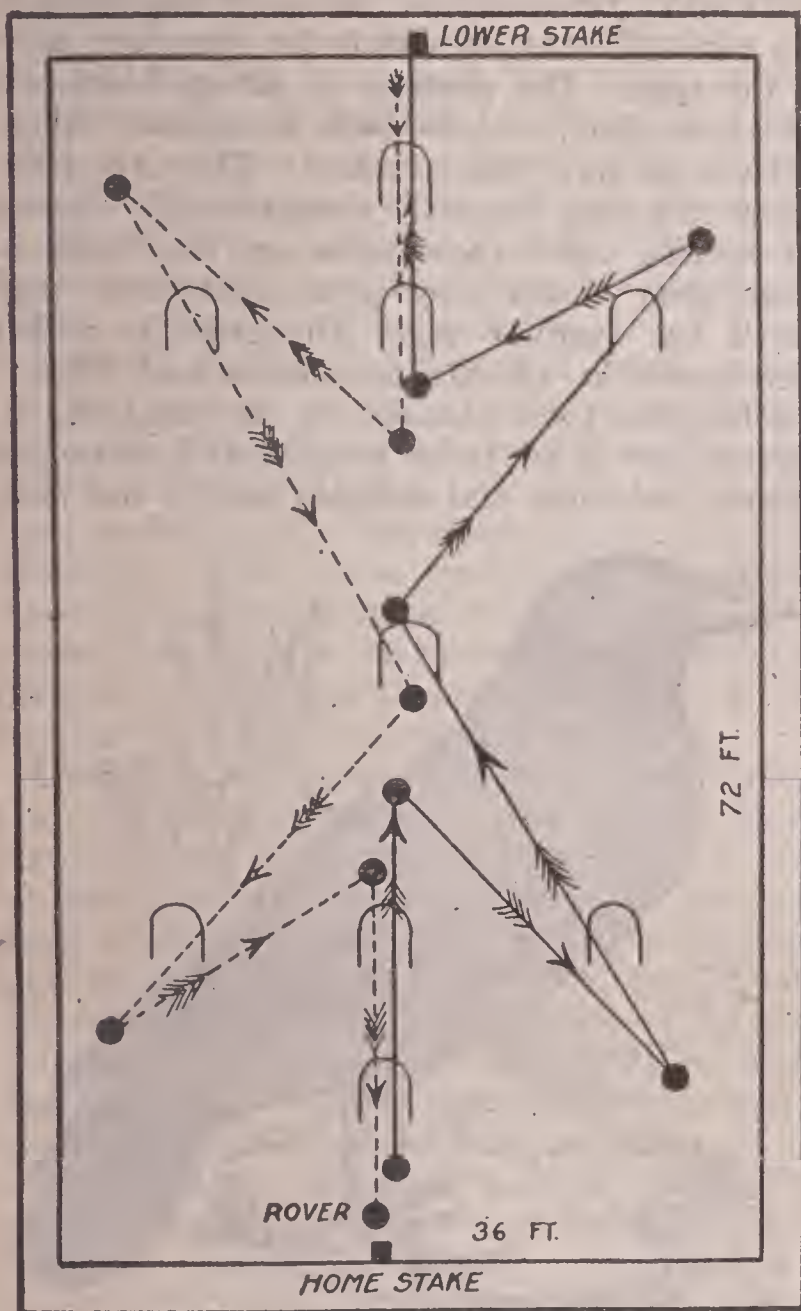


of two lines at right angles. In ancient times a cross was formed by fastening a piece of wood across an upright post or tree, which served for the execution of criminals by nailing or binding them in an upright position. Christ

association and fancy give the shape of a cross. In 1679 it was added to the list of constellations by Olaus Römer (1644-1710).

**CROSSBILL**, the common name of several species of birds of the finch family, so named because the tips of the mandibles cross each other. The form of the bill gives them facility to shell pine cones to find the seeds, their principal food. The crossbills are found in the northern parts of North America and the colder parts of Asia and Europe. They attain a length of about seven inches. The male is reddish in color and the female is yellowish-green. Their nests are built in the limbs of trees, where they breed.

**CROSS FERTILIZATION**, the term used by botanists to describe the fertilization of plants by bringing the pollen from the stamens of a given species in contact with the pistils of another. This is done in the course of nature by insects, birds, or the movement of air. However, the term has a broader signification in the cultivation of plants, since it implies bringing together the generative parts of such flowers as will result in producing the best plants and improving the fruits borne by them. In-and-in breeding among animals is known to sterilize and degenerate, while cross breeding tends to so combine temperaments and physical structures that the offspring may be improved. This is true in a great measure with plants, and those interested in their culture single out



CROQUET GROUNDS.

was crucified by nailing the hands and feet to the cross and securing the limbs by means of cords. The cross was adopted early as a symbol of Christian faith. It was carried by the legions of Christian warriors and was displayed in churches, cemeteries, and other places as a symbol of loyalty to the Christian cause. The cross is still a sign of distinction from the crescent used as a symbol by the Moslems, and is seen in Christian print, architecture, and worship.

**CROSS, Southern**, the most conspicuous constellation in the Southern Hemisphere, seen near the Antarctic Circle. At a northern latitude of  $30^\circ$  it is at the southern horizon, but, owing to the haze and fog near the sea, it is not seen clearly north of the Tropic of Cancer. It contains four bright stars, to which Christian



CROSSBILL.

the best species so as to have a combination of the stronger and better specimens.

Cross fertilization in plants, like that in animals, must be guarded with considerable care, since species of vastly different characteristics



do not produce the most healthful and serviceable offspring. Perhaps this is better illustrated in the human race, where crosses between individuals of vastly different races, such as the Caucasian and Ethiopian, do not result in an advantage to the race more highly developed. Bees, humming birds, and many insects are a prolific source of cross fertilization, and where botanists conduct experiments it is necessary to provide protection against their coming in contact with plants.

**CROTON** (krō'tūn), a genus of plants which include herbs, shrubs, and trees. They occur in the warmer parts of both hemispheres. The leaves are variable and extremely acrid. Important medicines are obtained from the wood and seeds. Croton oil is expressed from the seeds of a number of species. It is brownish-yellow and has a nauseous taste. In large doses it is a dangerous poison, but in moderate quantities it acts as a drastic purgative, often causing vomiting. It is used as a counter irritant for obstinate constipation and accidental poisoning. About thirty species occur in Mexico and the southern part of the United States.

**CROTONA** (krō-tō'nà), or **Croton**, an ancient Greek colony in the southern part of Italy, on both sides of the Aesarus River and on the east coast of the Bruttian peninsula. It was founded by Achaean colonists about 710 B. C., and grew rapidly in wealth and commercial importance. The disciples of Pythagoras became rulers of the city of Crotona about 530 B. C., and the colony furnished a large number of men during the war with Sybaris, about 510 B. C., but the Pythagoreans were soon after expelled. It suffered greatly during the war between the Romans and Pyrrhus, when it was plundered and nearly destroyed, and was overrun by its enemies in the second Punic War. The modern city is called Cotrone.

**CROTON AQUEDUCT.** See **Aqueduct.**

**CROUP** (krōp), a common disease occurring mostly in young children. It takes the form of an inflammatory affection of the trachea and larynx, and arises largely from exposure to wet and cold and from digestive disturbances. It occurs most frequently at the ages of two and three years, and generally on the fourth or fifth day produces death by exhaustion and strangulation. The two forms of the disease are known as false croup and membranous croup. Both are attended by coughing. In *false croup* the child has a running from the nose and the breathing is labored and noisy. *Membranous croup* is due to the bacillus of diphtheria and is contagious and frequently fatal. Small pieces of membrane are coughed

up in severe cases. The operation known as tracheotomy, which consists of inserting a tube into the windpipe below the inflamed tract, is often resorted to in this malady. The tube serves as a means of breathing.

**CROW**, the common name of any bird of the genus *Crovis*, of which the American crow is the type. The plumage is glossy black, the wings are long, and the beak is conical. About 200 species have been studied. They are intelligent and may be easily domesticated. Nearly all species build their nests on the limbs of trees, near which they perch and utter their harsh but familiar cry. The crow is widely distributed in all the continents and islands. Its favorite food consists of various kinds of carrion, but it feeds on fish, small quadrupeds, grains, and nuts, and delights to rob the nests



HOODED CROW.

of other birds and poultry of the eggs and young. Its habits are more or less gregarious, but it is frequently seen by itself or in isolated pairs. The crow of America is smaller than that of Europe, measuring about eighteen inches in length. The *fish crow* is found along the southern coasts, resembling the northern species, but is somewhat smaller. The *rook* is a small-sized species, has a peculiarly bare face, and is quite tame.

The crows are found in climates far north at all seasons of the year, but large numbers move southward in winter to warmer districts. The *hooded crow* has a small black tufted head, which is quite distinguishable from the gray body. It feeds on fish and carrion. Other spe-



cies are found in Ceylon, where they live in towns, and several are native to New Zealand, New Guinea, and other islands. The *jabbering crow* of Jamaica has a peculiar and active voice. The jays, ravens, magpies, and jackdaws are closely related species. The flight of the crow family is not graceful, being marked by incessant flapping of wings, but most species are able to sustain the fatigue of traveling long distances. They usually fly in a direct line toward their destination, stopping to rest on the roadways or on the limbs of trees. Their scent is very marked, enabling them to detect and locate carrion at some distance.

**CROW**, the name of a tribe of North American Indians, a branch of the Sioux family. Formerly they inhabited the region of the upper Yellowstone and Missouri rivers, but they are now confined on a reservation in the State of Montana. They were friendly to the whites when the main branch of the Siouxs conducted a warfare against the settlers, and many of them were employed as guides and scouts. At present the total number is about 1,975.

**CROWN**, the name of a coin issued by several European countries. The English crown was originally a gold coin, first issued in 1527 by Henry VIII., but since 1551 it has been made wholly of silver. It is worth five shillings sterling, or about \$1.23 in the money of Canada and the United States. The crown of Sweden, Norway, and Denmark is equivalent to about 26.5 cents, and that of Austria-Hungary has a monetary value of about twenty cents.

**CROWN**, the ornament worn on the head of princes, kings, and emperors as a badge of sovereignty. Similar ornaments, called *coronets*, are worn by the nobility. The *tiara* is a decoration of the Pope. This custom is of considerable antiquity. The first King of Israel, Saul, wore a crown, and this is true of the King of Ammon. The first Roman sovereign who wore a crown was Tarquinius Priscus, in 616 B. C. In 306 A. D., when Constantine began to reign, he wore a crown. The practice was afterward extended to western monarchs, and later sovereigns were represented with crowned heads on coins. Many of the crowns are of great value. The crown worn by Queen Victoria had 227 pearls, four small rubies, one large ruby, seventeen sapphires, 147 table diamonds, 1,273 rose diamonds, and 1,363 brilliant diamonds. In the crown of the Prince of Wales are the German words *Ich Dien* (I serve). The most celebrated crowns are those of Germany and Italy. The former is spoken of as the *silver crown*, but is a wealth of gold and gems. The latter is known as the *iron Lombard crown*, but is of

solid gold, except that it contains an iron nail reputed to have been used at the crucifixion.

**CROWN LANDS**, in America, the lands located west of the English colonies. All of these lands were declared to be crown lands by a proclamation of Great Britain after the Treaty of Paris, in 1763, and they were held as reserves for the Indians and declared to be under the jurisdiction of the home government. The colonists were not permitted to make purchases of, or make settlement in, any of this reserve territory without the royal permission. The several states claimed these lands after the Revolution.

**CROWN POINT**, a town in Essex County, New York, on Lake Champlain, 110 miles north of Albany. It is on the Champlain Canal and the Delaware and Hudson Railroad. Iron ore and phosphate of lime are mined in the vicinity. It has a public library, electric lighting, and a number of churches. Crown Point is noted for the ruins of the fortifications constructed here by the British at a cost of about \$10,000,000, although they are now in ruins. Seth Warner, at the head of a company of Green Mountain Boys, on May 11, 1775, captured the fort, which was garrisoned by only twelve men. Population, 1905, 1,890.

**CROYDON** (kroi'dŭn), a market town of England, in Surrey, ten miles south of London. It is located on several railway and electric railroad lines, and is a favorite residence suburb for merchants and business men of London. Among the principal buildings are a Gothic church, the Whitgift's Hospital, and a number of fine schools and charitable institutions. The manufactures embrace clocks, cotton and woolen goods, clothing, machinery, and spirituous liquors. Many fine drives and parks beautify the place, which was once the residence of the Archbishop of Canterbury. Its growth is comparatively recent, due largely to the development of many commercial and manufacturing enterprises. Population, 1907, 154,342.

**CRUCIBLE** (kru'si-b'l), a vessel made of material which is capable of holding substances that are to be submitted to a high temperature, such as the material for melting metallic ores or those used in glass-making. The form is circular, conical, or triangular. The material used for making crucibles is either iron, porcelain, graphite, or platinum.

**CRUELTY TO ANIMALS**, The American Society for the Prevention of, an organization incorporated April 10, 1866. It was the first society organized in America for the protection of animals. Henry Bergh was the founder and first president, and to his tireless energy and



self-sacrifice the laudable work of protecting animals in a systematic way owes its origin. Through the efforts of this society the first law enacted in America for the protection of animals was passed by the Legislature of New York. The example was followed by the legislatures of other states, thus leading to much good in the care, use, and protection of all kinds of domestic animals. Branch organizations are now maintained in many parts of the United States and in other countries of America and the Eastern Hemisphere. Many cases have been attended by the society and its agents. The object is to prosecute offenders in the courts, temporarily suspend disabled animals from labor, humanely destroy animals that are past recovery, investigate complaints, and provide ambulances for the removal of disabled animals from the streets and highways for medical attendance. *Our Animal Friends*, a monthly magazine, is the official organ of the society, through which knowledge and interest is disseminated.

**CRUELTY TO CHILDREN.** See *Children, Society for the Prevention of Cruelty to.*

**CRUSADES** (krū-sāds'), the expeditions and wars conducted by the Christians of Europe to uphold the rights of pilgrims at Jerusalem, and ultimately to establish a firm foothold for Christianity in Asia. The Crusaders wore a cross made of white, red, or green woolen, sewed on the right shoulder of the dress, as a signal that they fought for the interests of the *Cross* as against the *Crescent* of the Moslem. Jerusalem and the Holy Sepulcher fell into the hands of the Mohammedans in their early conquest of Palestine. Notwithstanding, the Christian pilgrims still thronged to the Holy Land to worship on the scenes frequented by the Savior.

During the ascendancy of the Saracens in the East the Christians were shown tolerable kindness, largely as a matter of policy, but when the Turks secured dominion widespread outrages were perpetrated. Many expeditions of pilgrims were insulted, pillaged, or murdered. The returning remnants spread complaints of Turkish insolence and barbarity throughout Europe, causing intense excitement and solicitude in the various nations. That they should be driven from the region embodying the most sacred interest of Christians, and the places of concern be occupied by a class foreign and adverse to everything pertaining to their spiritual welfare, led to a widespread desire to depose the Turks and establish Christianity on a firm basis in the East. The first general agitation of a Crusade to the Holy Land began in the latter part of the 10th century, when Pope

Sylvester II. attempted to induce the Christian world to succor the afflicted of Jerusalem, but to this call only a feeble support was given by the people. However, later there were no less than eight great movements, including the *Children's Crusade*, to accomplish the object desired.

I. The first Crusade was induced largely by the agitation of Peter the Hermit, who traveled throughout Europe for that purpose and aroused general interest in the project. He was aided by Walter the Penniless and others interested in various parts of Europe. The Crusaders under Peter the Hermit numbered about 40,000, and under Walter the Penniless about 20,000, and besides these were about 15,000 Germans and various smaller organizations. As a whole, the participants were illy prepared, impatient, and poorly equipped to enter upon such an expedition. Later a stronger organization was led by Godfrey of Bouillon, Duke of Lorraine, and his brother Baldwin, Count of Flanders, aided by several others. Nice was taken in 1097; Antioch, in Syria, in 1098; and Jerusalem, in 1099, where a Christian kingdom was established with Godfrey of Bouillon as sovereign. Soon after the Battle of Ascalon was fought, in which he defeated the Sultan of Egypt. The first Crusade dates from 1096 to 1099. Palestine was in the hands of the actors of this Crusade for fifty years. During their dominion the two great military and religious orders were formed—the Knights of Jerusalem and the Knights Templar.

II. The second Crusade was undertaken in 1147 and ended in 1149. It was signaled by the fall of Edessa into the hands of the Mohammedans in 1144. Following this Bernard, abbot of Clairvaux, traveled over Europe preaching a second Crusade much as Peter the Hermit had preached the first. In 1147 Conrad III., Emperor of Germany, and Louis VII., King of France, took up the cross and started upon a Crusade with more than 300,000 soldiers. They passed through Germany, Hungary, and over the straits into Asia. By the unfriendly schemes of Manuel, the Emperor of East Constantinople, the plan was frustrated and proved an entire failure. Conrad was defeated in the mountains of Cappadocia and returned in despair to Constantinople. Louis gained a slight triumph over the Saracens on the banks of the Meander and struggled on through storms and famine until he reached Antioch. There he was joined by Conrad. They united their forces and entered Jerusalem, but failed in their siege of Damascus.

III. The third Crusade dates from 1189 to 1192. It was agitated for a number of years, finding its greatest support in Italy, Germany



and France. When the report was spread throughout Europe that Jerusalem had fallen before Saladin, the Sultan of Egypt, and that the golden cross which had glittered on the Mosque of Omar for 48 years had been trampled in the streets, the enterprise was assured. The Italian contingent sailed to relieve the Christians in the siege of Acre, which had yielded to Saladin. Later Richard I., of England, Frederick Barbarossa, of Germany, and Philip Augustus, of France, led large armies into Asia Minor. The armies of Philip and Richard were weather-beaten and sorely pressed, only 5,000 reaching Acre. A detachment sailing under Richard for the Holy Land was divided by a storm and driven to Cyprus. Jealousies arose between Richard and Philip, after which the latter returned to France and the former was successful in several engagements by which he excited the admiration of the Saracens. A truce followed for a time with Saladin, in which the latter was left potentate in possession of Jerusalem.

IV. The fourth Crusade was brought about largely through the efforts of Pope Innocent III., and covers the period between 1195 and 1197. In these expeditions the Western Christians captured Constantinople from the Greeks in the East and founded a Latin kingdom which endured fifty-seven years. During the siege of Constantinople many precious works of art were destroyed and much of the city was burned. The purpose was to build up a permanent power against the Moslems but in this the enterprise failed.

V. The fifth Crusade dates from 1198 to 1204. It resulted in a second siege of Constantinople terminating to the advantage of the besiegers. Baldwin, Count of Flanders, was elected emperor over one-fourth of the Eastern dominions and the remaining portion was divided between the republic of Venice and the barons of France. In the meantime the *Crusade of Children* was organized in 1212. About 30,000 boys and girls of France and 40,000 of Germany crossed the Alps and pushed forward with the expectation that the Moslems would embrace Christianity by miracles. Large numbers of them became discouraged and returned home, while others perished, were sold into slavery, or lost at sea. Frederick II., Emperor of Germany, proceeded to Jerusalem in 1227, where he secured a treaty with the Sultan of Egypt without expenditure of human life, under which he was crowned King of Jerusalem. However, he returned to Germany in 1229.

VI. The sixth Crusade was conducted by Louis IX., King of France, from 1248 to 1254.

He was taken prisoner in Egypt, but secured his release by paying an enormous ransom. From Egypt he went to the Holy Land, where he built a number of forts, but soon returned to France.

VII. The seventh Crusade was started by Louis IX., of France, in 1270, but he died of pestilence in Tunis. He had been associated with Prince Edward of England, later Edward I., who landed at Acre in 1271. Nothing was accomplished aside from a truce of ten years. Subsequently several other efforts to secure a permanent foothold were made, but they were greatly weakened by those undertaken in the early period of the movement. The Latin kingdom of Jerusalem expired in 1291.

The most important events of the Crusades include the capture of Jerusalem by the Crusaders in 1099. It was retaken by Saladin in 1187, restored to the Christians by a truce in 1227, and taken by the Turks in 1239. The empire founded by the Crusaders expired with the capture of Acre by the Sultan of Egypt in 1291. The Crusades with their attendant interests were promoted about two centuries and had a marked impression upon the several kingdoms of Europe. Immense sums of money were spent without securing productive returns, millions of lives were lost, and marked changes were wrought in the habits and customs of European nations. After these conflicts were over, attention again turned to commerce, the laboring classes receiving a new impulse. During this period the germs of new ideas were sown in inquiring minds, and bigotry and imperialism rapidly diminished. While attended by some elements of harm, they broke up old feudal systems and paved the way for vast commercial and industrial enterprises.

**CRUSTACEA** (krūs-tā'shē-ā), a class of aquatic arthropods, so named from the hard armor which covers the whole body. About ten thousand species are included in this group of animal life. The shell of the body is jointed, forming the principal part of the skeleton, and each joint or segment of the body has a pair of jointed appendages. Two of the appendages are usually modified into antennae or feelers, below or back of which is the apparatus for eating. The higher classes have the bodies divided into three parts: the head, thorax, and abdomen. All are oviparous and the sexes are distinct in most species. The crust or shell is cast off in one piece when it gets too small for the growing body and a new one better fitted develops. Limbs lost by accident or in combat are replaced by new growth in a short time. The outer hard shell consists of many parts



and allows movements by being jointed much like the joints formed by cartilages in higher forms of life. Some species of the crustacea have compound eyes borne upon long stalks, a pair of jointed feelers, and gill-like appendages for breathing. Various species occur in the seas, in fresh water, and on land. Fossil remains of these animal forms have aided greatly in studying the age of strata. Among the familiar examples of the living crustaceans are the lobsters, crawfishes, barnacles, and shrimps.

**CRYOLITE** (krī'ō-līt), a compound of sodium, aluminum, and fluorine, so named from its fusibility in the flame of a candle. In a pure state it is snow-white, partially transparent, and has a vitreous luster. It is used in the manufacture of soda and in making a beautiful glass somewhat resembling porcelain, and is a source of sodium hydrate, sodium carbonate, and other salts. Cryolite is found chiefly near Arksuk, Greenland, and in El Paso County, California.

**CRYPT** (krīpt), a chamber under a church or beneath a monument to receive the bodies of the dead. Originally the term was applied to a subterranean chapel in the catacombs and later it designated a room near the confessional, of which it was an extension or enlargement. Crypts were constructed very largely in the churches from the ninth to the thirteenth century and many are of beautiful construction. The crypt under the cathedral at Glasgow, Scotland, is one of the finest examples. Others of note include those in the Cathedral of Canterbury, the Church of Saint Mark at Venice, the Cathedral of Strassburg, Germany, and the Sainte Chapelle, Paris.

**CRYPTOGAMOUS PLANTS** (krīp-tōg'ā-mūs), or **Cryptogams**, the name applied by Linnaeus to all the plants that do not reproduce by flowering. The seed-bearing plants, to distinguish them from the cryptogams, are usually called *phanerogams*. Formerly it was thought that the distinction between the two classes should be based upon the theory that the cryptogams reproduce by spores and the phanerogams by seed, but this view is not correct, since both groups include representatives that produce spores, but the former do not produce seeds.

**CRYPTOGRAPHY** (krīp-tōg'rá-fý), a system of writing with sympathetic ink, or with secret characters or ciphers. The most common method is to choose a sign or mark for every letter of the alphabet, using the substituted characters in committing the subject-matter to writing.

**CRYSTAL** (krīs'tal), in mineralogy and

chemistry, the solid mathematical form which a chemically homogeneous body tends to assume by undisturbed and mutual attraction of its particles. Crystals may be developed by dissolving crystalline bodies in water, alcohol, or other fluids, and then abstracting the fluid by evaporation. Crystalline forms occur largely in nature. The study of their structure and the laws by which they are formed is called crystallography, which is an essential division of mineralogy.

**CRYSTALLOGRAPHY** (krīs-tal-lōg'rá-fý), the science of crystallization, which investigates the system of form among crystals, and treats of their structure and method of formation. A crystal is bounded by plane surfaces, which have a symmetrical arrangement around certain imaginary lines called *axes*. Crystals are formed in all inorganic substances when solidifying, whether natural or artificial, and many thousands of forms are thus produced. Since the qualities of crystals depend directly on the forces of the ultimate molecules or particles of matter, crystallography constitutes an important department of molecular physics and is concerned in the study of cohesive attraction. All solidification in inorganic substances is crystallization, hence cohesive attraction in solidification consists wholly of crystallogenic attraction.

The very numerous forms of crystals may be classified under six systems. 1. The *monometric system*, in which the crystals have three lines or axes of equal length, hence are of one kind, include such crystals as are formed by silver, gold, iron pyrites, and common salt. All the forms of this system are symmetrical. 2. The *diametric system* has axes of two kinds, the lateral axes being equal to each other, but differing in length from the vertical axis. Under this system crystallization is in the form of square octahedrons, equilateral eight-sided prisms, eight-sided double pyramids, and in a number of other forms. Among the examples are the crystals of tin idocrase and calomel. 3. The *trimetric system* includes the forms in which the vertical axis is unequal to the lateral and the two lateral axes are unequal to each other, hence the three axes are all of unequal length. The crystalline forms are right rhombic prisms and rhombic-based octahedrons. The examples include topaz, sulphur, epsom salt, and heavy spar. 4. The *monoclinic system* includes the crystals in which two of the axes are at right angles to each other and the third is inclined. All the axes are of different lengths and the crystals are oblique rhombic prisms. Copperas, borax, sugar, and carbonate of soda crys-

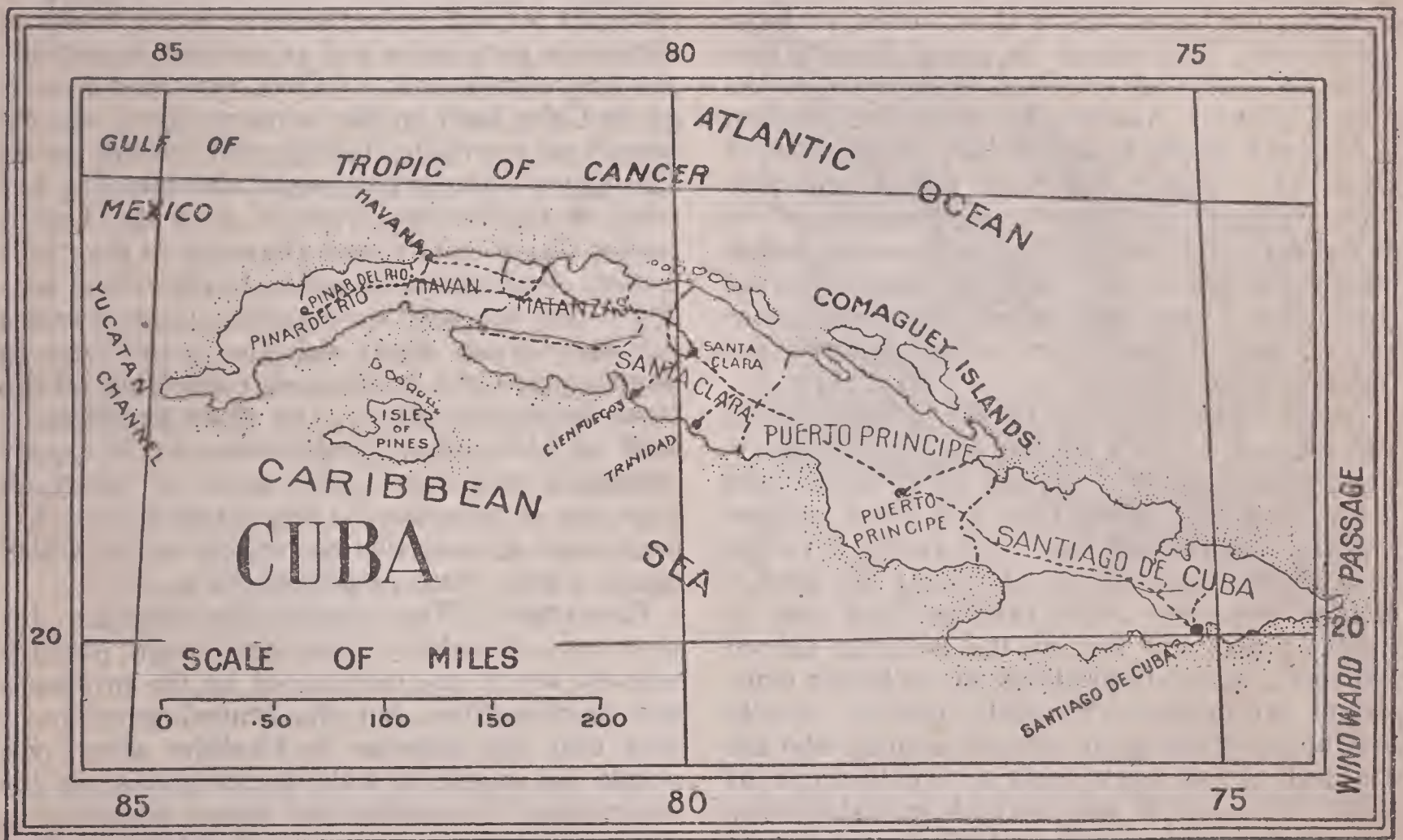


tallize according to this system. 5. The *triclinic system* includes the crystals that have three axes of unequal length, all the three intersections being oblique. The forms are oblique prisms contained under rhomboidal faces. The crystals of this system include those of sulphate of manganese and blue vitriol. 6. The *hexagonal system* includes the regular hexagonal prisms, in which the vertical axis connects the centers of the bases, and the three lateral axes join the centers of the opposite lateral faces or edges. It also includes the rhombohedron and its derivative forms. Among the crystals are those of many kinds of limestone and emerald.

**CUBA** (kū'bà), a republic in the West Indies, on the island of Cuba, the largest and most

from southeast to northwest across the island, known as the Copper Mountains, which vary in height from 1,000 to 4,000 feet. The most elevated summits are in the southeastern part, where Turquino, the culminating peak, rises to a height of 8,320 feet. Low and marshy lands lie west of Cape Cruz, near which is located the great Zapota swamp. Coral islands or reefs border the northern coast.

Cuba has no large rivers, but its streams that may be classed as rivers exceed 150 in number and only few of these are navigable. The Cauto, wholly in the province of Santiago de Cuba, is the largest stream. It is about 150 miles long and is navigable for a distance of fifty miles. The climate is variable inland, but along the coast it is very equable. At Havana



important of the Greater Antilles. It is situated mainly between latitudes  $19^{\circ} 20'$  and  $23^{\circ} 8'$  north and longitude  $78^{\circ}$  and  $85^{\circ}$  west, and between the Gulf of Mexico and the Caribbean Sea. The coast line is very extensive, containing numerous inlets and safe harbors. The northern coast is about 818 miles long and the southern 972 miles, the former having thirty-two harbors and the latter twelve. From east to west the island has a length of 760 miles, with an average width of eighty miles, and the area, including a number of small islands, is 45,881 square miles.

**DESCRIPTION.** A range of mountains extends

the rainfall is about fifty inches and in the northeastern section it ranges from 80 to 100 inches, but the southeastern region has a smaller precipitation. The winter season is marked by copious rainfall, but is not cold, while the summer breezes modify the temperature and render it quite pleasant in all portions. In summer the thermometer rarely rises above  $90^{\circ}$  and seldom falls below  $85^{\circ}$  in winter, but the mountainous regions have a lower temperature in winter, though rarely less than  $50^{\circ}$ . Normally the climate is healthful, but sickness prevails along the low coasts and in the marshy districts.

Cuba has a tropical vegetation and many of



the plants are luxuriant. The prairies abound with nutritious grasses and fully one-half of the surface is covered with forests, including the palm, mahogany, cedar, *lignum-vitae*, logwood, rosewood, acana, and Cuban ebony. Many species of fruit are native or have been naturalized. Animal life is abundant, especially birds, of which there are more than 200 species. They include the vulture, grouse, snipe, quail, wild turkey, and many birds of song. The reptiles are represented by the alligator, lizard, tree toad, and turtle. Many species of insects abound, including the scorpion, tarantula, firefly, ant, and a limitless number of others. The rabbit, bat, cat, and domestic animals are well represented. The waters of Cuba are rich in fish, including about 650 species.

**MINING.** Iron is found in the province of Santiago de Cuba, where it is mined in large quantities. The output is about 575,000 tons annually, nearly all of which is exported to the United States. Asphalt, an important product, is obtained chiefly in the vicinity of the Bay of Cárdenas. Copper has been mined profitably for many years and prior to the discovery of the deposits in the United States it was exported largely for use in the American manufacturing enterprises. Salt, gold, silver, petroleum, manganese, and a number of other minerals are found in paying quantities.

**AGRICULTURE.** Owing to the genial climate and general fertility of the soil, agriculture is the leading industry. Many of the cultivated fields have been tilled fully 200 years without artificial fertilization and their riches have not been perceptibly affected. Much of the land is divided into small tracts, ranging from eight to twenty acres, and few of the holdings exceed 100 acres, except in localities where larger plantations are managed by white owners. Nearly half of the farmers are colored tenants, who are confined almost exclusively to small tracts of lands. Agriculture was set back materially during the war with Spain, in 1897, but at present it is conducted with much profit.

Sugar cane has been cultivated since 1523 and takes rank as the most important product. The sugar plantations are operated on large holdings, usually several thousand acres, and they are equipped with private railways, plants to manufacture sugar, and numerous buildings for the occupancy of the laborers. Tobacco takes rank next to sugar as an important crop, and it has been cultivated with considerable success since 1580. The provinces of Havana and Santa Clara are the chief centers of the tobacco fields. Maize is cultivated in all parts of the island and rice is grown extensively, but the latter does

not yield sufficient for domestic consumption. Wheat and oats are not cultivated extensively, but vegetables, especially sweet potatoes, are grown in all parts of the island. Cocoanuts, lemons, limes, mangoes, guavas, figs, oranges, and pineapples are cultivated abundantly. Cattle, horses, swine, sheep, and poultry yield large returns.

**MANUFACTURES.** Sugar and tobacco products are the principal manufactures. The former consists chiefly of raw sugar and is made on the plantations largely as an adjunct of agriculture. Havana is important as a manufacturing center of cigars and smoking tobacco, large quantities of which are exported. Other manufactures include clothing, rum, flour, cordage, fabrics, and earthenware.

**COMMERCE AND TRANSPORTATION.** Havana, the principal seaport, is the focus of many routes in steamship navigation and is touched by numerous transatlantic routes. Cienfuegos and Santiago de Cuba, both on the southern coast, are the centers of a growing foreign and interior trade. The exports somewhat exceed the imports, and most of the foreign trade is with the United States, Great Britain, and Germany in the order named. Railroad construction has advanced rapidly within the last two decades. Lines traverse the island from Pinar del Rio in the west to Santiago de Cuba in the east, connecting all the more important cities. The lines aggregate a total of 1,500 miles, though some are in a poor condition, and about 4,500 miles of telegraph lines are in operation. Comparatively little has been done in constructing wagon roads, which are in a poor state of development.

**EDUCATION.** The constitution provides for free and compulsory attendance upon primary schools, which are maintained by the provinces and municipalities, but the central government may bear the expense in localities where the people are unable to make ample provisions for instruction. Secondary and higher education is under control of the state and culminates in a university at Havana. A large number of teachers from Cuba received normal training in the United States after the organization of the republic, and since then considerable progress has been made in public instruction. Many private and parochial schools are maintained, owing to the fact that the inhabitants are largely Roman Catholics.

**INHABITANTS.** The province of Havana is densely populated, having 187 persons to the square mile. About seventy per cent. of the people are white, and the remainder are negroes, mixed elements, and Chinese. Nearly half engage in agriculture, about one-fifth in domestic



service, and one-seventh in mechanical and manufacturing pursuits. Havana, the capital, is the largest city and most important commercial center of the West Indies. Santiago de Cuba, Cienfuegos, Matanzas, Pinar del Rio, Cárdenas, and Puerto Príncipe are among the leading cities. The last two censuses were taken under the direction of the United States, in 1899 and in 1907, from which the following table has been prepared:

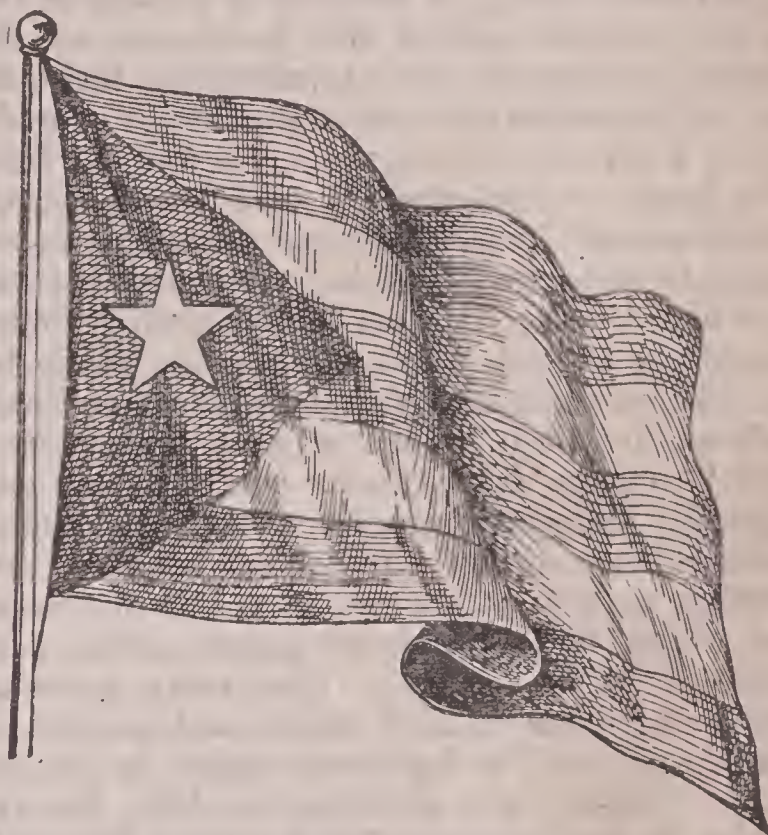
PROVINCES.	POPULATION, 1899.	POPULATION, 1907.
Havana.....	424,804	518,524
Pinar del Rio.....	173,064	240,781
Matanzas.....	202,444	239,866
Santa Clara.....	356,536	457,897
Puerto Príncipe.....	88,234	117,432
Santiago de Cuba.....	327,715	453,782
Total.....	1,572,797	2,028,282

**GOVERNMENT.** Cuba is governed under a constitution adopted in 1901, by which the administration is vested in a president, who is elected by manhood suffrage for a term of four years and is limited to a service of not more than two consecutive terms. It is required that the president be a native Cuban or a naturalized citizen who served not less than ten years in the Cuban army during the wars for independence. The members of his cabinet, who are responsible to him for the administration of their offices, are appointed and removed at his pleasure. A congress of two departments, the senate and house of representatives, has full legislative power. The former is composed of twenty-four senators, that is, four from each province, elected by an electoral board of the provincial councilmen and electors, and hold office for a term of four years. Representation in the lower branch of congress is on a basis of one member for every 25,000 inhabitants, or a fraction of more than 12,500, and the term is for four years, one-half retiring every two years. Congress, which meets annually, has general control of the finances and foreign affairs, and has legislative power in matters concerning the republic. The chief judicial power is vested in a supreme court, members of which are appointed by the president subject to confirmation by the senate. Citizenship was extended to all Cuban and Spanish residents who were on the island Sept. 11, 1899, and to all foreigners who resided here since Jan. 1, 1899, and those not included in these classes may acquire citizenship by naturalization, which requires a residence of five years.

The six provinces of Cuba are Havana, Pinar del Rio, Santa Clara, Matanzas, Puerto Príncipe, and Santiago de Cuba. Each of these has

the power to legislate and administrate in regard to matters of local concern, but their laws and administration are subject to the constitution of the republic. Members of the provincial assemblies as well as the governors are elected by popular vote. Spanish is the official and spoken language, but it is mixed somewhat with native dialects.

**HISTORY.** Cuba was discovered by Columbus in 1492 while on his first voyage to America. It was first named Juana in honor of Prince John, son of Ferdinand and Isabella, and later received the name of Fernandina. Afterward its name was changed to Santiago in honor of the patron saint of Spain, and still later to Ave Maria in honor of the Virgin Mary. The name applied to it at present is the one by which the



FLAG OF CUBA.

natives knew it at the time of its discovery. The aboriginies were a peaceful, semisavage people, who lived in tranquillity and possessed some degree of development in rude industry and a primitive form of religion. Columbus revisited the island twice after its discovery, in 1494 and in 1502. Diego Columbus, son of Christopher, organized an expedition of 300 men under Diego Velasquez and founded the first permanent settlement in 1511. The first settlements in Santiago and Trinidad were formed in 1514, and the present city of Havana was founded in 1519. In the first quarter of the 19th century all the continental colonies controlled by Spain secured their independence, but Cuba and Porto Rico remained faithful to the mother country. Many of the Spaniards remaining loyal to the mother government left the con-



tinental possessions and took refuge in these islands, thereby enriching them with their skill, energy, and capital. The cultivation of sugar cane and tobacco was early developed, and, with the income of large capital and superior skill, made rapid progress, soon replenishing the coffers of Spain, which had been drained by continuous foreign wars.

The colony of Cuba was a seat of contention whenever Spain engaged in war with European countries. Havana was destroyed in 1534 and again in 1554 by the French. The Dutch captured it in 1624 and the English in 1762. Beginning in 1810, it was governed by a foreign captain general. Excessive taxation and other differences caused numerous dissensions, which led to a rebellion in 1836 and to insurrections in 1844 and 1848. A number of parties in the United States coveted the possession of the island, particularly the slave-holding interests, and offered to buy it with the intention of making it a permanent possession. In 1850-51 Narciso Lopez was assisted by adventurers, known as filibusters, from the United States, in an attempt to seize the island, but the expedition was expelled by the Cubans. The United States issued the Ostend Manifesto in 1854, which declared that the island would be seized if Spain refused to sell it. Soon after a strong party for liberation from Spain was formed, and Maximo Gomez conducted a war for Cuban independence during a period of ten years, beginning in 1868. It was terminated by the Elzanjon Treaty in 1878 with the acting captain general, Martinez Campos. The treaty provided for the early abolition of slavery and guaranteed certain personal and political rights to the Cubans. Slavery was abolished in 1886, but the policy of Spain remained as before in the interest of the mother country, rather than for the benefit of the colony.

Conditions rapidly formed that led to the Cuban revolution of 1895. The native patriots were aided by the Cuban exiles, the latter having their headquarters at New York. Secret preparations were carried forward with remarkable rapidity, arms and ammunition were smuggled into Cuba, and a formal declaration of war was made Feb. 24, 1895. The revolutionary forces were placed under the command of Maximo Gomez, who was supported with alacrity by the negroes and by the inhabitants of Porto Rico. The warfare carried on by the revolutionists partook of a guerrilla form, being mostly raids upon plantations and cities. Afterward the forces fell back into the mountain districts, where they were secure against Spanish troops, but came forward successively with surprises to the Spaniards.

Antonio Maceo landed in Cuba in the spring of 1895 and was hailed with much enthusiasm by the patriots. The total forces of the Spaniards numbered 200,000, while the insurgents had about 60,000. Gen. Valeriano Weyler, governor general, carried on the war with much cruelty, whereby needless loss of property and life was occasioned. The people of the United States manifested a decided feeling of friendliness toward the patriots, who were struggling for liberty as the early colonists had done in 1776. This occasioned a feeling of hatred on the part of the Spanish sympathizers against the United States, and culminated in the destruction of the United States battleship *Maine* then on a friendly visit to Havana, by a submarine mine, on Feb. 15, 1898, in which 262 men and officers lost their lives. A commission to investigate the conditions surrounding the destruction of the *Maine* was appointed by the President of the United States, and the report following the investigation intensified the feeling of hostility. War was formally declared on April 21.

The first decisive engagement of the Spanish-American War resulted in the destruction of the Asiatic fleet of Spain at Manila, in the Philippines, on May 1. On July 3 the strongest fleet of Spain was destroyed at Santiago by the Americans, Rear Admiral Schley commanding in action. Gen. Shafter laid siege to Santiago with the United States army and fought a decisive battle on July 1. Gen. Toral surrendered his army of 25,000 men to the Americans on July 17. The surrender of the remaining portion soon followed and the final treaty of peace was signed at Paris on Dec. 10, 1898. By its terms Spain ceded Porto Rico to the United States and relinquished all sovereignty over Cuba and the Philippine Islands. As a partial consideration to secure the relinquishment of the latter, the United States paid \$20,000,000. The treaty was ratified by the Senate on Feb. 6, 1899, by a vote of sixty-one yeas to twenty-nine nays, one vote more than the two-thirds majority requisite.

The first president, Tomas Estrada Palma, was elected in 1901, and the United States, having exercised supervisory functions in aiding to establish the government, withdrew formally on May 20, 1902. He was reelected to the presidency in 1905, and the following year his chief opponent raised an insurrection and tried to overthrow the government. The rebellion operated to destroy social order and render the national army powerless, hence the United States intervened. President Palma resigned and Charles E. Magoon (born in 1861) administered the affairs as military governor under the



direction of the United States. This condition continued until January, 1909, when José Miguel Gomez, a member of the Liberal party, was inaugurated as president. The new administration was authorized to issue bonds to the amount of \$15,000,000 annually for three years, the money to be devoted to internal improvements.

**CUBE**, in geometry, a solid body with six equal square faces. A body in which the volume is one cubic inch has six equal faces, each of which is one inch square. The volume of a cube is found by multiplying the length by the breadth and the product by the height; thus, 27 is the cube of 3, being equal to  $3 \times 3 \times 3$ . The number which is thus multiplied to make the cube is called the *cube root*. The problem of the duplication of the cube, or of constructing a cube of twice the volume of a given cube, is a famous mathematical problem which interested geometers in the time of Plato.

**CUBEBS** (kū'bēbs), the berries of a perennial plant of the pepper family, native to New Guinea and the West Indies. The berries are gathered before they ripen, and when dried are about the size of small peas and have a dark brown color. They yield a volatile oil, wax, resin, and cubebic, all of which are used in medicine, chiefly for the treatment of indigestion, chronic catarrh, and affections of the mucous membrane.

**CUCKOO** (kōōk'ōō), a widely distributed genus of birds which belong to the climbers. They are most abundant in Eurasia and Africa,



CUCKOO.

though a considerable number of species occur in America. The species of America are distinguished from others in that they hatch their own eggs, while those of the old world lay their eggs to be incubated in the nests of other birds. Their custom is to lay one egg in the nests of a number of birds, preferring the yel-

low-hammer, titlark, hedge sparrows, green linnets, and water wagtails. The young usually seek to monopolize the nests of their foster parents. It requires about five weeks to develop the bird sufficiently for fledging. The color of most species is ashy-gray, the belly is white, the tail is spotted, and the legs are light yellow. The African cuckoo attains a length of about fourteen inches. Its peculiar *coo-coo* cry heralds its return in the spring. The food consists of dragon flies, moths, caterpillars, and other insects. There seems to be a preponderance of males as compared with females in the ratio of about four to one. The species of the old world reach Central Europe in April from Northern Africa. The American species are about twelve inches long, and olive-green in color, and are found more or less widely distributed over the entire continent. In the spring they penetrate far into Canada, but move southward to winter in the warmer regions of the continent and in the West Indies.

**CUCUMBER** (kū'kūm-bēr), a genus of plants distinguished by their heart-shaped leaves, trailing stems, and conisexual male and female flowers in the axils of the leaf stalks. They are native to Egypt and the southern part of Asia, but were brought to Western Europe during the Crusades and to America shortly after its discovery. Several species form an important food product, both for use in the fresh state and for pickling purposes. The fruit product is valued only in an immature or green state, turning yellow and tough at maturity. The plant is attacked by the grub of several insects known generally as *cucumber beetles*, and both the young and the mature insects feed upon the leaves of the vine.

**CUCUMBER TREE**, a forest tree native to North America, so named from its fruit, which resembles a small cucumber. The tree grows to a height of from sixty to ninety feet, has a trunk about three to four feet in diameter, and the leaves are ovate and deciduous. The young leaf is downy and of a pale green color, but at maturity it is deep green and from seven to ten inches long. Owing to the lightness of the wood, it is used for making boats and troughs. The cucumber tree is confined to the warmer parts of the Temperate Zone and is found in the eastern section of the United States.

**CUENCA** (kwān'kà), a city of South America, in the Andean tablelands of eastern Ecuador, at a height of 8,650 feet above the level of the sea. It is the capital of the province of Azuay. Next to Quito, it is one of the most important cities, and has a cathedral and university, besides several other noted institutions.



It has a considerable trade in minerals and merchandise. The city has a number of modern improvements, including waterworks, a library, and several parks. Population, 1906, 44,484.

**CUFIC WRITING** (kū'fik), an ancient form of Arabic writing, so named from the town of Cufa, in the pashalic of Bagdad. It is supposed to have been introduced in Arabia about the sixth century, when it came into use in writing manuscripts, marking coins, and in placing inscriptions on monuments. Cufic characters were used in copying the earliest editions of the Koran and it continued to be the form of writing until about the tenth century, after which it was used more generally in marking coins and inscriptions.

**CUIRASSIER** (kwē-rās-sēr'), a soldier armed with a cuirass. This armor consists of a breast and back plate, lapping on the shoulders and buckled together beneath the arms. It has remained in use longer than any other form of defensive armor for the body and is still used in the heavy cavalry of some armies of Europe. The early cuirass employed by the Greeks was of linen, while the Romans made this armor of flexible bands of steel. Several regiments of cuirassiers were organized by Napoleon and maintained for effective service. A body of French cuirassiers swept across the plain to embarrass the British army in the first Battle of Waterloo. Cavalry equipped in this way is maintained by most European powers as an essential part of their armies.

**CULLODEN MOOR** (kūl-lōd'ēn mōōr), a Scottish heath five miles east of Inverness, celebrated for the decisive battle fought on April 27, 1746, between Prince Charles Stuart and the Duke of Cumberland. It was the last battle fought on Scottish soil, and ended all attempts of the Stuarts to recover the throne of England. Prince Charles was the pretender and was supported by a small army of Highlanders, who were in an unfit condition for battle, owing to exertion in marching, and soon fled before the disciplined troops and artillery of the Duke of Cumberland.

**CUMAE** (kū'mē), a Greek city of ancient Italy, in Campania, ten miles west of Naples. It was situated on the Mediterranean, founded by colonists from Chalcis in Euboea and Cymae in Asia Minor, and was noted for its extensive commerce. Citizens of Cumae built a number of port towns, including Naples and Messina. It was the most important city in the southern part of Italy for 200 years, between 700 and 500 B. C. It was attacked by the Etruscans, who came in contact with it as a maritime power, and it was conquered by the Samnites in 417

B. C. Hannibal failed to capture it in the Second Punic War and it held out as the last stronghold of the Goths in Italy, but was taken in 552 A. D., by the Byzantine army. The Saracens burned it in the ninth century and it was totally destroyed by the people of Naples in 1205.

**CUMANÁ** (kōō-mā-nā'), a city of Venezuela, in the state of Bermudez, on the Gulf of Cariaco. It is located near the mouth of the Manzanares River, in a hot and unhealthful climate, but has a large export trade in sugar, hides, coffee, and tobacco. The chief buildings include a college, a cathedral, and a number of government buildings. It was founded in 1520 and is thought to be the oldest city in America. Near it are several suburban towns, including San Francisco and Serritos. Population, 1906, 15,350.

**CUMBERLAND** (kūm'bēr-land), a city in Maryland, county seat of Allegany County, on the Potomac River and on the Pennsylvania, the Baltimore and Ohio, and other railroads. The chief buildings include the courthouse, the public library, an academy, and the high school. Gas and electric lighting, street railways, waterworks, and pavements are among the improvements. The surrounding country is rich in fertile soil and valuable deposits of bituminous coal. Among the manufactures are flour, ironware, carriages, clothing, cigars, machinery, cement, glass, and tin plate. It ranks second in size of the cities of the State. Cumberland was platted in 1785 and incorporated in 1815. The Chesapeake and Ohio Canal contributed to its early growth. Population, 1910, 21,839.

**CUMBERLAND MOUNTAINS**, a ridge of the Appalachian system, which forms a part of the boundary between Kentucky and Virginia and passes into Tennessee and Alabama. Its highest peaks rise about 2,800 feet above sea level. It is about fifty miles wide, well covered with maple, oak, hickory, chestnut, white ash, and pine timber, and is penetrated by numerous fertile valleys. Its mineral wealth consists of extensive coal, limestone, granite, and sandstone deposits.

**CUMBERLAND RIVER**, a tributary of the Ohio, rising in Kentucky. Its source is in the Cumberland Mountains, whence it flows toward the southwest into Tennessee, returns to Kentucky, and courses north until its waters unite with the Ohio. The total length is about 650 miles, of which 200 are navigable for steamboats in favorable seasons. A fall of sixty feet is near Williamsburg.

**CUMBERLAND ROAD**, a highway built by the United States government from Fort Cumberland, Md., to Vandalia, Ill., a distance of



800 miles. Congress authorized the President to appoint three commissioners to lay out the road and appropriated \$30,000 to cover the expenses. Work was begun soon after and the road was completed in 1838. The total sum appropriated was \$6,821,246. It was known as the Great National Pike and was controlled by the government until 1856, when the control was given to the various states in which the different portions were located. This highway was important as an avenue for emigrants from the Eastern states to the West.

**CUNEIFORM** (kū-nē'ī-fōrm), the name applied to various inscriptions that were made by the peoples of remote antiquity. The name is taken from the wedge-shaped characters that prevail largely. It is sometimes referred to as arrow-headed writing, from the resemblance that numerous strokes bear to the head of an arrow. Each of the hieroglyphic characters of the most ancient forms represents an idea or object, like the written characters of the Chinese, but they were corrupted later into forms found on the monuments of Babylon and Assyria. The early Accadians of Chaldaea, who spoke a language allied to the Turkish, invented the system and from them it was borrowed and modified by the Babylonians and Assyrians, who belonged to the Semitic races and spoke a language entirely different. Later it was used by the Persians and other races of Western Asia in a still greater modified state. The oldest form consists of about 700 characters; the remains of antiquity indicating that they were made in a period about 3,000 years B. C. The Accadian language ceased to be spoken about 1700 B. C., but it was employed in these writings for a longer period of time. Subsequent modifications made the characters partake more of the form of an alphabet, thus decreasing them in number but extending the meaning. Since the Persian cuneiform writings are among the latest, they contain about sixty characters, all having divers significations, but as a whole are greatly inferior in scope to the system of the highly cultured originators.

Cuneiform characters were regarded meaningless for centuries. By some they were thought to be the production of corrosive elements, others regarded them as ornaments, while still others looked upon them as records of hidden treasures. Karsten Niebuhr (1733-1815), a German historian and traveler, was one of the first to decipher them and give to them the vast value which they possess in preserving historic records of antiquity. He was followed by others, among them Rask, Grotefend, Lassen, and Rawlinson, by whose labors means of

translation were slowly discovered and perfected.

The cuneiform inscriptions of Babylon and Assyria are particularly of value in that they throw light upon the discoveries, achievements, and governments of ancient peoples. Many of the inscriptions are devoted to a history of the reigns and wars of the kings. The Persian are of special interest since they throw light upon the reign of Darius and other Persian sovereigns. For the purpose of study cuneiform inscriptions are divided into four classes, according to the period in which they appear to have been made, the *Archaic*, *Hieratic*, *Assyrian*, and *Later Babylonian*. The most celebrated inscriptions are found at Behistun, where large portions of the history of Darius and his ancestors are cut upon the face of a rock 1,700 feet high. As a rule the inscriptions are found on objects made of stone, glass, bronze, clay, and iron. In the museums of Berlin, London, and other cities many excellent specimens may be seen.

**CUPID** (kū'pīd), in mythology, the god of love, known to the Greeks by the name of Eros. He is described as a beautiful naked boy, armed with a bow and a full quiver of arrows, with which he kindles a desire for love in the human heart. Sometimes he is represented with a covering over his eyes, indicating that love may be blind. The darts sent from his bow are capable of piercing the birds of the air, the fishes of sea, and even the Olympian gods. He is represented as the son of Mercury and Venus.

**CUPOLA** (kū'pō-lā). See **Dome**.

**CURAÇOA** (kōō-rā-sō'), an island in the Caribbean Sea, about forty-five miles north of Venezuela. It is forty miles long, eight miles wide, and has an area of 210 square miles. The principal harbor is Santa Anna and Willemstad is the local seat of government. The climate is hot and dry, while the surface is quite hilly and partly barren. Salt, sugar, tobacco, maize, and cochineal are the principal products. This island and Saba, Bonaire, Aruba, Saint Eustache, and a portion of Saint Martin constitute the colony of Holland known as Curaçoa. The entire area is 403 square miles. The government is administered by the Netherlands through a resident governor appointed by the sovereign. These islands were discovered by the Spaniards in 1527, taken by Holland in 1634, and conquered by England in 1798 and again in 1806, but were restored to Holland in 1814. The school system and commercial interests have been developed under Dutch control. A kind of bitter orange growing in these islands, known as Curaçoa, is exported to Holland, where it is used in the manufacture of Curaçoa



liquor. Population, 1905, of the island, 31,090; of the colony, 53,466.

**CURARE** (kû-râ'rê), a poison used by the Indians of South America for poisoning their arrows, made chiefly from the juices of several plants. The principal ingredient is obtained from a tree which yields *nux vomica*, and to this product are added the scrapings obtained from the bark of several plants. Water is added to the component parts and boiled to form a consistence much like syrup. Death results from the poison when it is introduced into the blood, where it acts on and paralyzes the motor nerves, causing paralysis.

**CURASSOW** (kû-rās'sô), a large bird native to Mexico and South America, related to the partridges. The bill is strong, surmounted by a cere at the base, the wings are rounded, and in size these birds are similar to the turkey. Several species have been described, of which the *helmeted curassow* is the most noteworthy. It has a bony excrescence on the top of the head, which is bluish in color, and is somewhat larger in the males than in the females. The plumage is glossy black with a greenish hue on the breast. The flesh is eaten and resembles that of the turkey. This bird is reared in Guiana and has been domesticated in continental Europe.

**CURFEW** (kûr'fû), a signal given to the inhabitants of a town that the time to extinguish fire and lights and to retire has arrived. The usual time for ringing a curfew bell or signal is eight o'clock in the evening. The custom was introduced into England by William the Conqueror, and severe penalties were provided for those neglecting to comply with the requirements. In some countries a bell is rung in a similar manner for the purpose of indicating the time for evening prayer.

**CURLEW** (kûr'lû), a genus of birds of the same family as the woodcock and snipe and classed with the waders. The different species are widely distributed in most parts of the world. They inhabit marshy and wet regions. Most species have a bright ash color on the head and breast, with spots of red and white on the back and beneath. The bill is long and well adapted to catching animals under water, such as mollusks, fish, insects, slugs, and earthworms. The greenish eggs are deposited in a nest made of dry leaves, usually in rushes. A number of species are prized as food and several in America have migratory habits.

**CURLING**, a game played with smooth stones, which are shaped somewhat like a tea-kettle, weighing from 30 to 45 pounds. A handle of iron or wood at the top enables the

player to grasp it with a firm hold. Two games are usually played, known as the rink play and as playing for points. The *rink game* is played on ice, upon which a rink about ten yards wide and forty-two yards long is platted. The player endeavors to throw the curling stone as near the mark as possible, as well as to strike off that of his antagonist, in case the latter has thrown first. Two stones are thrown alternately from each end of the course or rink. In the game of



CURLEW.

*playing for points* there are no sides, but each player throws with the view of scoring for himself. Curling is a Scottish game and is played wherever settlements of Scotchmen are found. Match games played in a series are called *bonspiels*. Several national and international bonspiels are promoted in Canada and the United States. Interesting contests have been held between the champions of the two countries at Ottawa, Montreal, Winnipeg, Minneapolis, Chicago, Duluth, and other cities.

**CURRANT** (kûr'rânt), the name of a fruit-bearing shrub cultivated in orchards and gardens for its fruit. It is grown most extensively in the Temperate zones. The different species are hardy shrubs, bearing abundantly under cultivation, and their fruit is valuable for food. It is eaten raw as a dessert and is used in cookery for jelly, preserves, and pies. In some localities it is grown for making vinegar and currant wines. Among the species cultivated largely in America and Europe are the red and white, the latter being a cultivated species of the red. The black currant yields abundantly in the colder regions and in the higher altitudes.



Most species of currants ripen in May and June and are improved by training the shrubs against walls. The fruit grows in clustered bunches. The dried currants of market are made from the fruit of a small grape first cultivated on the Isthmus of Corinth, hence its name, but it has been naturalized in various climates. The fruit of this grape is small and is produced abundantly on the vines of the plants. Currant plants are greatly injured in the season when the fruit develops by the larvae of two sawflies. They are commonly called *currant worms*.

**CURRENCY REFORM** (kŭr'rĕn-sŷ), the policy advocated by a number of political parties in the United States since the early organization of the government as a means to reform the monetary system. It was the leading issue and reached its height of interest in the presidential campaign of 1896. The currency of the United States consists of gold, silver, nickel, copper, and paper money. Gold and silver were recognized as standard money of final redemption in the United States under various laws from the early organization of the government until in 1873, when the use of silver was partly limited by acts of legislation. Partially restored to its former position in 1878, it continued to be used as money with much of its monetary functions recognized until in 1900, when the single gold standard was given the validity of law by Congress. The theory of *bimetallism* and the issuance and control of paper currency by the government were advocated by the Democratic party, while the Republican party advocated a *single gold standard* and the enlargement of the functions of national banks. Partisans on both sides advocated their positions in Congressional and State elections and in Congress, which finally developed a line of national legislation relative to the issuance and control of the currency.

The position of the Democrats was supported by Senator Chandler of New Hampshire and other Republicans, while several Democrats supported the Republican position. The Democrats favored the continuance and use of both gold and silver as standard money. They demanded that the two metals should be coined into money of equal exchangeable value, the equality to be secured and maintained through international agreement, or otherwise, thus maintaining the parity in value of the coins of both metals. It committed the government to the establishment and maintenance of such a system of bimetallism as would insure parity at all times. They also held that the paper currency should be issued and controlled di-

rectly by the government, instead of through national banks, and favored the eventual payment of the national debt in coin. The position taken by the Republicans in Congress was favorable to the single gold standard and a modification of the national banking system. That party, having a majority in both houses and the administration, enacted a law favorable to this position. It passed the Senate on March 6, 1900, and the House on March 13, becoming a law on March 14 by the signature of the President.

The law as passed contains ten sections. Among them are the following principal provisions: That the gold dollar of 25.8 grains, nine-tenths fine, shall be the standard unit of value, that all forms of United States money shall be maintained at parity with it, and that all treasury notes and greenbacks shall be redeemable in gold. The sum of \$150,000,000 in gold is to be set apart by the treasurer for the redemption of these notes; he is to maintain this fund at not less than \$100,000,000, and is empowered to issue United States bonds bearing interest at not over three per cent. The treasurer shall retire and cancel treasury notes equal in amount to the standard silver dollars that may be coined, and issue silver certificates against the silver so coined. Gold certificates shall be issued against the gold held in the treasury under certain provisions. The highest denomination of silver certificates shall be ten dollars, and the lowest denomination of the United States notes and treasury notes shall be ten dollars. The Secretary of the Treasury is authorized to refund the United States bonded debt in 33-year bonds bearing interest at two per cent., principal and interest payable in gold. Any national bank shall be permitted to issue circulation notes of the face value of the bonds deposited by such bank as security in the United States treasury. See **Money**.

**CURRENTS**, the movements of oceanic waters with considerable regularity from and to the polar and equatorial regions. They resemble streams or rivers, but are much broader, deeper, and longer. Their temperature is either higher or lower than the waters through which they flow. They are formed on the surface and at great depths, the upper currents usually passing from the equator and the lower currents in an opposite direction. Currents are caused partly through the agency of evaporation, but principally by the variation in the density of the waters, owing to a difference between the temperature of the regions of the equator and those near the poles. The equatorial waters, becom-



ing lighter on account of the warm temperature, rise to the surface and flow both north and south, their place being taken by the denser, colder waters flowing in from the polar regions. In this way a constant interchange of the waters is effected between the equatorial and polar regions, which takes place mostly along the bottom from the poles to the equator and along the surface from the equator to the poles. Owing to a low temperature in frozen seas near the poles, the interchange is larger between the equator and the polar circles. These currents would flow due north and south, if the earth had no rotation on its axis. They are deflected from a direct course between the equator and the polar regions on account of the earth's rotation, the position of the land masses, the winds, and differences in the density and level of the sea caused by evaporation.

The currents of the ocean are of utility in commercial and agricultural enterprises. By means of them the climate of the countries located in high latitudes is modified materially by the warm equatorial currents, while the warmer climates in the tropical regions are pleasantly modified by currents from the polar regions. The speed of vessels has been materially increased in certain directions by entering into their paths. Both the Pacific and Atlantic oceans have great equatorial and polar currents, their courses extending between the equatorial and polar circles. In the Indian Ocean the movements are largely restricted to currents which flow southward, owing to there being no outlet toward the north. The Sargasso Sea is in the North Atlantic Ocean. It is a vast expanse of ocean in which seaweeds float upon the surface, owing to the water being undisturbed by extensive movements. The best examples of currents are the Kuro Sivo, or Japan Current, in the North Pacific, and the Gulf Stream, in the North Atlantic.

**CURVE**, in geometry, a line which continually changes its direction, or a line no part of which is straight. The circumference of a circle is the simplest of all curves. It is defined as a curve, each point of which is equally distant from the center, or one in which each part of the line is equally curved. The measure of curvature is based upon the circle. The circle which would exactly fit any curve at any point is called the circle of curvature at that point, and its radius is designated the radius of curvature. Curves, in modern geometry, are classified according to the degree of equation by which they are represented. Thus, a straight line is represented by an equation of the first degree and a curve by one of a higher degree.

**CUSCUS**, an animal of the phalanger family, native to New Guinea, the northern part of Australia, and the Solomon Islands. It is stoutly built, has a prehensile tail, and is covered with a woolly fur. Several species have been described, including the gray cuscus and the spotted cuscus. These animals are marsupials and are hunted for their flesh and fur by the natives. The spotted cuscus is about three feet long and has a yellowish-white color marked with spots of dark brown.

**CUSTOMS DUTIES**, the taxes levied on imports and exports of commodities. Duties on exports are forbidden by the Constitution of the United States, owing largely to the disadvantage at which the country would be placed by the competition of general commerce, if consumers in foreign countries were required to pay duties to secure American products. The import duties are paid by the importers for the benefit of the government. Customs duties were levied by Greece and Rome. The Venetian government and others supported customhouses during mediaeval ages. The Tariff Union, or *Zollverein*, as it was called, was maintained by the North German States from 1818 until they united and formed the German Empire after the War of 1870-71. The first customhouse was established in London in 1304. Legislation establishing the more modern customs of Great Britain dates from the conflict between the Parliament and the crown in relation to the right of taxation. The term *custom* was derived from the claim made by the crown that it had acquired rights in certain import and export duties by the right of custom. Beginning with 1846, the legislation of Britain has been largely in the interest of free trade, and duties are now levied only on a few articles.

The customs of Canada are collected under the Customs Act of 1907. It provides for three classes of duties known as the British Preferential Tariff, the Intermediate Tax, and the General Tariff. The *British Preferential Tariff* applies to goods as manufactures imported from any British country. On the other hand, the *Intermediate Tariff* applies to imports from any British or other country to which its benefits have been extended, hence is based upon the principle of reciprocity. The *General Tariff* applies to all goods that may not be admitted under either of the other two classes. A *surtax* is levied on imports from the countries which treat imports from Canada less favorably than those from other countries. The customs collected in 1907 amounted to \$53,006,546, which is about the annual average.

Alexander Hamilton, who became the first



Secretary of the Treasury of the United States, adopted the English system of customs with scarcely any modifications. In 1799 the earliest customhouse was established in New York City. The net revenues at first were barely sufficient to pay the officers and clerks employed in its management. At present there are about 160 customhouses in the United States. The ten most important are located at New York, Boston, Philadelphia, San Francisco, Chicago, Baltimore, New Orleans, Saint Louis, Detroit, and Tampa. The receipts at New York aggregate about as much annually as those of all others combined. In 1907 the total net receipts were \$311,985,647. The fiscal year begins on July 1, according to an act of Congress in 1842, hence the decade from 1841 to 1850 embraces only nine and a half years. Following are the total receipts by decades of the government through the customhouses since the organization of the system:

From 1791 to 1800.....	\$	50,321,485.87
“ 1801 to 1810.....		129,540,517.63
“ 1811 to 1820.....		163,804,167.09
“ 1821 to 1830.....		198,523,207.69
“ 1831 to 1840.....		204,703,913.92
“ 1841 to 1850.....		243,666,681.78
“ 1851 to 1860.....		544,980,470.30
“ 1861 to 1870.....		1,239,458,442.34
“ 1871 to 1880.....		1,663,973,043.74
“ 1881 to 1890.....		1,992,600,748.76
“ 1891 to 1900.....		2,195,396,503.80
“ 1901 to 1905.....		1,300,844,840.00
Total.....	\$	9,927,814,022.92

**CUTLERY** (küt'lēr-ȳ), the general name of sharp-cutting and many-pointed instruments, made chiefly of iron, steel, and cast steel. The first cutting instruments that may be classed as cutlery were made of flint and shells, and these were superseded by those in which bronze was used for the cutting blade. At present steel is employed almost exclusively, though the quality differs materially. The best grade of cast steel is used in making the better class of razors, scissors, penknives, and lancets. Knives and forks employed for table use are manufactured largely of shear steel. Cutlery of all kinds is made chiefly by a forging process, either hand or machine forging, the former being employed for small pieces and the latter for the larger articles. After forging, the piece is made true by filing, after which it is tempered, ground, and polished. Heavy cutting instruments, such as axes, are usually made of two kinds of steel, the cutting edge of the finest quality and the thick part of a soft, cheap, grade of steel.

**CUTTER** (küt'tēr), a small vessel with one mast and fitted with fore and aft sails. Most cutters are built with special reference to speed. They differ from the sloop in having no stay to support the jib and are used by yachtsmen

and for revenue cruisers. Large vessels usually carry four or more boats, known as cutters, as a part of the equipment. This class is fitted either for rowing or sailing.

**CUTTLEFISH** (küt't'l-fish), a genus of fish which includes the squid, octopus, nautilus, sepia, and other species of marine animals. They bear the scientific name *Cephalopoda*. The body of the cuttlefish is oblong and depressed, sacklike in form, and provided with two narrow lateral fins extending to the anterior part of the body. It has ten arms, each containing four rows of suckers. An internal shell is lodged in a sack, which is somewhat oval, light, and porous. The eyes are very large, and the long tentacles, furnished with suckers on one side at the extremity, serve as food catchers. When not in use, they are carried in pockets beneath the eyes, and may be thrown out with considerable force and skill in seizing the prey. The skin is whitish in color, dotted with spots of red, and the length of the fish is from eight inches to three feet.

The cuttlefish is provided with a bag containing a deep brown fluid that is thrown out to darken the water in cases of danger. By means of it the animal is able to make an easy escape. On account of this and its great activity, much difficulty is found in catching the animal. In early times this fluid was used in making India ink, but it has been superseded by the product made from lampblack and other substances. From the blade-shaped cuttlebone are made tooth powder, pounce, molds for small silver castings, polishing powder, and other useful products. It yields medicine useful for stomach and other complaints.

Cuttlefish are found in almost every portion of the sea. They habitate the bottom of the ocean and coast indentations, confining themselves along the shore and in moderately deep water. Their movements are largely by means of two fins through which streams of water are squirted in such a manner as to assist in propulsion. When in search of food, they watch the prey in a motionless position, but when within easy reach dart their tentacles forward with great rapidity and secure the victims. By a process of withdrawing air from the limbs, they are fastened with a viselike rigor to the victim and escape is rendered impossible. Fishermen have found cuttlefish harmful in devouring fish when caught in their nets. Some of the ancients regarded the flesh of the cuttlefish valuable for food. See **Octopus**.

**CUZCO** (kōōs'kō), a city of Peru, capital of a department of the same name. It is located in a broad valley between the headwaters of the



Urubamba and Apurimac rivers, about 11,250 feet above sea level. Railroad connections with the coast and Lake Titicaca make it an important seat of commerce and local industry. The manufactures include cotton and woolen goods, soap, sugar, leather, clothing, machinery, and furniture. It is the seat of a cathedral and a university. Many of the streets are paved with stone and macadam. The public utilities include a public park, electric lighting, waterworks, and a public library. Among the ancient Peruvian cities it held high rank. The Incas emperors occupied it as their capital for many years and beautified it by fortresses and massive architecture, specimens of which still remain. Pizarro conquered it in 1534. Population, 1906, 31,226.

**CYAMETER**, an instrument for measuring the intensity of the tint of the atmosphere. It was invented by Saussure and consists of a disk divided into sections, each of which is tinted, ranging from white to a deep blue. It is held by the observer in such a position that the color of the sky may be compared with the tints of the instrument, and as the disk is turned it is possible to find a color that corresponds with the blueness of the sky.

**CYCLADES** (sīk'lä-dēz), the southern group of islands in the Aegean Sea, belonging to Greece, so named because they encircle the sacred isle of Delos. They are mountainous and of volcanic origin, but contain fertile soil. Among the largest islands are Myconus, Andros, Tenos, Paros, Melos, and Naxos. The productions include silk, wine, cereals, live stock, olive oil, and fruits.

**CYCLAMEN** (sīk'lä-mēn), a class of plants belonging to the primrose family, native to many parts of Europe and Asia. Two species are cultivated for their flowers in greenhouses. The hardier variety is native to the southern part of Europe and is admired for its flowers, which are either white or rose-colored. The



CYCLAMEN.

flower has the appearance of being turned inside out, owing to the petals being strongly reflexed.

**CYCLE** (sī'k'l), a period of years or time in which particular phenomena or a succession of events take place, beginning again at the end of the cycle to pass through the same course. The cycle of the sun covers a period of twenty-eight years; that is, the days of the month return to the same days of the week. In the calendar the return to their former place is marked by the dominical or Sunday letters. The cycle of the moon includes a period of nineteen years, after the lapse of which time a new and full moon occurs on the same days of the month. From its discoverer, Meton, the latter is sometimes called the Metonic Cycle and the Golden Number.

**CYCLING** (sī'klīng), an art developed by the perfection and general use of bicycles. In many centers of population associations are maintained for the purpose of developing the art. It is their aim to promote interest with the view of establishing bicycle riding as a game and for the development of grace and skill in its use. Among the most celebrated organizations founded are the League of American Wheelmen and the National Cycling Association. The best records made by professional riders as to time include the following: One-half mile, 40 seconds; one mile, 57; two miles, 2:30; three miles, 3:52; four miles, 5:21; and five miles, 6:45. When the bicycle first came into use, wheeling was a fad, but now it is employed more specially for business purposes and scientific sports.

**CYCLOMETER** (sī-klōm'ē-tēr), an instrument used to record the revolutions of certain parts of machinery, such as the wheel of a carriage or bicycle. It is commonly attached near the wheel of an automobile, in such a position that a cam on the spoke will act upon a projecting part at every revolution, causing the clockwork within the cyclometer to move. The circumference of the wheel being known, it is possible to estimate the distance traveled by computing the revolutions recorded in the instrument. In most forms the mechanism is so arranged that the register will show every five, ten, and one hundred miles, as the case may be, when the instrument will begin anew in registering in these denominations.

**CYCLONE** (sī'klōn), the name applied to storms that have a circular or rotary movement. The diameter varies from a small extent to 500 miles, the rotary motion being rapidly round a center and the advance movement often reaching forty miles an hour. Cyclones are



caused by the rays of the sun falling within the tropics and heating the air so it rapidly ascends, thereby causing colder currents to rush beneath and take its place. The revolving motion is produced partly by the rotation of the earth, but more directly by the rapid inflow of the lower currents of air as the lighter currents ascend. No cyclones are experienced directly under the Equator. Those south of the Equator revolve in a direction the same as that of the hands of a watch, while those north of the Equator revolve in a diametrically opposite direction. Cyclones are most common to the western portions of the United States, the West Indies, the China Seas, and the seas surrounding the Mauritius Islands. The cyclones frequenting the West Indies originate mostly in the Caribbean Sea. This class of storms is extremely destructive, often tearing down forests, destroying cities, and causing great loss of life and property. Skillful navigators are able to escape them by sailing out of their course, or, if struck, they avoid serious damage by a careful and proper adjustment of the sails. The approach of cyclones is marked by a rapid fall of the barometer and is preceded by a singular calm. They are attended frequently by intense electrical disturbances.

**CYCLOPEAN** (sī-klō-pē'an), the name applied to a primitive style of architecture, which is fabled to be the work of the Cyclops. It consists of huge blocks of stone, unhewn and uncemented, and the corners are fitted accurately into one another. Other structures of this kind consist of regular blocks of equal height. Specimens are found in Asia Minor, Sicily, at Mycenae, in Greece, and other regions of the ancient peoples.

**CYDNUS** (sīd'nūs), a river of Asia Minor, in Cilicia, rises in the Taurus Mountains and flows into the Mediterranean Sea. Anciently it was navigable to Tarsus, about twelve miles, but its mouth is now obstructed by bars of sand. The Cydnus is celebrated as the meeting place of the fleets under Antony and Cleopatra in 41 B. C.

**CYLINDER** (sīl'in-dēr), a solid geometric form consisting of a long, round body, having two flat, circular surfaces which are equal and parallel. Any cylindrical portion of a machine is called a cylinder, especially if hollow and proportioned so the length somewhat exceeds the diameter, as the cylinder of a printing machine, the chamber in which the force of steam, or other power, is exerted on the piston, the barrel of a gun, etc. The axis of a cylinder is the straight line about which it revolves; the bases are the two opposite ends.

**CYMBALS** (sīm'bals), the name of plates of bronze, more or less basin-shaped, to which leather straps are fastened for holding by the hands in producing sounds in accord with music. They were used in very ancient times and are represented upon many monuments. In 1043 B. C. they were mentioned among other instruments in connection with the return of the ark of David. The Grecians used them in worshipping the goddess Cybele. Cymbals now made consist of twenty parts of tin and eighty of copper. The best are imported from China and Turkey. They are used mostly in military music and on the bass drum played in orchestras. One cymbal is fixed to the drum and the other is held in one hand by the player, while the drumsticks are held in the other hand. The best effect is secured by being struck together with a single sliding motion.

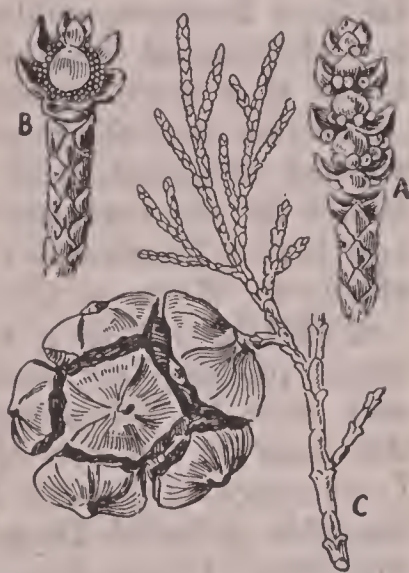
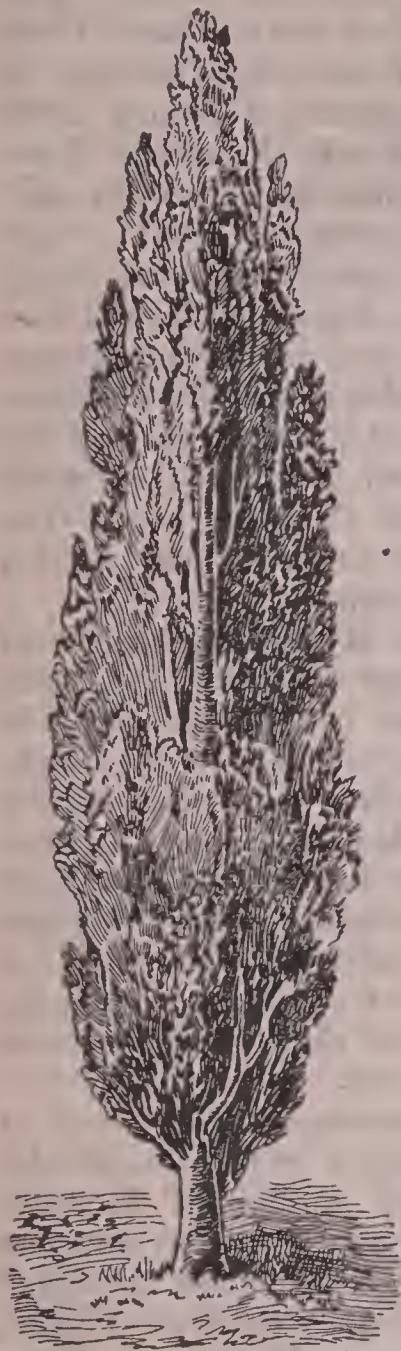
**CYMRI** (kīm'ri), or **Kymry**, a branch of the Celts of Britain. They succeeded the Gauls and drove them west into Ireland, into the Isle of Man, and toward the north into the Highlands of Scotland, while they themselves located in and occupied the southern portion of Britain. Later they were driven out of the Lowlands of Britain into the mountain regions of north-western England, and into the mountains of Wales by the invasion of the Saxons, Angles, and Jutes. Descendants of the Cymri are found chiefly in Wales at present.

**CYNICS** (sīn'iks), the name of a school of Greek philosophers, founded in the fourth century B. C. by Antisthenes, a pupil of Socrates. The seat of this school was in the gymnasium Cynosarges in Athens, and the most renowned disciples included Diogenes, Crates of Thebes, his wife Hipparchia, and Menippus. They taught that all speculative philosophy is detrimental to the real knowledge of truth, that it leads to sophistry and the destruction of human society, and that the true object of philosophy is to show how men might best live morally and peaceably. In this they harmonize with the Stoics, but differed from them in defining virtue to be the highest possible simplicity in living. Their devotion to the simple life was so great that they came to despise labor, decency, cleanliness, and the essential requirements of society. This caused them to become in disrepute. The name *Cynic* is still applied to one who disregards the proprieties of life, doubts the wisdom of protecting personal character or motives, or displays singularity in treating the social usages.

**CYPRESS** (sī'prēs), a genus of evergreen, cone-bearing trees or shrubs. The leaves are small and entirely cover the branches, while



the globe-shaped cones have woody scales that bear numerous seeds. The wood of most species is of a yellow or reddish color, very hard and durable, owing to its resinous constituents, and has a pleasant smell. It is not subject to destruction by insects, resists decay both in the dry and under water for many years, and is a favorite wood for cabinet work, owing to its beautiful color and property of being easily polished. It grows profusely in swamps and often attains a thickness of from ten to twelve feet at the ground. Some species have large spreading tops, while others assume a slender, cone-



CYPRESS.

*A*, male flower; *B*, female flower; *C*, fruit.

shaped form. In the United States there are large forests, especially in the south and on the Pacific slope, and some species are common to the far north of Canada and Alaska.

The name was derived from Kypros, the Greek name of the island of Cyprus, where the tree is found in great abundance. It is native to Persia, the Levant, and countries adjacent to the Mediterranean Sea. The Mohammedans planted it largely in burial grounds, which have taken on the form of immense forests. The Romans and Greeks cultivated it in their parks and gardens for ornamental and sanitary purposes. Cypress wood was used largely for coffins by the Greeks and for mummy chests by the Egyptians. The doors of Saint Peter's at Rome were originally made of it. Though subsequently replaced by brazen doors, they

answered the purpose for more than a thousand years. The cypress gates of Constantinople served their purpose for an equal length of time. Cypress wood is used largely at present for building purposes in Europe as well as in other portions of the old world.

**CYNTHIANA** (sĭn-thĭ-ă'nà), a city of Kentucky, county seat of Harrison County, thirty-three miles northeast of Lexington, on the Louisville and Nashville Railroad. It is finely located on the south fork of the Licking River, and is surrounded by a fertile farming region. The manufactures include machinery, cigars, and spirituous liquors. It has electric lights and other municipal facilities, several county buildings, and a number of churches and schools. In 1864 it was the scene of a battle between the Confederates under John Morgan and the Federals under General Burbridge, in which the former were defeated. Population, 1900, 3,258.

**CYPRUS** (sĭ'prŭs), an island in the eastern part of the Mediterranean, south of Asia Minor. It is sixty miles wide and 145 miles long. The area is 3,584 square miles. Two mountain ranges traverse its surface, one along the northeastern coast and the other in the southern part. Both ranges trend east and west. The southern chain is the most prominent, its highest point, Mount Troödos, having an altitude of 6,585 feet above sea level. Numerous bays and inlets indent the coast and furnish safe harbors. A number of small lakes occur in the eastern and southern parts. The Pedioes Potamos is the chief stream. Large areas of the surface are exceedingly fertile and productive. All parts of the island have a pleasant and healthful climate. The mountains are covered with forests of excellent timber and underlaid by rich mineral deposits. The chief minerals include copper and salt, which were produced in large quantities anciently, but are not worked extensively at present. Among the products are cotton, wheat, barley, tobacco, olives, raisins, carobs, and various vegetables. Silk culture is an important industry. The extensive pasture lands facilitate the rearing of large herds of sheep, goats, and cattle. The chief exports consist of raisins, cotton, wool, carobs, cheese, cocoons, and salt. The imports are exceeded greatly by the exports, thus adding annually to the wealth of the island.

The island is divided into the six districts of Kyrenia, Larnaca, Nicosia, Papho, Limasol, and Famagusta. The government is administered by a resident high commissioner with an executive council, and a legislative council of eighteen, of whom twelve are elected by popular vote. Nicosia, population 14,752, is the seat of



local government. Other towns include Larnaka, Limasol, and Famagusta. Under British rule a system of schools has been established, supported by public grants. A number of railway lines have been built, including one inland from Famagusta, where a harbor has been improved. A majority of the inhabitants are Greek Catholics and the remainder are mostly Moslems. Population, 1906, 238,312.

Cyprus was colonized by the Phoenicians and later fell successively into the hands of the Greeks, Egyptians, Persians, and Macedonians. It became a Roman province in 57 B. C., and was connected with the eastern division of the empire. The Cypriotes were visited by Saint Paul and were among the first gentile people to embrace Christianity. They were conquered by the Saracens after the decline of Rome began. Richard I. of England conquered them in the third Crusade to Jerusalem and restored the island in 1191 to Guy de Lusignan, but, after his line became extinct, it fell into the hands of the Venetians, in 1489. The Turks conquered it in 1571 and added it to the Ottoman Empire, but it was ceded to Great Britain in 1878 by the convention of Constantinople, with the provision that it should revert to Turkey when Batusm and Kars are restored by Russia. The island is rich in relics of ancient peoples. Among the remains discovered is the oldest copy of the Gospels and other early Christian writings of much value. Many of the remains may be seen in the museums of London, Berlin, and New York City.

**CYRENAICS** (sī-rē-nā'iks), a school of Greek philosophers, founded in 380 B. C. by Aristippus of Cyrenaica, a pupil of Socrates. It taught that pleasure is the highest object in life, that virtue consists in the art of producing the highest possible amount of agreeable feeling, and that all should live in moderate activity, but pains should be shunned. This school agreed with the Cynics in despising all speculative philosophy, but maintained a higher plane of morality and limited their practice to the amiable and moderate enjoyments of life. It was succeeded a century later by the philosophy of Epicurus, known as Epicureanism. The chief philosophers of the Cyrenaic school included Aristippus, the founder, his daughter Arete, his grandson Aristippus Metrodidactus, and Hegesias.

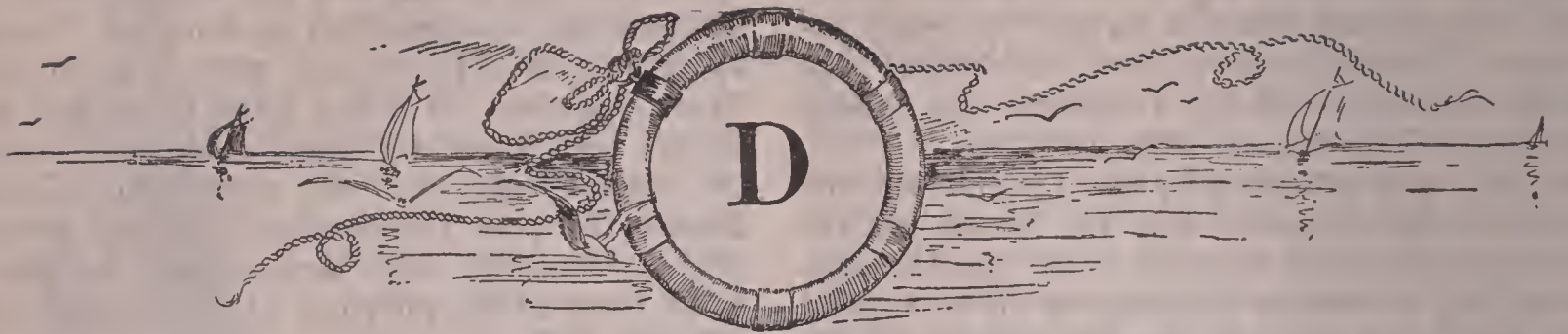
**CYRENE** (sī-rē'nē), an ancient city of Africa, the capital of Cyrenaica, located about ten miles from the Mediterranean. It was situated on an elevated tract of land about 1,800 feet above the sea, giving it a fine outlook over the surrounding country. A colony of Dorians founded it in 631 B. C. and made it a center of Greek learning. It had a large commerce with Greece and Egypt for many centuries. Among its famous men are the astronomer Eratosthenes, the poet Callimachus, and the philosophers Carneades and Aristippus. Grenna, a small town of the province of Barca, now occupies the site.

**CZAR** (zär), the title of the emperor of all the Russias, probably derived from the Roman title *Caesar*. Ivan IV., the Terrible, was crowned the first Czar of Russia in 1547. *Czarina* is a term used to designate the empress; *czarevitch*, the heir apparent; and *czarevna*, the wife of the heir apparent.

**CZECHS** (chěks), the branch of the great Slavonic family of races now having its chief seat in Bohemia. Nearly all of the Czech people, numbering altogether about 5,900,000, live in Austria. About half of these people are in Bohemia. They migrated from Carpathia, on the upper Vistula, about 451-495 A. D., and settled in Bohemia. The Czech language has an alphabet of forty-two characters. It is of great antiquity and is noted for its high culture. Its grammatical construction is complex. The language is highly inflectional, admitting of many inceptives, frequentatives, derivatives, and diminutives. As a musical language the Czech is classed next to the Italian.

**CZERNOWITZ** (chěr'nō-vīts), the capital of Bukowina, a crown land of Austria, on the Pruth River, about 136 miles southeast of Lemberg. It is the seat of a Greek Catholic cathedral, several synagogues, and a number of noted monuments. The university, founded in 1875, has sixty-two professors and lecturers, an excellent library, and is attended by 850 students. It has a public library of 60,500 volumes. The city is connected by railroads and has modern municipal facilities. Among the manufactures are carriages, clocks, silver plate, toys, cigars, implements, and machinery. It was occupied by the Austrians in 1774. A majority of the inhabitants are Germans. Population, 1906, 71,226.





D

DACIA

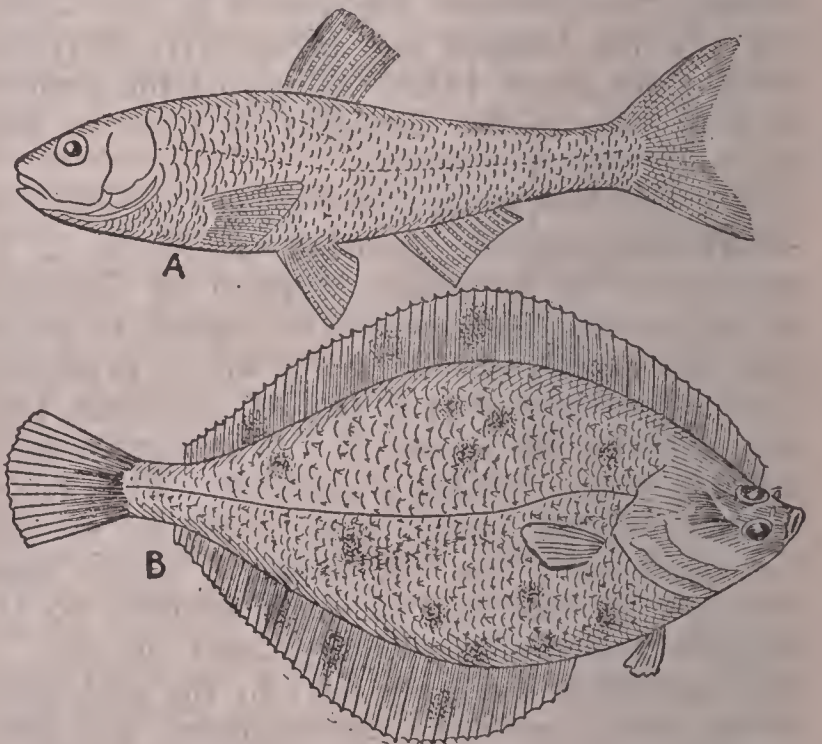
**D**, the third consonant and fourth letter of the alphabet. The name in the Greek is *delta*, which is a modification of the Semitic word *daleth*, meaning a door. It is interchangeable with *t* in some languages, since the two letters are similar in the mode of pronunciation. In English it is always sounded, though often but slightly, as in handkerchief. It represents a dental sound formed by passing vocalized breath into the mouth, after placing the tip of the tongue against the roots of the front teeth. In Roman numerals **D** represents 500 and is equal to 5,000 when a line is placed over it, as  $\bar{D}$ . As a symbol in music **D** is the second note of the natural scale of **C**.

**DAB**, a species of flatfish belonging to the same genus as the plaice and flounder. It is allied to the soles, turbot, and halibut. The length seldom exceeds twelve inches. The color is brown and yellow and it is characterized by a small mouth and eyes. It is common off the coasts of England and France. A similar fish, the *rusty dab*, is found on the coast of Nova Scotia and New England.

**DACCA** (*däk'ká*), a city of Bengal, capital of a district of the same name, on the Burhi Ganga, 150 miles northeast of Calcutta. The streets are narrow and angular and the older portion is not well improved. In the newer parts a number of fine buildings are maintained. Besides numerous schools, there are several colleges and mosques and places of worship belonging to the Greeks and Armenians. Railroad connections have been established with many commercial centers. Its navigation trade is large, especially in textiles and live stock, owing to its favorable location and safe harbor. It has numerous modern facilities, including tramways, electric lights, and telegraph and telephone lines. It became the seat of the Mohammedans in Bengal in 1610, and with a short intermission remained its capital until 1704.

Large manufactures of muslins were carried on in the city by the Dutch and French in the 18th century, when it had a population of about 200,000. Owing to civil disturbances and other causes, it declined for some time, but in recent years its prosperity has been revived. Population, 1906, 92,342.

**DACE** (*däs*), or **Dare**, a fish common to the streams of Europe and New England. The various species are fine anglers and favorites for table use. They are gregarious and swim in shoals. Their weight seldom exceeds a pound. The dace spawns in April and May. Artificial



A, Horned Dab; B, Brown Dace.

pearls are made of the scales of several species, especially of the roach. Several species, such as the chubs, are favorite fishes in the streams and lakes of the Rocky Mountains.

**DACIA** (*dä'shä-ä*), an ancient country of Europe, located between the Danube and the Carpathian Mountains. It was occupied by the Daci, a warlike people, and was annexed to



Rome by Emperor Trajan in 101 A. D., after a decisive battle near Torda. The Romans sent colonists into the country, constructed highways, and built a great bridge across the Danube. In 274, in the reign of Aurelian, the Romans relinquished Dacia and it was occupied by the Goths. At present the region is comprised in Moldavia, Transylvania, Wallachia, and the eastern part of Hungary.

**DAFFODIL** (dăf'fō-dīl), a group of plants of the genus *Narcissus*. Though native to Europe, many species have been widely acclimated and are grown in gardens in America. Most of the cultivated plants bear solitary flowers with a bell-shaped crown longer than the perianth tube. The flowers are mostly yellow and include both single and double forms.

**DAHLIA** (däl'yä), a genus of plants native to Mexico, named after the Swedish botanist Dahl. The plant has been greatly improved and its flowers variegated in color by cultivation. Specimens were first brought to Europe in 1784,



DAHLIAS.

but it is now known almost world-wide. The flowers are general favorites in gardens and parks, where the dahlia is cultivated as an ornamental plant. Some species have single flowers, but most of them are double, showy, and symmetrical. They are propagated by cuttings, seeds, and the roots, which are dug up in the fall and stored like potatoes in the cellar. The corolla of the dahlia yields a beautiful carmine.

**DAHOMY** (dä-hō'mä), a French colony in Africa, on the northern coast of the Gulf of Guinea, located between Nigeria and the German colony of Togoland. It has been the seat of some contention on account of conflicting

claims of France, Germany, and England. The area is about 60,000 square miles and it has a seacoast of seventy miles. It consists of two divisions, a native kingdom under the rule of a local African prince and a colony comprising the settlement of Benin on the coast, with a tract of country extending toward the interior.

The colony is governed by a local governor, who is assisted by a council. Two prominent residents, one of whom is native and one is white, are included with the higher officials. The capital is Abomey, near the port of Whydah, and it and Kotonu are the principal trading points, though considerable commerce is carried on at Grand Popo and at Porto Novo. The natives of Dahomey are Negroes, who are small of stature, but robust, and quite industrious. They engage in fetish worship. Their chief sacrifices are made to trees, snakes, thunder, and the sea. Agriculture, trading, hunting, and rude manufacture are their chief occupations.

The colony has a large area of fertile soil, is well watered by small streams, and is valuable for its coast line on the Gulf of Guinea. Large desert tracts extend throughout the northern part. The wild animals include lion, tiger, boa, hyena, elephant, and many species of reptiles and birds. Among the chief products are tobacco, cotton, indigo, sugar, palm oil, India rubber, millet, vegetables, and many varieties of fruits. The annual exports have steadily increased the past decade. The export of palm oil aggregates about 10,000 tons annually and of palm kernels about 20,000 tons.

Dahomey was organized into a native kingdom at the beginning of the 18th century, but reached its greatest strength under the reign of King Ghezo from 1818 to 1858. It was placed under the protectorate of Portugal in October, 1885, but fell to the French on account of local differences in 1892. A consistent development has been made under French influence. The slave trade has been abolished and the former custom of offering human sacrifices is almost extinguished. Population, 1908, 998,500.

**DAIRYING** (dä'rÿ-ing), the industry in which milk and butter are produced. This branch of agricultural industry has been greatly extended and radical changes in methods of work have been brought about. The improvements are notable not only in the United States and Canada, but in the dairying districts of Germany, Austria, Denmark, Holland, Belgium, and Sweden, where experimental stations and dairying schools are maintained for the investigation and study of rearing cattle and making butter and cheese. Denmark maintains about a



hundred high schools and a dozen agricultural institutes in which pupils learn dairying by practical work, and, as a result, the industry has been placed on a very high basis. About fifty institutions teach dairying and related productive arts in the United States, where the annual output of butter has a value of \$115,500,000 and cheese \$32,000,000. About 10,000 creameries and cheese factories are operated. The leading dairy schools of Canada are at Guelph and Toronto. Coöperation has been applied more successfully in dairying than in any other branch of industry. Many farmers have introduced coöperation in various places, uniting the milk products of the farms and sharing the results obtained at a central creamery. The effect has been that butter of a much higher quality is now obtained, the price of the product has been raised, and the quantity has been increased notably.

Much attention is given by agriculturists to the improvement of cattle for dairying purposes. As distinct butter producers the Jersey and Guernsey cattle have been found preferable, since their milk contains the best and largest quantity of butter fat and the flavor is of a high quality. The Holstein-Friesian cattle yield the largest quantity of milk, but their product is inferior in solid material, though they possess a high degree of beef-producing qualities. The Ayrshire cattle are midway between the Jersey and Guernsey on the one hand and the Holstein-Friesian on the other in the quality of milk produced, and have been found excellent for cross breeding with other stock on account of their rugged constitution. An average cow produces about 130 pounds of butter per year, while the higher grades of cattle produce from 300 to 350 pounds, but some individuals yield larger quantities.

The apparatus used in dairying has undergone marked improvements. The Babcock milk-tester, a centrifugal machine for separating cream in small tubes, formerly tested to about one-tenth of one per cent., but it has been so improved and modified that it is capable of testing to one-hundredth of one per cent. It is now used largely among dairymen for testing cattle by their milk product. Equally beneficial improvements have been made in machines for mechanical separation. There are now more than a dozen separators on the market, by which butter fat to within one-tenth of one per cent. can be extracted from the milk. Churns and machinery for working the butter have been improved correspondingly. Another improvement is in *Pasteurizing* cream, which is done by subjecting it to a temperature of 140° to

155° Fahr. Pasteurized cream contains forty to fifty per cent. of butter fat, is considered highly valuable for hygienic reasons, and retails for about forty cents per quart, thus rendering better profit than the butter.

The butter sold on the market is much better and more wholesome than that formerly produced. There are, of course, some exceptions, but as a rule it is much cleaner, more healthful, and pleasanter to the taste. Many of the improvements in manufacturing and in the quality of butter and cheese are due to legislation. The dairying enterprise as a whole has been benefited through the efforts of commissions, which have investigated the industry in foreign countries and utilized the more important discoveries in building up the enterprise in America. See **Creamery**.

**DAISY** (dā'zŷ), the common name of the well-known flowers and plants of the species *Bellis perennis*. It is widely distributed, being common to nearly all inhabited countries. The name was derived from its tendency to flower almost continually and means the *day's eye*. It was the emblem of fidelity in love in the age of chivalry. The common daisy of Europe has



DAISY.

Oxeye Daisy; Common Daisy.

been greatly improved and is the plant which is cultivated most extensively in gardens. It includes both single and double flowering species and nearly all shades of colors. The *Oxeye daisy* is a species of chrysanthemum.

**DAKOTA** (dā-kō'tā), a family of Indians native to the vast regions between the Mississippi and the Rocky Mountains. It includes among others the Winnebagoes, Sioux, Oma-



has, Iowas, Poncas, Kansas, Crows, Otoes, Missouris, Assiniboins, and Minnetarees. The Dakotas seem to have come eastward from the Pacific until they met the Algonquins. The language shows some similarity to the Mongolian, perhaps more than that of any other Indian language. The total number of Dakotas now aggregates about 60,000. Some writers use the name interchangeably with Sioux, since they consider the Siouan stock the predominating influence.

**DAKOTA RIVER.** See James River.

**DALLAS** (dāl'lās), a city of Texas, county seat of Dallas County, on the Trinity River, near the mouth of the West Fork. It is on the Missouri, Kansas and Texas, the Southern Pacific, the Texas and Pacific, the Texas and New Orleans, and other railroads. Lines of electric railways connect it with Fort Worth and other cities. The chief buildings include the county courthouse, the post office, the Carnegie Public Library, the Protestant Episcopal Cathedral of Saint Matthew, the Roman Catholic Pro-Cathedral, and a number of fine public schools. It has a fine Confederate monument. Oak Cliff and City Park are notable public grounds.

Dallas is surrounded by a productive farming country and has extensive wholesaling interests. The industries include iron factories, flouring mills, cigar and candy factories, cotton gins, grain elevators, machine shops, and farm implement manufactories. Many of the streets are substantially paved. It has gas and electric lights, waterworks, sewerage, and an extensive electric railway system. The first settlement was made in 1841. Population, 1910, 92,104.

**DALLES** (dālz), the name applied to various cataracts in the United States. The Dalles of the Saint Louis are cataracts located near Duluth, Minn. The Dalles of the Columbia are near Dalles City, Ore., on the Columbia River, about 200 miles from its mouth and fifty miles above the Cascades. Here the river is compressed by basaltic rocks to about one-third of its usual breadth, with lofty walls on both sides. The chasm formed in this way is fifty-eight yards wide, and through it the waters plunge in the form of a roaring torrent. The Dalles of the Wisconsin, near Kilbourne City, Wis., is about seven miles long and sixty feet wide. On both sides of the gorge are walls of Potsdam sandstone fully 100 feet high.

**DALLES, The,** or Dalles City, a city of Oregon, county seat of Wasco County, at the head of navigation on the Columbia River, eighty-eight miles east of Portland. It is on the line of the Oregon Railroad and Navigation

Company. The chief buildings include the high school, the county courthouse, and a number of churches. It has a large trade in grain, fruit, and live stock. The manufactures include flour, woolen products, clothing, and machinery. In the vicinity and down the river is much beautiful natural scenery. A military post was established at The Dalles in 1838 and the place was incorporated in 1858. Population, 1900, 3,542.

**DALMATIA** (dāl-mā'shī-à), a province of Austria, extending along the Mediterranean, and bounded by Croatia, Montenegro, Bosnia, Herzegovina, and the Adriatic Sea. The area is 4,940 square miles. It contains ranges of the Dinaric Alps, a large number of coast inlets, and numerous small lakes and rivers. The greatest elevation is reached by Mount Orien, which rises 6,230 feet above the sea level. A large per cent. of the soil is fertile and is farmed, pastured, or occupied by forests. The mountain districts yield minerals, though mining is not highly developed. Among the chief products are cereals, fruits, domestic animals, cheese, silk, and vegetables. Though the least developed of Austrian dependencies, it has considerable shipbuilding. The people along the coast are largely seafaring and engaged in fisheries. A number of thriving cities are located on the Adriatic, where the chief centers of manufactures and commerce are situated. Several railway lines connect them with the interior districts.

The province was once an independent kingdom of considerable strength. It was conquered by the Romans in the reign of Augustus. Afterward it was overrun by the Goths and conquered successively by the Slavonians, Venetians, French, and Italians. Since 1814 it has been a part of Austria, with the title of kingdom. The inhabitants consist mostly of Dalmatian Slavs, who resemble the Croats, and they are the modern representatives of the ancient Illyrians. Other elements include Germans, Italians, and Jews. Population, 1906, 598,764.

**DAM**, a bank or structure to confine the flow of a stream in order to raise its level. Dams are usually built of stone, earth, or wood, though in recent times cement, steel, and cast iron have been utilized to a large extent. Those constructed in ancient times were largely for protection against overflows from rivers; or for safeguards against waves and tides on lakes and seas. Among the most important modern dams of this class are the great dikes of Holland and the levees in the lower course of the Mississippi. The former protect the lowlands against overflows from the sea, while the lat-



ter provide safety against general overflows during excessively rainy seasons. Many dams are maintained in streams to obtain power for machinery. In this class the water is raised sufficiently to permit currents to pass rapidly through artificial channels parallel to the main bed of the stream, thus obtaining a permanent flow of water where the force is applied. Another class of dams built which are extensively used includes those constructed to provide water for cities and for irrigation purposes. The New Croton dam, on the Croton River, was constructed to provide an immense storage reservoir for the water supply of New York City.



Dam at Saint Anthony Falls, Minneapolis, to furnish power for large mills.

It is 290 feet high and 216 feet thick at the base, and the solid masonry is 700 feet long, besides which an earthen dam lined with a wall of masonry is extended to a length of 1,500 feet. The structure forms a reservoir eighteen miles long with a capacity of 32,000,000,000 gallons of water, the cost being about \$4,250,000.

A dam for irrigation purposes at San Diego, Cal., is 130 feet high and 545 feet long. It is constructed largely of steel and is protected from rusting by paints made of semiliquid asphalt. The capacity of the reservoir is 14,000,000,000 gallons. A dam almost entirely of steel is located near Ash Fork, Ariz., which has a capacity of 36,000,000 gallons. One of the notable dams is located on the South Platte River, Col., forming a reservoir for the water supply of Denver. The greatest height is 210 feet, but its site in a rocky gorge made it necessary to build it only twenty-five feet long at the base and 500 feet at the top. It is constructed of granite blocks, with an inner lining of steel plates, and is supported by steel beams. The reservoir is 200 feet deep at the dam, 150 feet three miles up the river, and fifty feet six miles above the dam. It has a storage capacity of 35,000,000,000 gallons of water. The Roose-

velt dam, across the Salt River, seventy-two miles above Phoenix, Ariz., is of the arched gravity type and is 284 feet high. It was completed in 1907.

The largest dam in the world is maintained by the Egyptian government across the Nile at the Assuan cataracts. The length of this remarkable structure is 6,400 feet, the width is eighty feet at the bottom and twenty-three feet at the top, and the height is ninety-two feet. It is constructed of granite masonry, its foundation being solid granite rock. It serves the purpose of collecting a supply of water from the Nile between November and April for the purpose of irrigating the land farther north during the months of May, June, and July. In the dry season the water is conducted by canals to the different cultivated fields. Through the agency of this improvement vast regions of arid land have been redeemed and made productive. The capacity of the reservoir is about 280,000,000,000 gallons. It is estimated that the entire cost of this dam, including locks and accessories, was \$8,750,000.

**DAMAGES**, in law, the amount of money a person may recover for the injury done by another to his person, property, or other rights. If damage is done through neglect or by a willful act, the party injured may recover in money the amount of the loss, and, if the damage results from a malicious act, the amount recovered may be larger than the actual loss. The courts of England and America generally agree that the person damaged may recover to make good the loss sustained, which is estimated in money, and in addition the defendant is required to pay the court expenses. When the damage results from causes over which no one has control, such as a storm or earthquake, or if it is chargeable to an accident for which no one is to blame, such as a horse running away, the injured party cannot recover.

**DAMARALAND** (dä-mä'ra-länd), the northern portion of German Southwest Africa, extending from Walfisch Bay to the Kunene River. The area is about 100,000 square miles. The coast region is arid and desert, but the interior contains fertile tracts adapted to agriculture. It has valuable mineral products, including gold, silver, iron, and copper. Cotton, tobacco, silk, fruits, and live stock are the chief



products. The drainage is largely toward the east by tributaries of the Zambezi. A large proportion of the inhabitants belong to the Bantu and Damara races. Population, 1905, 200,000.

**DAMASCUS** (dā-mās'kūs), the capital of the Turkish vilayet of Syria, regarded the most ancient city of the world, called *Dimishk-esh-Shâm* by the natives. The Scriptures mention it on numerous occasions, connecting it with the time of Abraham and successively with other distinguished men, including Saint Paul. It is still one of the largest cities of Western Asia, is beautifully situated in a fertile plain of the same name, and is bounded on the north and west by the high mountain range of Anti-Libanus. Jerusalem is located about 140 miles west of Damascus and a railroad line connects it with the Mediterranean Sea at Acre. While possessing many points of interest which are mentioned by travelers, it contains narrow and angular streets, and in the poorer portions has many low houses that are filled with filth. The courts are paved with marble and ornamented with fountains. Many of the public places are adorned with trees and beautified by fine architectural structures. The chief buildings include the citadel and the Great Mosque built in the eighth century. About seventy-five mosques of considerable size are maintained in the city, in addition to fully 175 chapels for instruction and prayer.

The Moslems regard Damascus one of the holy cities. Its general features are thoroughly Oriental and it is the gathering place of great companies of pilgrims. Pilgrimages to Damascus began soon after the time of Mohammed, a number of his revelations being associated with it. In several portions are colonies of Christians and Jews, who are allowed religious liberty and educational advantages. Among its notable features are numerous bazaars, the various classes being located by themselves on different streets. Among the bazaars are those of the saddlers, silversmiths, shoemakers, booksellers, and others. In the midst of these stands the Great Khan, which forms a market place for merchants. Straight Street, mentioned in connection with the conversion of Saint Paul, is one of the most important commercial thoroughfares.

Much of the trade of Damascus is in the hands of Europeans. The manufactures include tobacco, fabrics, silk and cotton goods, jewelry, olive oil, damask, soap, and furniture. Formerly the celebrated Damascus steel was produced largely in the city, but its manufacture is no longer carried on. The population is

made up of many classes, including Kalmuks, Turkomans, Afghans, Kurds, Circassians, and Europeans. A large trade is carried on with the interior of Asia by caravans of camels, while within the immediate vicinity it is facilitated by a number of canals. The building of railroads, telephone and telegraph lines, and other modern facilities has enlarged its importance commercially. A macadamized road was built between it and Beyrout in 1860. The educational status is somewhat better than formerly, owing largely to the work done by Christians. Damascus has been the seat of much military contention and passed successively under the Israelites, Persians, Greeks, and Romans. It has been under the dominion of the Turks since 1516. Population, 1908, 212,641.

**DAMASCUS STEEL**, a kind of steel made originally in Syria, so named from Damascus, where it was used largely in manufacturing cutlery and swords. It has been known to Europeans since the time of the Crusades, but the secret of making the Damascus blades, a kind of sword, is not well understood. Damascus steel is noted for its temper, hardness, and durability. It requires careful forging and workmanship and contains a larger per cent. of carbon than ordinary steel. The Damascus blades are beautified by ornamental designs, including inscriptions and landscapes. The art of producing these is called *damaskeening*.

**DAMASK** (dām'ask), a rich silk fabric originally made at Damascus, from which it is named. It is distinguished by raised figures of animals, landscapes, flowers, and fruits in their natural colors embossed upon a white or colored base. The name is now given to various products made of silk, wool, linen, or cotton, and to a mixture of several of these colored differently. Damask textiles are used for window curtains, fine towels, napkins, tablecloths, and furniture coverings. The figures of fruits, flowers, vases, and other objects placed on the surface are produced by a particular management of the warp threads. Damasks of this character are made extensively in America and Europe.

**DAMIETTA** (dām-ĭ-ĕt'tā), a city of Egypt, on the eastern branch of the Nile, about five miles from the Mediterranean Sea. The main part of the city is built irregularly, but some of the streets are well improved. It is the seat of several European consuls, a Coptic bishop, and an Egyptian governor. Among the public improvements are electric lights, marble baths, and a number of ancient mosques. Large vessels cannot ascend the river to Damietta, owing to sand bars at its mouth. It has railroad con-



nections with Cairo and other centers of commerce. The manufactures include clothing, cotton fabrics, and utensils. It was strongly fortified by the Saracens in the time of the Crusades. The construction of the Suez Canal has caused its commerce to decline. Population, 1906, 32,642.

**DAMPS**, the name generally applied to gaseous products fatal to animal life. Damps frequently occur in coal mines, wells, and other excavations, especially if they are covered up and unused for some time. *Choke damps* are composed of carbonic acid mixed with carbonic oxide, being so called from their tendency to extinguish life and fire. *Fire damps* consist largely of light carbureted hydrogen and are so named because of their tendency to explode when mixed with atmospheric air, after being brought in contact with a flame.

**DAMSON** (dăm'z'n), the name of a common plum tree which bears small oval fruit. Numerous species have been developed by cultivation. They bear fruit of various colors, such as yellow, bluish, dark purple, and black. They were imported originally from Damascus and are cultivated extensively in the Temperate zones. Some species are used in making a confection called *damson cheese*.

**DANBURY** (dăn'bēr-ī), a city and one of the county seats of Fairfield County, Connecticut, on the Still River, a tributary of the Housatonic. It is on the New York, New Haven and Hartford Railroad and on several electric lines. The noteworthy buildings include the courthouse, the public library, the city hall, and the high school. It has a fine public park and two monuments, one of which was erected to the memory of General Wooster in 1854. Among the manufactures are boots and shoes, shirts, clothing, sewing machines, machinery, and utensils. It has paved streets, waterworks, electric lights, street railways, and other modern facilities. The first settlement was made in 1684 and it was incorporated as a city in 1889. At the time of the Revolution, in 1777, it was captured by the British under General Tryon. Population, 1900, 16,537; in 1910, 20,234.

**DANCING** (dăn'sing), an amusement or exercise in which one or more persons move the body successively in rythmical order, usually accompanied by music. It consists of steps, bounds, and inclinations of the body, and all the movements are executed with a care designed to make them artistic. In ancient times dancing was a part of the religious observances and worshipers danced before the altars and images of their gods. The Egyptians considered their god Thoth as the inventor of dancing. In

Greece it expressed all the different passions from the genteel and beautiful to the dance of the Furies, which inspired the beholders with terror. It played an important part in the sculptures of Greece and was classed with poetry by Aristotle. In Rome dancing was permitted by free citizens only as a religious rite, but in Egypt and India it was employed in public, where dancing and singing girls entertained on public occasions.

Dancing was not practiced extensively after the fall of Rome, largely for the reason that it was discouraged by Christianity on the ground that it was inherited from the Jews and pagan nations. Its revival began in the fifteenth century, when it gained favor in Italy and was introduced by Catherine de' Medici into France. War and harvest dances were given in Germany even before that time. The *carole* and *egg dance* were among the dances of England. Savage warriors practiced dancing to a considerable extent, as exemplified by the American Indians in their celebrated war dances. The Protestant churches either forbid it or look upon it with a measure of disapproval.

The art of dancing has been modified from time to time and has varied in the extent to which it has been practiced. Among the dances characterized as national are the *polonaise* of Poland, the *fandango* of Spain, the *tarantella* of Italy, the *jig* of Ireland and Wales, the *waltz* of Germany, and the *reel* and *Highland fling* of Scotland. The *breakdowns* are popular among the Negroes and the *step dances* and *hornpipes* are quite common among sailors. Among the modern dances common in America are the *quadrille*, the *two-step*, the *polka*, the *lancers*, the *waltz*, the *ballet*, the *galop*, the *cotillion*, and the *schottish*.

**DANDELION** (dăn-dě-lī'ŭn), a plant native to Europe, but now common in America. It has a naked, hollow stock, with a composite, bright yellow flower. The leaves rise from a tap root in the form of a bunch. The seed has a white, downy tuft of hair and is scattered extensively by the winds. In many places the dandelion is an obnoxious weed in lawns and parks. Its blanched leaves are recommended as a salad and are eaten as lettuce in the form of greens. The plant yields a milky juice, which, in the form of extract, is employed for medicine. Its roots have been used to adulterate coffee in a way quite similar to chicory. Though small in the native state, the plants have been greatly enlarged and improved by cultivation.

**DANISH WEST INDIES**, a group of three islands belonging to Denmark, situated east of Porto Rico and classed with the Virgin Islands.



The area is 138 square miles, which includes some tracts of marshy lands. The area of each of the three islands is as follows: Saint John, 21 square miles; Saint Thomas, 23 square miles; Saint Croix, 74 square miles. A large part of the inhabitants consists of negroes and mulattoes and more than half are on the island of Saint Croix. Christiansted, on Saint Croix, is the seat of local government.

The Danish West Indies, though of little importance commercially, possess value as stations for steamship lines crossing the Atlantic.



DANDELION.

1, Floret; 2, involucre and floret; 3, involucre and fruit; 4, fruit with pappus; 5, involucre and ripened fruit.

Excellent harbors are located at Christianstad and Charlotte Amalie, on Saint Thomas, in fact, the latter is one of the deepest and safest in the West Indies. Two cable lines, one French and the other English, connect Saint Thomas with European ports. The exports consist chiefly of sugar and rum, and trade is almost exclusively with the United States and Denmark. A Spanish dialect is the chief language, but English and Danish are spoken in the courts. The revenue has been insufficient to cover the expense for a number of years, owing to the fact that it is obtained chiefly from customs, and the shortage arises because trade is not large. Negotiations were made a number of times to sell the islands to the United States, but in 1902 the treaty of sale was rejected by the Danish Parliament. It is considered that these islands will be valuable after the completion of the Panama

Canal, and they would add materially to the value of Porto Rico as an American trading center. Population, 1906, 36,152.

**DANTZIC** (dănt'zĭk), or **Danzig**, a seaport of Germany, capital of West Prussia, on the west branch of the Vistula River, about three miles above its mouth. However, its port, Neufahrwasser, is at the mouth of the Vistula. It is strongly fortified by a moat and ramparts and these are strengthened by twenty bastions and several detached forts. Among the principal buildings are a cathedral built in the fourteenth century, the Church of Saint Catharine, several monasteries, synagogues, observatories, and theaters. Langgasse is the finest street in the city, and, owing to its lofty gables built after the style of architecture common to the sixteenth and seventeenth centuries, its appearance is picturesque. Other noteworthy features include the public market, the city library of 150,000 volumes, and the railway depot. The commerce consists largely in wheat, amber, machinery, wool, starch, and leather. Shipbuilding and the manufacture of artillery and machinery engage large numbers of workmen. The general manufactures include hardware, clothing, and textiles. It has extensive railroad and electric railway facilities, municipal waterworks, gas and electric lighting, and stone and asphalt pavements. The first mention of the city was in 997, when it became identified with Christianity. In 1358 it joined the Hanseatic League. It has belonged to Prussia since 1793, except when it was set apart as a dukedom by Napoleon. Population, 1905, 159,648.

**DANUBE** (dăn'üb), the second largest river of Europe, being exceeded in length only by the Volga. The Brege and the Brigach, two streams having their source in the Black Forest of Germany, unite at Donaueschingen and form the Danube. The length is 1,750 miles and the area drained by it includes 315,000 square miles. At the union of the two rivers that form it the height is 2,265 feet above the sea level, the average fall is eighteen inches per mile, and its waters flow through a delta of seven branches into the Black Sea. The principal tributaries are the Drave, Save, Theiss, and Pruth rivers. After leaving Germany, it passes through Austria, between which and Serbia it forms a portion of the boundary, thence passes between Serbia and Rumania, thence between Rumania and Bulgaria, and thence makes a bold curve north and east to a point between Rumania and Russia, where its waters unite with the sea. Of its 400 tributaries about one hundred are navigable, while Ludwig's Canal connects it with the Rhine and



the Moldau and Muhl canals with the Elbe, and several others widen its sphere of commercial importance.

The three principal divisions of the Danube system include the river from its source to Passau, where it leaves German territory; thence the middle course, ending at the Iron Gate, below Orsova; thence the lower course to the sea. The middle course is especially beautiful in scenery, rapids, and cataracts. At the Iron Gate the stream has a width of only 129 yards and its waters are piled up to a depth of twenty-eight fathoms. At each side great ledges of rock tower above the surface and form a continuous line of beautiful panorama. The delta contains a vast area, equal to about 1,000 square miles, covered with dense rushes and cut up by winding channels, where sea birds and various animals find a safe and favorite haunt. Three main channels are included in the delta. They are known as the Kilia, Saint George, and Sulina mouths, and the last named is the one through which ships enter. The mouths farthest apart are sixty miles from each other. Owing to its favorable location through densely populated regions and to its deep water, the Danube is one of the most important rivers to commerce. Great numbers of steamboats ply on its surface and reach hundreds of commercial centers, the total connected navigation facilities constituting about 2,500 miles. The navigation is controlled by the International Navigation Commission, which is composed of delegates appointed by the riparian or great powers. This commission has made extensive improvements in various portions, particularly by a great canal at the Iron Gate.

**DANVERS** (dän'vēr-z), a town of Essex County, Massachusetts, about eighteen miles northeast of Boston, on the Boston and Maine Railroad. Among the chief buildings are the State insane hospital, the high school, and the Peabody Institute Public Library. The manufactures include lumber products, boots and shoes, ironware, clothing, machinery, and carpets. It has systems of waterworks, public lighting, and electric street railways. In 1692 it was implicated in the Salem witchcraft delusion. It was incorporated in 1752. Population, 1905, 9,063.

**DANVILLE**, a city in Illinois, county seat of Vermilion County, on the Big Vermilion River and on the Big Four, the Wabash, and the Chicago and Eastern Illinois railroads. The surrounding country is rich in coal deposits, building material, and fertile soil. Among the noteworthy buildings are the courthouse, the Carnegie Library, the post office, the high

school, and the Y. M. C. A. building. Douglas and Lincoln parks are fine public grounds. It has systems of paving, sewerage, waterworks, and electric street railways. It was settled in 1830 and incorporated in 1867. The manufactures include hardware, cigars, engines, farming machinery, clothing, and utensils. Population, 1900, 16,354; in 1910, 27,871.

**DANVILLE**, county seat of Boyle County, Kentucky, forty miles south of Frankfort, on the Cincinnati Southern Railroad. Besides having a fine school system, it is the seat of Cadwell's Female Institute, Danville Theological Seminary, Southern Collegiate Institute, Morrison Female Seminary, Center College, Hogsett Academy, and a State institute for deaf-mutes. The industries include machine shops, grain elevators, and stock yards. It is surrounded by a rich agricultural and stock-raising country. Danville was incorporated in 1789. Population, 1900, 4,285.

**DANVILLE**, a borough and county seat of Montour County, Pennsylvania, on the north branch of the Susquehanna River, 150 miles northwest of Philadelphia. It is on the Lackawanna, the Pennsylvania, and the Philadelphia and Reading railroads. The noteworthy buildings include the public library, the high school, the courthouse, and the State hospital for the insane. Among the manufactures are iron and steel wares, silk goods, stockings, suspenders, and custom-made clothing. It has extensive blast furnaces and rolling mills. The surrounding country is rich in agricultural and mineral products. Population, 1900, 8,042.

**DANVILLE**, a city of Virginia, in Pittsylvania County, on the Dan River, 140 miles southwest of Richmond. It is on the Danville and Western and the Southern railroads. An abundance of water power for manufacturing is furnished by the river. The manufactures include flour, cotton and knit goods, ironware, cigars, tobacco, clothing, and machinery. The output of the tobacco factories is particularly large. Besides fine public schools, it contains the Roanoke Female College, the Danville Male Academy, and the Danville Female Academy. Among the municipal improvements are gas and electric lights, waterworks, pavements, and an extensive street railway system. Danville was incorporated in 1792. It was the capital of the Confederate States for a short time near the close of the war. Population, 1900, 16,520.

**DAPHNIA** (dăf'nī-ă), a genus of freshwater crustaceans, known popularly as the water flea. These animals have a bivalve shell, long swimming antennae, and five pairs of feet. A compound eye is attached to the head, which



is elongated into a snout. They are abundant in ponds and are important as the diet of many fishes.

**DARDANELLES** (där-dä-nělz), the Hellespont of the ancients, so named from Dardanus, the mythical founder of Troy. The strait is forty miles long and from one to four miles wide. It separates Europe from Asia at this point, and connects the Sea of Marmora with the Aegean Sea. A current flows through it from the Sea of Marmora, which is often increased by winds. The country on the European side is hilly, but is in a high state of cultivation and densely populated, while on the Asiatic side is a fertile plain, rising toward the range of Mount Ida with gradual ascent. Two castles mark the sites of the ancient Sestos and Abydos, while strong fortifications guard it on both sides. In 1841 a treaty was made by the five great powers and Turkey to the effect that no warship shall pass the strait, except with the expressed permission of Turkey. Abydos, on the Asiatic side, is celebrated for the story of Hero and Leander. It is noted for the passage of the armies of Xerxes in 480 B. C., when invading Europe, and that of Alexander in 334 B. C., when leading his famous expedition into Asia. Lord Byron, to demonstrate the possibility of the reputed feat of Leander, swam across the strait.

**DARFUR** (där'fōor), the name applied to the western portion of eastern Sudan, in Africa. It has an estimated area of 200,000 square miles and a population of 2,500,000. In 1874 it was reduced by Ziber Pasha and placed under the control of Egypt. The British claims were strengthened by an agreement with Germany and Italy in 1891. A battle with the French troops at Fashoda resulted in an agreement between France and England, signed March 21, 1899. By the terms of this treaty the western boundary of Darfur is to mark the sphere of influence between the two powers in Central Africa. The district is drained largely by the head waters of the White Nile and Shari rivers. It contains large tracts of desert lands in the north, but there are quite productive regions toward the south. Cotton, wheat, tobacco, sesame, maize, and fruits are grown. Cattle raising is the principal industry. A majority of the inhabitants are Arabs, who profess Islam. The government is administered from El Fasher, its capital.

**DARIEN** (dā-rĭ-ĕn') **Gulf of**, a gulf extending from the Caribbean Sea, between the Isthmus of Panama and the mainland of South America. It receives the inflow of several rivers, including the Atrato, has a number of sea-

ports, and is the most prominent inlet on the northern coast of Colombia. The southern portion is known as the Gulf of Urabá.

**DARIEN**, **Isthmus of**, the name applied to a neck of land between the Gulf of Darien and the Pacific Ocean, and sometimes to the entire isthmus which connects North and South America, though the name usually applied to the latter is Panama. See **Panama**, **Isthmus of**.

**DARIEN SCHEME**, a proposition to establish a colony on the Isthmus of Darien with the view of controlling the trade between the Western and Eastern hemispheres. It was formulated by William Patterson, a Scotchman, in 1695, and about \$4,500,000 was subscribed to finance the scheme. In 1698 about 1,200 colonists sailed from Scotland to their prospective new home, which was called New Caledonia. A second company was sent out in 1699 and a third the following year, but the project proved an entire failure. The colonists found the region unhealthy, suffered by disease and starvation, and were harassed by the hostile natives and Spaniards.

**DARK AGES**, the name applied to a portion of the Middle Ages, including a period of about a thousand years, from the fall of Rome to the revival of letters in the fifteenth century. The period properly commences with the invasion of France by Clovis in 486 A. D., and closes with the invasion of Naples by Charles VIII. in 1495.

**DARLING** (där'ling), a river in Australia, the largest tributary of the Murray. It is formed by the confluence of several rivers rising in the Liverpool Range, has a length of 600 miles, with its tributaries 1,150 miles, and drains an area of 197,500 square miles. Its confluence with the Murray is at Wentworth, on the boundary between Victoria and South Australia. The name is applied to two districts in Australia, the Darling District and the Darling Downs. The former is in New South Wales and the latter in Queensland.

**DARLING RANGE**, a chain of mountains in the western part of Australia, extending parallel with the coast for a distance of nearly 300 miles. The highest summit, Point D'Entrecasteaux, has an altitude of 3,700 feet above the sea. The general altitude ranges from 1,200 to 1,500 feet, and many sections of this range are covered with fine forests.

**DARMSTADT** (därm'stät), a city of Germany, capital of the grand duchy of Hesse-Darmstadt, situated on the Darm River, fifteen miles south of Frankfort-on-Main. It is the converging center of several railroads and has a large jobbing trade. The streets are well



paved with stone and macadam. Among the chief buildings are the palace of Prince Henry, the town hall, the Victoria School, and the Grand Ducal Palace. The last mentioned contains a museum of rare paintings and a library of 500,000 volumes. A fine Doric column rises to the height of 134 feet in one of the public squares, upon which is mounted a statue of the Grand Duke Louis, who founded the newer portion of the city and greatly extended its commercial importance. The manufactures include hats, carpets, chemicals, clothing, and earthenware. It has modern municipal facilities, such as gas and electric lighting, public waterworks, and electric street railways. Darmstadt has been the capital since 1567. Population, 1905, 83,123.

**DARTER** (därt'ēr), the name of a group of small fishes found in the fresh waters of North America, so named from their quick motion. These fish belong to the perch family, are from six to ten inches long, and are classed among the smallest spiny rayed fish. They frequently lie concealed under stones at the bottom of clear running water, and when hungry or frightened dart suddenly for a short distance. Several species are familiar, most of them frequenting the streams of the central and southern parts of the United States.

**DARTER**, or **Snakebird**, a bird native to the tropical parts of most continents, closely allied to the cormorant. The feet are webbed, the bill is longer than the head, and the neck is long and slender. They are called darter from their quick motion. The name *snakebird* is applied to them from the fact that the head is scarcely thicker than the neck, giving that part of the body the appearance of a snake. When frightened while sitting on a branch over a stream, they dart quickly into the water or fly upward and circle in the air like a hawk. They are skilled in catching fish, at which they dart with a sudden and well-directed aim. The American darter is sometimes called water turkey and is about three feet long.

**DARTMOOR** (därt'mōor), an extensive and desolate upland in Devonshire, England, belonging to the duchy of Cornwall. It is noted because of its rugged scenery and as the source of several rivers. A large portion of it furnishes grazing for cattle and sheep during the summer months. The extent is fourteen miles from east to west and twenty miles from north to south, with an area of 150,000 acres. The minerals include China clay and tin. At Lee Moor, which is the seat of a meteorological observatory, are the largest kaolin works in England. A number of earthworks, Cyclopean bridges, and stone antiquities abound. A prison

was built on the Dartmoor upland in 1809 for the custody of French prisoners of war. The British impressed about 2,500 American sailors during the War of 1812, confining them in this prison until peace was concluded. The prison incloses about thirty acres and is now used as a depot for convicts.

**DARTMOUTH COLLEGE** (därt'müth), an institution of higher learning at Hanover, N. H. It is the outgrowth of a school which was established at Lebanon, Conn., in 1754, for the Christian education of Indian youth. This school was founded by Eleazer Wheelock and was known as Moor's Indian Charity School, so named from Josiah Moor, who contributed a house and two acres of land. The college received a royal charter in 1769, hence is one of the oldest of New England colleges, ranking next to Harvard and Yale. John Wentworth, the governor of the Province of New Hampshire, gave to the college the name of Lord Dartmouth, who was its most active patron in Great Britain, but he and other Englishmen who contributed to its support withdrew their patronage soon after it ceased to be devoted particularly to the education of Indians. It is at present one of the foremost institutions of higher learning in New England. Though surrounded by religious influences, it is nonsectarian, but it remains an institution for men only. The departments include those of medicine, classics, sciences, commerce and finance, and civil engineering. It has a library of about 100,000 volumes and 20,000 pamphlets. With it are associated the Dartmouth Medical School, founded in 1798; the Thayer School of Civil Engineering, founded in 1867; and the Amos Tuck School of Administration and Finance, established in 1900. In 1907 the academic department of the college was attended by 1,150 students drawn from thirty-five states. The State of New Hampshire attempted to gain control of the college in 1860, which gave rise to a famous case in the lower courts and the Supreme Court of the United States. See **Dartmouth College vs. Woodward**.

**DARTMOUTH COLLEGE VS. WOODWARD**, a case decided by the Supreme Court of the United States in 1819. It grew out of a controversy between the trustees of Dartmouth College and the Legislature of New Hampshire. George III. granted a charter to found Dartmouth College in 1769, and after the Revolution the State of New Hampshire claimed the same control as was exercised by the throne prior to the independence of the United States. William Woodward held the offices of secretary and treasurer of the cor-



poration of Dartmouth College under the trustees of the college, twelve in number, and a controversy arose between him and the trustees, who removed him from office. In the meantime the State Legislature passed an act to amend the charter so as to supervise the affairs of the college under a new board of twenty-one members. This board appointed William Woodward secretary and treasurer, and the old trustees brought a suit against him to recover the property of the college. A verdict for the defendant was given in the superior court of New Hampshire, but this was reversed on appeal in the United States Supreme Court and the plaintiffs were awarded \$20,000 damages. The essence of the decision is that the "charter of Dartmouth College is a contract within the meaning of that clause of the Constitution which prohibits the states from passing any law impairing the obligation of contracts." This decision was handed down by Chief Justice Marshall. The plaintiffs were represented by Daniel Webster.

**DARWINISM**, a term used to designate the views advocated by Charles R. Darwin, relating to the origin of species of plants and animals. The view that all things are susceptible to change by cultivation was held by a vast majority of naturalists before the publications of Darwin became known. It had been demonstrated that hybrids might originate from various species, but writers deemed the hybrids sterile and regarded any further change impossible. The views of Darwin were held by Alfred Russel Wallace and were foreshadowed by Aristotle. The theory of transmutation of species stands in direct opposition to the belief that each species was originally created as a separate type. It embraces the proposition that in every plant or animal exists a certain amount of variability. The offspring differ in some respects from each other and from the parent stock, this becoming aggravated by climatic conditions and environments through long periods of time, as is noticed by the domestication of animals. There is a tendency on the part of each animal and plant to multiply at a geometrical ratio, and, if a single one were not checked, it would in the course of ages fill the earth. On account of this there is a severe struggle for existence, in which all forms of life engage against other forms, and especially against their own kind.

According to this view, the types best adapted for the struggle of life survive, while others die by suppression and defeat. Those which endure are said to do so from *natural selection*. As the offspring of each class of animals and

plants resemble the parent stock in most respects, the less improved forms ultimately become exterminated, and each family is continued by the *representative* individual which it embraces. The result of this, and of sexual preference, leads to an endless progression by which evolve higher species, genera, families, orders, classes, and even subkingdoms. The theory may be illustrated by the claim that neither a horse nor an ox existed at a remote time in the past, but there was an animal that had the characteristics common to both. The various changes gave rise to specialized forms, until finally the horse came forth from an ancestor not so specialized as itself, and the ox from another. The theory, more briefly stated, is that the "Creator may have breathed life into one or more forms of life, from which the others originated."

**DASYURE** (dās'ī-ūr), the common name of a genus of marsupial animals native to Australia and Tasmania. They are allied to the opossums. Most species are spotted and have bushy tails. The dasyure of Tasmania is light brown or whitish beneath, gray and whitish above, and about two feet long. It lives in burrows, feeds on insects and flesh, and is particularly fond of poultry. Several species of Australia resemble the cat and are quite strong and fierce. Fossil remains of the dasyure are found in many sections of South America.

**DATE**, the common name of the fruit borne by a number of species of trees which belong to the genus *Phoenix dactylifera*. The tree itself is known as the date tree or date palm. It is the palm tree mentioned by classic writers and in the Scriptures. Its nativity is in India, Southwestern Asia, and Northern Africa, where it still flourishes, serving a useful purpose in the domestic and commercial life of the inhabitants. The trees have a straight stem, from twenty-five to sixty feet in height, and are of nearly the same thickness throughout the entire length. Date palms are divided into male and female, the former usually numbering about one in twenty-five when found in palm groves. The pistillate trees bear from 150 to 200 dates. In the larger species the bunches of dates weigh from twenty to twenty-five pounds, hanging below the leaves, at the top of the tree. The Arabs are among the most extensive producers, propagating them from suckers. In the eighth year they begin to bear. They reach maturity at about twenty-five and decline after growing fully a hundred years.

The fruit of the date tree is eaten fresh or is preserved by drying. Large cakes are made of dates by pounding and kneading them to-



gether, and these form the principal food of the Arabian caravans that traverse the deserts. Some species are used in the manufacture of wine and a sort of vinegar. The date stones or seeds are ground and fed to camels, or are used as a substitute for coffee. A valuable oil



DATE.

A, Male flower cluster; B, male flower; C, female flower cluster; D, female flower; E, fruit; F, single date.

is obtained from the seeds, while in some countries they are used in making ornaments and charms. Baskets, bags, and pouches are made from the leaves, while the fibers found near the bottom of the tree are used for making ropes, and the wood is valuable for fencing and building purposes. The fruit of several species native to Asia is used in the manufacture of toddy, which forms a pleasant drink. The date

palm, next to the cocoanut tree, is the most interesting and useful of the palms.

**DATE PLUM**, the name of several species of trees of the ebony family, usually large, thick-leaved, and hard-wooded. The low-growing date plum tree of Europe produces a small fruit. It is native to the southern portion of that continent. The American persimmon or date plum attains a height of from forty to sixty feet. Its fruit is about an inch in diameter, nearly round, very hard, and eatable after being frosted. The date plum of China is cultivated for its fruit, which resembles a small apple in size, and is useful in making preserves.

**DAUGHTERS OF THE AMERICAN REVOLUTION**, a woman's society of the descendants of the soldiers and sailors of the Revolution, organized at Washington, D. C., on Oct. 11, 1890. The purpose is to perpetuate the memory of those who fought upon the American side in the War of Independence, to promote the erection of monuments, and to encourage the collection of relics. A site was purchased in Washington, D. C., in 1902 for the purpose of erecting in that city a memorial hall. The society has about 700 local chapters and a total membership of 40,000, and is represented in nearly all states of the United States. A number of chapters are maintained in Canada, the Hawaiian Islands, and Europe.

**DAUPHIN** (dā'fīn), the eldest son of a French king, prior to the revolution of 1830. The title was originally held by the lords of Viennois, whose province was called Dauphiné. It was first assumed about the middle of the ninth century. The last lord ceded the province to the French king in 1349, on the condition that the title should be forever borne by the heir apparent. The wife of a dauphin was called a dauphine or dauphiness.

**DAVENPORT** (däv'ən-pōrt), a city in Iowa, county seat of Scott County, on the Mississippi River and on the Chicago, Burlington and Quincy, the Chicago, Rock Island and Pacific, the Chicago, Milwaukee and Saint Paul, and other railroads. Across the Mississippi is Rock Island, Ill., with which it is connected by a number of bridges. The public buildings include the county courthouse, a Federal building, the city hall, the public library, Mercy and Saint Luke's hospitals, Saint Ambrose College, the Masonic Temple, and Griswold College, a Protestant Episcopal institution founded in 1859. It has a number of fine public schools and churches, a State orphan home, and many substantial residences. Rock Island, opposite the city, is a beautiful island several miles long. It is owned by the United States government,



and is the seat of an arsenal and of military headquarters.

Davenport is important as a commercial center. It has regular steamship communication with ports on the Ohio and the Gulf. Among the manufactures are clothing, furniture, flour, railroad cars, farming implements, buttons, pottery, and woolen goods. It has large interests in shipping grain and in slaughtering. The streets are generally well improved by grading and paving. Among the public utilities are waterworks, sewerage, electric lighting, and electric street and interurban railways. It was settled in 1854 and named after Colonel Geo. Davenport. In 1838 it was incorporated as a town and in 1851 as a city. Population, 1905, 39,797; in 1910, 43,028.

**DAVIS STRAIT**, the portion of the sea which separates Baffin Land from Greenland and connects Baffin Bay with the Atlantic Ocean. The width is from 180 to 500 miles. It is valued for its whale fisheries. An Arctic current flows southward through this strait and passes along the Atlantic coast of America. It is thought to be the Ginnunga Gap spoken of in the Norse Sagas.

**DAWSON** (dā'sŭn), a river port of Canada, capital of Yukon, on the Yukon River. It is finely situated at the confluence of the Klondike and Yukon rivers, about 330 miles northwest of Skagway, on an elevation 1,450 feet above the sea. The surrounding country is a gold-mining region. Its importance dates from 1896, when gold was discovered on Bonanza Creek. The chief buildings include a number of schools and churches, several theaters, a public library, and the buildings occupied by government officials. It is connected with the coast by telegraph lines and has local telephone service. Transportation is chiefly by steamers on the lower and upper Yukon. It was so named from George Mercer Dawson, a noted geologist of Canada. Population, 1901, 9,142.

**DAY**, the term employed originally to distinguish the time of daylight from the space of night or darkness, but now used more frequently to denote the complete alternation of light and darkness caused by an entire rotation of the earth upon its axis. Only one-half of the earth can be in the light of the sun at once, owing to its being a sphere. Night is merely the shadow of the earth, the two, day and night, covering equal portions of the earth's surface, and together constituting twenty-four hours. The alternations of light and darkness are caused by the rotation of the earth upon its axis, and, on account of it, the several portions of the surface have each a proportional share of light and

darkness. The length of each varies at different seasons of the year, owing to the continual parallelism of the axis of the earth to any former position. The fact that different portions of the earth's surface are being turned consecutively toward the sun constitutes the cause of both the change of seasons and the variations of the length of day and night.

A *solar day* is measured from the sun's coming to the meridian and again returning to it. Owing to the revolution of the earth around the sun, the solar day varies in length. It is about four minutes longer than the *sidereal day*. The latter is measured by the time of a star's coming to the meridian and returning to it on the immediate subsequent night. The mean solar day is twenty-four hours, and the mean sidereal day is twenty-three hours, fifty-six minutes and 4.098 seconds. This difference is due to the sun's apparent movement at a slow rate to the east through the stars, by which they reach the meridian in a shorter time than the sun does, if estimated by sun time. The interval existing between two successive transits of the sun across the meridian is called an *apparent day*, while the *astronomical day* is a day beginning, since January, 1885, at noon and extending to the next. It is divided into twenty-four hours, not into two periods of twelve hours each. The day at the Equator is always twelve hours, while the longest day at the poles is six months. On the 21st of March and the 21st of September the days and nights are equal in all parts of the earth.

In different countries the day is counted to begin at different times. The Jews began the day at sunset and the Babylonians at sunrise; while the Egyptians and Romans counted from midnight, which is the basis used by most modern peoples. The Latin *post meridiem*, meaning afternoon, is abbreviated by writing P. M.; and *ante meridiem* (forenoon), by writing A. M. These are necessary on account of dividing the common clock time, or day, into two portions of twelve hours each.

**DAY LILY**, a genus of plants belonging to the lily family, native to Europe and Asia. Several species are cultivated in the flower gardens of America, especially the fragrant yellow day lily. These plants include many species that are noted for the variegated colors of their flowers. The leaves are long and grow from the ground and the stem is branching. In some parts of Europe the day lily is cultivated to furnish food for cattle.

**DAYTON** (dā'tŭn), a city of Kentucky, in Campbell County, on the Ohio River, opposite Cincinnati. It is on the Chesapeake and Ohio



Railroad. The noteworthy features include the city hall, the high school, and the Speers Memorial Hospital. Among the manufactures are cigars, machinery, cordage, shoes, and spirituous beverages. It was settled in 1849 and was incorporated the same year as Jamestown, but the name was changed to Dayton in 1893. Population, 1900, 6,104.

**DAYTON**, a city of Ohio, county seat of Montgomery County, sixty miles northeast of Cincinnati. It is on the Pennsylvania, the Erie, the Big Four, the Dayton, Lebanon and Cincinnati, and other railroads, and on the Miami and Erie Canal, which connects Lake Erie with the Ohio River. The city is divided by the Great Miami River, which is joined here by the Mad River. It is beautifully platted with wide streets, has extensive urban and interurban electric railways, and in the vicinity are numerous macadamized highways. Many of the streets are paved substantially with asphalt and stone. Twelve bridges span the river, a number of which are constructed of concrete. The city has fine systems of waterworks and sewers.

The business section is located near the river, whence the ground rises to heights of from 200 to 300 feet; and the residence sections are chiefly on these more elevated parts. The notable buildings include the courthouse, the Union Passenger station, the Steele High School, the Y. M. C. A. building, the Dayton State Hospital, and a large number of fine business blocks, the last mentioned including the Arcade and the Conover. Among the educational and charitable institutions are the United Brethren Theological Seminary, the Academy of Notre Dame, the Saint Elizabeth's Hospital, and a number of manual training and commercial schools. The public library is located in the center of the city, in Library Park. Near the city is the National Military Home for disabled soldiers of the Civil War, which occupies a beautiful tract of 640 acres. Dayton is the seat of the State asylum for the insane and the county orphan asylum. It has a handsome soldiers' monument and numerous fine boulevards.

The city takes high rank as a manufacturing and wholesaling center. Among the chief manufactures are railway cars, flour, bicycles, electrical machinery, automobiles, steam pumps, cash registers, stoves and hardware, cotton and woolen goods, and agricultural implements. In the vicinity are extensive limestone and marble quarries. The first settlement was made on its site in 1796, after a tract of land had been purchased from the Indians by a company which included Jonathan Dayton, from whom the city received its name. In 1805 it was incorporated

as a town. It received its charter as a city in 1841 and since then has had a prosperous growth. It was visited by an epidemic of cholera in 1849 and was several times damaged by floods. Population, 1900, 85,333; 1910, 116,577.

**DEACONESS** (dē'k'n-ēs), name of an order maintained among the women in the Christian churches. An order of deaconesses is mentioned in the New Testament, in I. Tim. v., 9-10 and Rom. xvi., 1. It appears that this order was established in Apostolic times, when the deaconesses assisted in the work among members of their own sex and to some extent supplemented that of the deacons. In the early centuries it was connected with the Roman Catholic Church, but was abolished in the twelfth century. Theodor Fliedner, a pastor of the United Evangelical Church of Germany, founded a home for deaconesses in 1836, in which it was made the duty of the inmates to do charitable work. Since then many similar homes were established in Germany and other parts of Europe, such as the various sisterhoods in the Anglican Church of England.

Among the first order of deaconesses established in America is that of Saint Andrew's Parish, Baltimore, Md., under the auspices of the Protestant Episcopal Church in 1855. The order is recognized by the Lutheran Church in America, which erected the Drexel Home for Deaconesses at Philadelphia, Pa., in 1888. In the same year the order was established by the general conference of the Methodist Episcopal Church. It is sanctioned by the Presbyterian and other Protestant churches, and many homes are maintained both in Canada and the United States. The work of the deaconesses in the different churches is quite similar. As a whole the order may be said to constitute an independent society of charitable women, including many trained nurses, who do a noble work in relieving suffering and in spreading Christianity.

**DEAD LETTER**, a letter that lies at a post office unclaimed for a certain period, or one so defective in address that it cannot be delivered. The postal departments of Canada and the United States maintain dead-letter offices, in their seats of government, where all unclaimed letters are sent, including those that do not show the address, or are unstamped. These letters are opened at the dead-letter office, and, if the address of the writer is found, they are returned to the sender; otherwise, they are destroyed. Not less than 8,000,000 pieces of mail matter that find their way annually to the dead-letter office of the United States, of which about 4,000 do not contain the addresses of the



senders. The money and drafts found in letters are returned to those by whom the letters were mailed, if their names and addresses are known, while many periodicals, magazines, and picture cards are sent to various hospitals and libraries.

**DEAD SEA**, a remarkable lake in the southern portion of Palestine, in the pashalic of Damascus. In the Scriptures it is called the Sea of the Plains, Salt Sea, and East Sea, and is thought to be the site of the ancient Sodom and Gomorrah. It is located about twenty miles southeast of Jerusalem and ten miles south of Jericho, where it stretches north and south a distance of forty-five miles, and has a width of ten miles. It receives the waters of the Jordan and numerous other rivers, though its surface, owing to the arid climate, is 1,317 feet below the level of the Mediterranean. It is bordered by lofty cliffs of limestone along its eastern and western shores, while its northern and southern extremities are marked by low and dismal marshes. Violent earthquakes that occurred in periods far remote are evidenced by lava and volcanic deposits. Thermal and sulphur springs, pumice stone, rock salt, and other phenomena abound.

The water of the Dead Sea is remarkable for the quantity of its saline ingredients. In every hundred pounds of its water there are over twenty-six pounds of saline substances, more than one-fourth. It is nauseous to the taste and smell, and so buoyant that the human body floats upon its surface. The maximum depth in the central portions is 1,315 feet, while the southern lagoon is twelve feet deep in the middle, and at the edges not more than three feet. Geologists have advanced the theory that the inflowing waters carry sufficient saline matter to transform the lake into solid saline deposits within a considerable period of time, unless present conditions become greatly modified by climatic or volcanic changes. The saline density increases as the arid atmosphere carries off inflowing moisture by means of evaporation.

**DEADWOOD**, county seat of Lawrence County, South Dakota, in the Black Hills, on the Chicago and Northwestern and the Chicago, Burlington and Quincy railroads. It is surrounded by a mining region which produces gold, silver, tin, lead, and clays. The chief buildings include the high school, the Franklin Hotel, and the Masonic Temple. Among the industries are flouring mills, brick and lime works, smelters and reduction works, and machine shops. It has waterworks, electric lights, macadamized streets, and telephone connections. Deadwood was settled in 1876 and owes its

growth largely to the development of its mining interests. Population, 1905, 4,364.

**DEAF-MUTES** (dĕf'-mŭts), the persons who are deprived of both hearing and speech, the dumbness resulting principally from deafness existing either at birth or in very early childhood. Dumbness results in this way because deaf children, being deprived of the sense of hearing, are unable to imitate sounds. Imitation being the basis of learning to utter regular sounds, deafness in early life, therefore, is the most prolific cause of dumbness. The per cent. of deafness varies somewhat in the different nations and stages of social and intellectual development, but usually rates one affected individual to every 1,500 to 1,800, the mean being about the usual average. Among the most prolific causes are local or climatic conditions, ill health of the mother, scrofula, and the heredity of certain physical defects. It is certain that deafness is not communicated by heredity, since what is transmitted is but the tendency to such disease, or some anomaly of the auditory organs or of the nervous system, of which deafness is the result or symptom.

Investigations made by the government indicate that about nine per cent. of the children born of deaf and dumb parents, or of whom one is thus affected, inherit tendencies to deafness. This is in accord with the law of heredity, that the offspring tends to revert to the normal type. Deafness is frequently acquired in old age and through such diseases as measles, paralysis, typhus, smallpox, and other cerebral affections, and particularly through violent attacks of scarlet fever, by which the patient suffers from an inflammatory state of the throat, which extends to the internal ear and more or less suppurates and destroys the delicate portions of the auditory organs. No defect is visible in most deaf-mutes, and no application has yet been discovered to render cure possible. Deaf-mutes are obliged to observe and imitate the expressions and actions which attend various states of the mind, by means of which they communicate their feelings and desires to others. This has resulted in the development of the *sign language*, through whose agency deaf-mutes have learned to acquire considerable advancement in educational arts.

Among the early discoverers of the principles underlying the teaching of deaf-mutes is Jerome Cardan (1501-1576), an Italian physician, who published a treatise on the association of writing with speech, and speech with thought, pointing out the fact that written characters and thought can be associated without the intervention of



vocalized sound. The practical instruction of deaf-mutes was demonstrated in France in 1743 before the Academy of Sciences, which institution attested the methods employed by Jacob R. Pereira (1715-1780), a Spanish teacher. In the United States there are ninety schools, including both public and private, for deaf-mutes. They are attended by more than 10,000 students. Nearly all the states have institutions supported by public appropriations for the instruction of deaf-mutes. A national college is located at Washington, and is under the immediate direction of the United States. Conventions and institutes of deaf-mutes have been held in the United States for more than fifty years, while the *American Annals of the Deaf and Dumb* has been published since 1847. The method employed makes use of the manual alphabet, combining it with observations of the lips of the teacher. There are two alphabets—a *one-handed* alphabet and a *two-handed*.

The method of teaching by watching the lips during articulation was first advocated by Samuel Heinicke (1729-1790), an educator of Germany. It is known as the *articulation and lip-reading* method. A public institution based upon his theory of instruction was established in 1779 at Leipzig, Germany, and the institutions of Germany and Austria are still based upon this system. The pupil is taught to recognize words by observing the motion of the lips and tongue of the instructor, who also makes use of diagrams and pictures to facilitate the work. Persons trained by this method are efficient in carrying on a conversation with any one not taught in deaf-mute methods, and it is often quite difficult to see that the speaker is afflicted in any way. In this respect it is superior to the alphabet method, but, like the latter, it is used within sight of the person with whom the conversation is conducted. The German method was adopted by the Clarke Institute at Northampton, Mass., in 1867. In this system pupils are not instructed as early as in public schools, or in courses using the alphabet method. However, it is quite certain that the articulation and lip-reading method is the superior, and is either used or largely combined with the other method in nearly all the schools for deaf-mutes.

**DEARBORN, Fort**, a fortress built in 1803 at the mouth of the Chicago River, near Lake Michigan, on the site of Chicago. Its purpose was to form a defense against the Indians. When war was declared against England in 1812, General Hull, the commander, ordered its abandonment and the withdrawal of the garrison to Detroit as a measure of safety. The Americans were attacked by Indians while retreating

and two-thirds were massacred, including twelve children. The remainder surrendered on promise of safety and were permitted to return to their homes, after being taken to Fort Mackinaw. In 1816 Fort Dearborn was rebuilt and was garrisoned till 1837. The last building was destroyed in the Chicago fire of 1871.

**DEATH** (dĕth), the extinction of life in animals and plants, resulting from a cessation of the vital functions. It sometimes occurs from decay of nature, as in old age, but more commonly from disease and accident. The two forms consist of death of the whole body, and death of a portion, or the *somatic* and the *interstitial*. There are three principal modes of dying—those that begin at the lungs, heart, and brain—and they are respectively designated as suffocation, syncope, and coma. Death by *suffocation* begins at the lungs. In this form the functions of respiration are suspended, after which the heart ceases beating in about three minutes, though the pulse may be felt for some time after all other signs of life have vanished. When the action of the heart ceases from loss of blood, death results by *syncope*, or *fainting*. Death may likewise take place in this form by a decline of the aortic pressure of the heart, by a loss of nerve power, and by starvation. Death by *coma* begins at the brain. It is indicated by profound stupor and the breathing is accompanied by snoring. Human life is of longest duration in individuals that have exercised the powers of the brain, generative system, and other vital organs in moderation, and is curtailed both by disuse and excess. Death ensues when all vitality and power of action is extinct. The claim that a dead body may possess all the organizations it had in life is not to be credited, since death is an entire cessation of all organization and vitality.

**DEBRECZEN** (dĕ'brĕ-tsĕn), a city of Hungary, capital of the county of Hajdú, 135 miles east of Budapest. It is located on a fertile plain, has railroad facilities, and is noted as a market for cattle and swine. The manufactures include soap, clay pipes, flour, sausages, and cotton and woolen goods. Among the buildings is the theater, a library, and the Rathaus. It is famous as the seat of a Protestant college founded in 1531, which has a library of 100,000 volumes. Debreczen became a Protestant town in the seventeenth century and was occupied by a German army in 1849. Population, 1906, 78,843.

**DEBT** (dĕt), an obligation, liability, or claim incurred. Debts are either personal, corporate, municipal, county, state, provincial, or national. It is a well-known characteristic of



many individuals and the government to draw financial aid from the prospects of future development in commercial enterprises. The total indebtedness of the United States, of all interests combined, though small when compared with that of other nations, is so vast that one is astounded when contemplating future payment. The possibility that individuals or states possess for going into debt is often a source of convenience and advantage, in that by means of it enterprises are developed and the prosperity of a country is affected more or less favorably. The total national indebtedness of the nations has been increasing constantly. In 1793 it aggregated \$2,433,250,000, while in 1900 it had reached the enormous sum of \$31,201,759,000, an amount wholly incomprehensible. At the beginning of the Civil War, in 1861, the principal of the public debt in the United States was only \$64,842,288, while the net receipts amounted to \$55,000,000 per annum. The requirement of meeting the expense of the war increased the indebtedness until its greatest height was reached on Aug. 1, 1865, being then \$2,756,431,571.

The following is an abstract showing the indebtedness of the principal countries as ascertained in the early part of 1907:

NAME OF COUNTRY.	TOTAL DEBT.	DEBT PER CAPITA.
Austria-Hungary.....	\$1,092,863,255	\$ 23.07
Brazil.....	512,213,359	37.83
Canada.....	253,997,742	39.44
France.....	5,655,134,825	143.90
Germany.....	855,963,454	14.21
Great Britain.....	3,839,620,745	88.33
Italy.....	2,767,911,949	82.37
Japan.....	932,445,798	19.43
Mexico.....	222,658,181	16.32
Russia.....	4,038,199,722	28.64
Spain.....	1,829,265,995	98.35
Turkey.....	458,603,213	18.39
United States.....	964,435,687	11.11

**DECALOGUE** (děk'á-lŏg), the ten commandments given to Moses on Mount Sinai. They are placed in the Bible before the collection of laws called the Book of the Covenant, but are also found in Deut. v., 1-21. Christ summed them up in two commandments.

**DECAPODA** (dě-kăp'ŏ-dă), the highest order of crustaceans. The members of this order have five pairs of legs, the first pair being enlarged to form claws, as in the crawfish, lobster, shrimp, and prawn. The term is also applied to one of the classes of cuttlefish. They have eight arms and two tentacles, the latter being longer than the arms and serve to seize their prey, or to moor themselves safely in a stormy sea.

**DECAPOLIS** (dě-căp'ŏ-lis), a word mean-

ing ten cities, applied to a district of eastern Palestine prior to the second century A. D. The ten cities included in the district comprised Canatha, Damascus, Dion, Gadara, Garasa, Hippos, Pella, Philadelphia, Raphana, and Scythopolis. It is probable that these cities were built by the Romans in 64 B. C. after the conquest of Syria, and received grants of certain commercial privileges.

**DECATUR** (dě-kă'tēr), a city in Illinois, county seat of Macon County, thirty-seven miles east of Springfield, on the Illinois Central, the Wabash, and other railroads. It occupies a fine site on the Sangamon River. The chief buildings include the courthouse, the public library, and the Millikin University. The manufactures comprise flour, woolen goods, spirituous beverages, ironware, farm machinery, engines and boilers, linseed oil, and furniture. It has gas and electric lights, waterworks, pavements, and street railways. The surrounding country is agricultural. It was settled in 1830 and incorporated in 1836. Population, 1910, 31,140.

**DECCAN** (děk'kăṅ), the name applied to a large scope of country in eastern India, particularly to the portion lying between the Kistna and Nerbudda rivers, but also in a general way to the whole country lying south of the Vindhya Mountains. When applied in the latter sense, it includes the Madras presidency, Mysore, Hyderabad, part of Bombay, Travancore, and other dependent states of India.

**DECEMBER** (dě-sēm'bēr). See Month.

**DECEMVIRI** (dě-sēm'vī-rī), the term applied to the ten men appointed to systematize and codify the public laws of Rome. With this end in view, a number of commissioners proceeded to Greece to study the laws of Solon and other celebrated Greek legislators. On their return in 451 B. C., ten patricians secured an appointment to write the laws under the leadership of Appius Claudius. The laws were set on twelve tables of wood in the Forum, and became known as the Laws of the Twelve Tables. This action on the part of Rome was due to the dissatisfaction of the plebians, because the patricians had no written law to direct them.

**DECLARATION** (děk-lă-ră'shŭn), the act of declaring, or making known, or publishing an avowal or affirmation. The most important declaration is the one issued by the American colonies, which see. A declaration of war is a formal notice that, by the practice of nations, belligerents are expected to give before hostilities begin. The *Declaration of Rights* is a document which was drawn by Parliament in 1689 and presented to William III, and Mary, when they accepted the crown of England. In this



document Parliament announced that the election of members of Parliament shall be free, that Englishmen have the right to carry arms for their own defense, that unusual punishments and excessive fines shall not be inflicted, that public revenues shall not be collected without the consent of Parliament, and that a standing army shall not be raised or maintained in times of peace. Subsequently the *Bill of Rights*, a formal enactment, contained these articles. The *Declaration of Paris* is an instrument signed by the congress of Paris in 1856, which was subsequently accepted by the principal powers. Among the declarations it contained these: Neutral goods, except contraband of war, are not liable to capture under an enemy's flag; privateering should be abolished; the goods of an enemy, except contraband of war, may be covered by a neutral flag; and blockades must be effective in order to be binding.

**DECLARATION OF INDEPENDENCE**, the solemn declaration that severed the thirteen colonies from Great Britain. At the beginning of the struggle a permanent separation was not contemplated. An independent government was so distasteful to the colonies, aside from New England, that Congress declared against it on July 6, 1775. Subsequent events and the publication of Thomas Paine's "Common Sense" set ablaze the spirit of 1776. The Legislature of Pennsylvania was so pleased with Paine's production that it voted him a grant of \$2,500. The Virginia convention instructed its delegates in May, 1776, to propose a resolution of independence. Accordingly Richard Henry Lee offered such a resolution on June 7. The Colonial Congress on June 10 resolved to appoint a committee to prepare a declaration "that the United Colonies are, and of right ought to be, free and independent states." The committee consisted of Thomas Jefferson, John Adams, Benjamin Franklin, Roger Sherman, and Robert R. Livingston. This committee reported a draft of the Declaration on June 28, and on July 2 the colonies were declared free and independent by resolution.

The Declaration of Independence was formally passed July 4, 1776. It was written by Thomas Jefferson and only a few changes were made from the original draft. At that time Congress was in session at the State House in Philadelphia, known as Independence Hall. The old "Liberty Bell" rang out the glad tidings and the beating of drums and firing of cannon followed. John Hancock was the president of the Congress, and the Declaration of Independence was signed by him and the representatives from the different colonies. Charles Carroll (q. v.),

of Maryland, was the last survivor of the signers.

**DECLINATION** (děk-lī-nā'shŭn), in astronomy, the angular distance of a heavenly body from the celestial equator, measured along a great circle passing through the poles of the heavens and through the center of the body. That is to say, it is the angle which a line drawn from the center of the earth to the heavenly body makes with the plane of the Equator. The place of a star in the heavens is determined by its right ascension and declination, which correspond to the longitude and latitude of the earth's surface. Circles of declination are great circles which pass through the poles and cut the Equator at right angles. Twenty-four of these divide the Equator into arcs of 15° each, known as *hour circles* or *hoary circles*. *Magnetic declination* refers to the magnetic needle in the compass, and is the variation of the magnetic needle from the true meridian of a place on the earth's surface. The variation may be either east or west of a place, differs at different points, and is not the same at a given locality at different times.

**DECOMPOSITION** (dě-kōm-pō-zīsh'ŭn), in chemistry, the separation of a compound into more simple substances. When the red oxide of mercury is heated, it undergoes decomposition and is resolved into mercury and oxygen. Water, when subjected to a current of voltaic electricity, is decomposed into hydrogen and oxygen. Decomposition in vegetable and animal matters is due to minute animals or plants, known as *bacteria* and *ferments*. Many decompositions are effected by light, as those of nitric acid and of the silver salts used in photography.

**DECORATION DAY** (děk-ō-rā'shŭn), the day set apart in the United States for commemorating by appropriate exercises the services of fallen soldiers and sailors. The practice originated in the South before the war closed; and for a number of years was observed by individual parties in the North. The widespread custom owes its origin to an official order made by Gen. Logan in 1868, then commander of the Grand Army of the Republic. This order contained the following: "The 30th of May, 1868, is designated for the purpose of strewing with flowers or otherwise decorating the graves of comrades who died in defense of their country during the late rebellion, and whose bodies now lie buried in almost every city, village, hamlet, and churchyard in the land. In this observance no form of ceremony is prescribed, but posts and comrades will in their own way arrange such fitting services and testimonials of respect as circumstances will permit."



The day is usually called Decoration Day, though in some portions of the country the term Memorial Day is used. Different days were observed by the various states for some years, but the 30th of May has been settled upon universally and is a legal holiday in most of the states of the Union. In the South it is commemorated by decorating the graves of those who fought to preserve the Confederacy. Usually the program includes processions, orations, and the floral decoration of the graves. The exercises observed on this day are among the most appropriate and beautiful connected with public events in the history of the United States, and have taken a deep hold upon the people.

**DECOY** (dĕ-koi'), a contrivance to entice wild game into a snare, or lure it to come within the range of a weapon. The decoys used differ according to the game to be secured. Success in the art of alluring depends to a considerable extent upon the close observation of animals and mechanical skill in constructing the contrivances. Wild ducks are attracted by decoys which closely resemble the living animals. They are placed in the water near the shore in such a position that they appear to be swimming. In this way it is possible to allure the ducks to alight, bringing them within gun range of the concealed sportsmen. Other decoys of a similar kind are used to allure geese, brants, and prairie chickens.

**DEDHAM** (dĕd'am), county seat of Norfolk County, Massachusetts, ten miles southwest of Boston, on the Charles River. It is on the New York, New Haven and Hartford Railroad. Among the noteworthy features are the courthouse, the public library, the town hall, the Historical Society building, and several fine churches. The manufactures include pianos, brooms, cigars, woolen goods, and machinery. The first public school supported by a general tax in America was established at Dedham in 1644. Population, 1905, 7,774; in 1910, 9,284.

**DEDUCTIVE METHOD** (dĕ-dŭk'tiv), the mode or process of teaching in which the student is taught to proceed from general truths to particular facts. It proceeds from rules and definitions to particular facts, instead of first investigating particular facts and then forming and applying rules. To illustrate, an explorer who begins at the mouth of a main stream and follows it to its source, then explores its tributaries from their mouths upward, employs the deductive method, which is the reverse of the inductive method. If the explorer were to use the latter, he would trace the various rivulets from their source to the common débouchure, or outlet. In the deductive method the student

reaches the smaller through the greater, the special from the general; while in the inductive method the process is reversed, and the greater is reached through the less, the general through the special. Many branches of study are taught by the deductive method, as geometry, in which the theorems form general truths, and are proven by the demonstration of particular propositions. In psychology we have attained to laws of high generality, hence it offers a wide scope for deduction.

**DEE**, a river of England and Wales, rises in Lake Bala, Merionethshire, and flows by an estuary into the Irish Sea, about 20 miles below Chester. The chief tributaries are the Alwyn and Treveryn, and a canal seven miles long extends from Chester to the estuary. It is about 85 miles long and is connected by canals with the rivers of central England.

**DEE**, a river of Scotland, rises in the vicinity of Ben Macdhui, and flows into the North Sea at the harbor of Aberdeen. The Geauley is the principal tributary near its source, and farther in its course it receives the Lui and Feugh. Balmoral Castle is on its banks. It is about ninety miles long. Another river of Scotland called Dee rises near the northern boundary of Kirkcudbrightshire, and after a course of about fifty miles flows into the Solway Firth. About seven miles of its lower course is navigable. It is noted for its fine salmon fisheries.

**DEED**, an instrument in writing, signed and delivered by the party bound to the donee or purchaser, conveying title to real estate. In some countries it is necessary that the deed be executed under seal, but in others the private seals have been abolished, hence a deed conveying land may or not have a seal, depending upon the state or country where it is executed. In most states it consists of an instrument in writing that has been acknowledged by a notary public or other competent officer, who certifies to it under his seal or official signature. A *warrantee deed* is one in which the party conveying title agrees to defend it against all claimants, while a *quitclaim deed* conveys only what title may be in the party making the deed. A *deed of trust* is similar to a mortgage, the title depending upon the payment of money from the seller to the purchaser. Instruments of this kind, to be valid in some states, must be witnessed by two persons. It is universally required that the wife join the grantor, if he is married, in making the deed, and it must be recorded in the office of the county recorder or register of deeds.

**DEER**, a family of ruminant mammals, most species of which are distinguished by decidu-



ous branching horns or antlers. The horns are solid structures growing from the frontal bone, with many branches and tines, growing to an enormous size. They appear the second spring and are shed each year. In the *reindeer* both male and female bear horns, while in other species the female is hornless. The horns appearing first consist only of the beams. In the second year a basal branch appears, the following year a second branch, and in successive years a greater or smaller number of subdivisions grow from the main beam. Each year's growth is at first covered with a sensitive skin or velvet, which later dries and peels off, and a bony ridge is formed on the antlers just above the base of attachment to the frontal bone. The *water deer*



RED DEER OF EUROPE.

of China and the *musk deer* have no horns. There are no deer in Australia and only a few species are found in Africa, though antelopes take their place, but they are widely distributed in many portions of the other continents and some of the islands. The smallest of the family include the Indian *muntjacks*, while the largest are the *moose* or *true elk*. Among the species common to the colder latitudes are the *reindeer*, *elk*, *caribou*, and *moose*, while in the temperate and warmer regions are found the *fallow deer*, *stag*, *roebuck*, *sambo deer*, and *muntjack*. The *red deer* of Europe is a fine animal, of which the female is known as the *hind* and the male as the *stag*, the latter having large antlers.

The deer family has sharp hoofs with a cleft between and the feet have two toes. In most species the ears are large and the hair is crisp

and thick. They vary in color, though they are mostly brown with reddish tints and white spots. The senses of sight, hearing, and smell are highly developed, thus enabling them to guard against their enemies. Swamps, plains, and forests are alike favorite haunts, though they are seen mostly on hills in the daytime, from which they can take a survey of a large scope and guard against danger. They are fleet of foot, moving with the speed of a race horse when danger confronts them. Their ability to swim is highly developed, the swiftest canoe being alone able to overtake them. The young are born in the spring and kept in a secluded place, which is visited only at odd times in the day by the mother, though it is made her exclusive haunt at night. The food consists of grasses during the warmer season, and of bark, tufts of dried grass, and rushes during the winter. While deer are easily tamed, the reindeer is the only one of the group that has been completely domesticated.

**DEERMOUSE**, or **Jumping Mouse**, a class of small mice that resemble the deer in color and in being active. They are about four inches long and have a tail somewhat longer than the body, and the hind legs exceed in length the fore legs. The deer mouse of Canada is a representative species. It is able to jump ten feet at a bound. Other species are distributed in various parts of Mexico and the United States, and all are rodents that show close resemblance to the jerboas.

**DEFIANCE** (dĕ-fi'ans), county seat of Defiance County, Ohio, fifty miles southwest of Toledo, at the junction of the Tiffin and Maumee rivers. It is on the Wabash and Erie Canal and on the Wabash and the Baltimore and Ohio railroads. The surrounding country is rich in agriculture. Among the chief buildings are the courthouse, the public library, and Defiance College. The industries include wagon works, woolen mills, machine shops, and cigar factories. It has systems of public lighting, waterworks, and street paving. Population, 1900, 7,579.

**DEGREE** (dĕ-grĕ'), in mathematics, the 360th part of the circumference of a circle. The circumference of every circle is supposed to be divided into 360 equal parts, each being called a *degree*. A degree is divided into sixty minutes, and a minute into sixty seconds. The signs respectively are °, ', ". They are written to denote values in this wise: 48° 16' 12", meaning forty-eight degrees sixteen minutes and twelve seconds. It is said that an angle contains as many degrees or parts of a degree as there are in the arc subtended by an angle at the cen-



ter of a circle. We speak of a star as located a given number of degrees above the horizon, or declined a given number of degrees from the Equator. Likewise geographical points are located at certain degrees of latitude or longitude.

A *degree of latitude* is the 360th part of the earth's circumference, north or south of the Equator, while a *degree of longitude* is the 360th part of the earth's circumference measured east or west of a fixed meridian. Since the length of a degree depends upon the magnitude of the circumference of a circle, it is evident that the length of the degrees of longitude is greatest at the Equator and diminishes gradually as we proceed toward the poles, at which a degree equals 0. A degree of longitude at the Equator contains sixty geographical or sixty-nine and one-sixth statute miles. Since the earth is flattened at the poles, the degrees of latitude increase slightly as the poles are approached. The term is also applied to a unit of difference in temperature, called a degree of *Fahrenheit*, when the difference between the freezing point and the boiling point of water is divided into 180 parts; *Centigrade*, when it is divided into one hundred parts; and *Reaumur*, when it is divided into eighty parts.

**DEGREE**, a mark of distinction conferred by colleges and universities on students and others as a testimony of scholarship in the arts or sciences. It is *ordinary*, when conferred upon students, and *honorary*, when conferred upon members or distinguished strangers as a mark of respect. The value and designation of degrees depend upon the branches covered by college and university courses, though they include mostly the degrees of *bachelor*, *master*, and *doctor* in the branches of medicine, law, divinity, music, sciences, and arts.

**DEHORNING** (dē-hōrn'ing), the practice of preventing the growth or removing the horns of cattle. It came into vogue in Europe about the middle of the nineteenth century, and is now practiced very extensively in Canada and the United States. Formerly it was held to be cruelty to animals, but actual experience has demonstrated that dehorning is beneficial to cattle, largely for the reason that it renders them more gentle and docile, hence they feed and may be housed to better advantage. However, the horns should be removed when the weather is mild and at a season of the year when flies are not troublesome. Dehorning is done by placing the animal in a substantial stall, in which its head is held firmly in place, and the horns are cut off near the base with a sharp saw. A better way is to prevent the growth of

horns as soon as the horn button is beginning to develop on the head of the calf, when about four or five days old, and this may be done by applying caustic potash. It requires only a few minutes to make the application, after which a scab forms, but this falls off in about a month, and the horns never grow on the smooth poll that remains.

**DEISM** (dē'iz'm), the tenets or doctrines of a deist. This system of belief admits the being of a God and acknowledges a number of his perfections, but does not hold to the existence and necessity of a divine revelation.

**DEKALB** (de-kālb'), a city in Dekalb County, Illinois, in the northern part of the State, about fifty-eight miles west of Chicago. It is on the Chicago Great Western and the Chicago and Northwestern railroads. The chief buildings include the city hall, the public high school, and the Northern Illinois Normal School. Among the manufactures are ironware, furniture, machinery, clothing, shoes, and farming implements. It was settled in 1838 and incorporated in 1877. Population, 1900, 5,904.

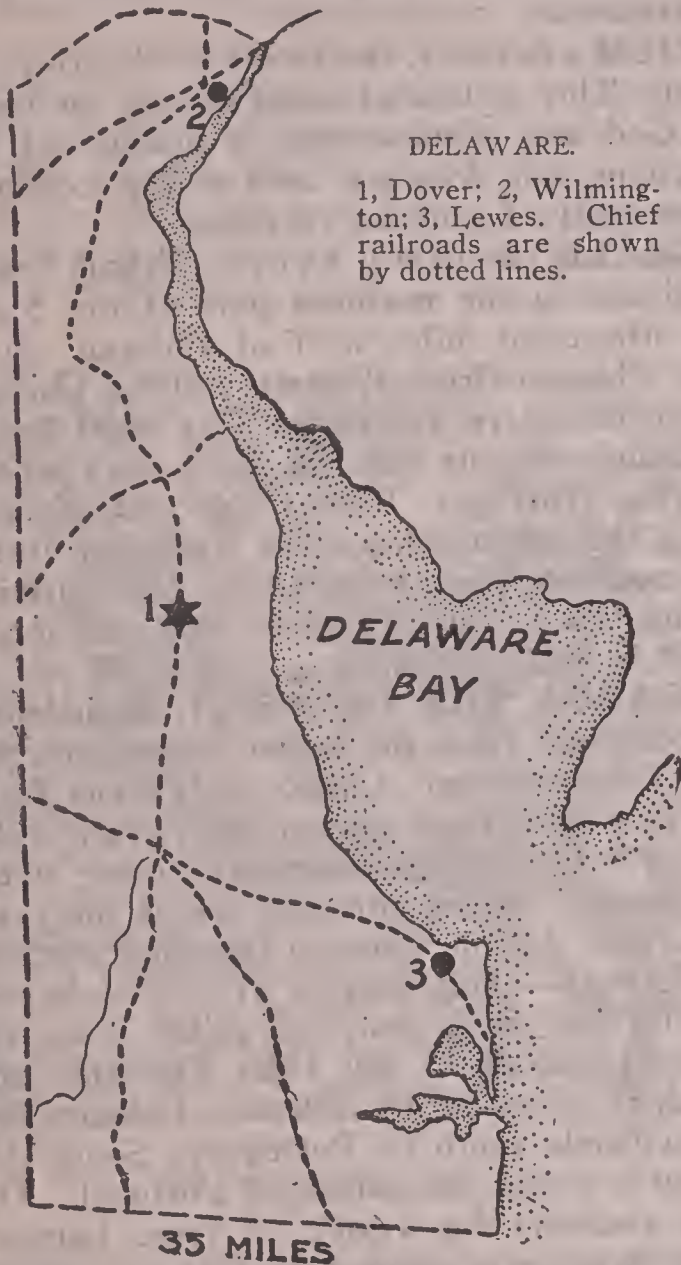
**DELAGOA BAY** (dēl-a-gō'ā), an indentation extending from the Indian Ocean into the coast of Southeastern Africa. It is about forty miles long and from sixteen to twenty miles wide. The Crocodile, Maputa, and other rivers flow into it. At the northern end is the town of Lourenço Marques, one of the chief ports of South Africa. This port is of special importance because it is only 52 miles from the Transvaal and about 350 from Pretoria, with which it is connected by railroads. Delagoa Bay is immediately south of Portuguese South Africa and is under the control of Portugal. The bay is available for vessels of large tonnage, though there are a number of flats and shoals, making navigation quite intricate. In the war between England and the South African republics the bay was a neutral district, and the only one by which the two republics had access to commerce not passing over British territory.

**DELAWARE** (dēl'ā-wār), a State of the United States, one of the thirteen original states, popularly called the Diamond State. Next to Rhode Island it is the smallest State in the Union. It is bounded on the north by Pennsylvania, east by the Delaware River, Delaware Bay, and the Atlantic, which separate it from New Jersey, and south and west by Maryland. The greatest length from north to south is 95 miles; greatest width, 35 miles; and area, 2,050 square miles. It has a water surface of 90 square miles. Cape Henlopen, opposite Cape May, N. J., projects into Delaware Bay.

**DESCRIPTION.** The larger part of the State is



located in the Atlantic coastal plain and has an elevation of about 50 feet above sea level, but in the extreme north is a small hilly section. The elevations are not more than 280 feet above the sea and are highest near the boundary of Pennsylvania. Much of the southeastern part is characterized by sandy ridges and the region



near Delaware Bay contains a number of extensive marshes. Cypress Swamp, in the extreme southern part, has an area of about 75 square miles.

A number of small rivers supply the interior drainage, most of which flow into Delaware River and Delaware Bay, and several flow toward the southwest into Chesapeake Bay. The soil is generally fertile, with forests in the northern and western parts. It has a temperate climate, with ample rainfall and healthful conditions throughout the year. In the extreme south the average annual temperature is about  $56^{\circ}$  and in the northern part it is about  $52^{\circ}$ . The lowest winter temperature is about  $17^{\circ}$  below zero, though this is rare, and the highest in summer ranges from  $90^{\circ}$  to  $103^{\circ}$ . The earliest frosts in autumn occur from the 10th to the

15th of October and plants begin to grow the early part of April. A slightly larger rainfall occurs on the coast than in the section inland, but the average for the State ranges between 42 and 48 inches.

**MINERALS.** Situated entirely within the Atlantic coastal plain, the State is underlain by rocks of recent geological formation. Kaolin and a good quality of clay are found in the vicinity of Wilmington, where they are quarried for use in manufacturing. In the vicinity of that city are deposits of granite and some feldspar. A good class of glass sand is widely distributed, and marls and bog iron ore deposits occur in many places. The output of granite is the most important.

**AGRICULTURE.** Nearly 75 per cent. of the surface is utilized in farms and agriculture ranks as the leading industry. Most of the farms are small, ranging from 50 to 75 acres in extent, and comparatively few have more than 160 acres. The soil is tilled with much care and fertilizers are used very extensively. Corn and wheat are the chief cereals and hay takes third rank in the acreage. Stock raising is a secondary industry, but considerable attention is given to the rearing of horses and to dairy farming. Many large orchards are cultivated, the chief products being apples, peaches, and many varieties of small fruits. Vegetables are grown extensively for the Philadelphia and New York markets. The soil and climate are especially adapted to the cultivation of tomatoes, and about 15,000 acres are planted in that product annually.

**MANUFACTURING.** The location of Delaware gives it good opportunities in the manufacturing industry, especially in that it has extensive transportation facilities and is located near large markets. Iron and steel products comprise the leading manufactures. The leather industry takes rank as the third in the value of the total output. Canning is an important enterprise, both in fruits and vegetables. Other manufactures embrace machinery, railway cars, sailing vessels, cotton and woolen goods, carriages and wagons, and clothing. The oyster and sturgeon fisheries yield large returns, much of the product being canned and cured for export. A small output of wood is obtained for manufacturing in the swampy districts, especially cypress.

**TRANSPORTATION.** The northern part of the State is crossed from northeast to southwest by two trunk railways, the Pennsylvania and the Baltimore and Ohio, and all parts of the State have convenient railway facilities. The lines in operation aggregate about 400 miles. They include the Philadelphia and Reading, the Queen



Anne, and the Baltimore and Delaware railroads. Electric railways are operated to a considerable extent and a canal fourteen miles long connects the Delaware River with Chesapeake Bay. At Lewes, near Cape Henlopen, is an extensive breakwater that cost about \$2,225,000. Much of the foreign trade is with Baltimore and New York, though a small per cent, is carried through the port at Wilmington, which is a customs district.

**GOVERNMENT.** The executive branch is vested in a Governor, who is elected for a term of four years, but is not eligible for a third term. A similar provision governs the election of the Lieutenant Governor, who presides over the Senate. Two houses constitute the legislative department, the Senate of 17 members and the House of Representatives with 35 members. Members of the Senate are chosen for four years and representatives for two years. Six judges constitute the judiciary, one of whom is chief justice and one is chancellor. All the judges are appointed by the Governor for a term of twelve years, subject to confirmation by the Senate. Delaware has one representative in the Lower House of Congress, hence is entitled to three electoral votes.

**INHABITANTS.** The population is 94 to the square mile. All of the leading religious denominations are represented, including chiefly the Methodist Episcopal, Presbyterian, Baptist, Protestant Episcopal, Roman Catholic and Lutheran. Dover, the capital, is located in the central part of the State. Wilmington, the largest city, is in the northern part, on the Delaware River. Smyrna, New Castle, and Lewes are among the business centers. In 1900 the State had a population of 184,735. This number included a Negro population of 30,687, or 16.6 per cent. Population, 1910, 202,322.

**EDUCATION.** The system of public schools is based upon a plan adopted in 1875. Support is obtained from direct taxation levied locally and from certain fees and licenses. No normal schools are maintained by the State, but each county has a teachers' institute. Separate schools are maintained for white and colored children. Delaware College, which is open to both sexes, is located at Newark. A college for colored students is maintained at Wilmington and an insane asylum at Farmhurst, and ample provision has been made for the education of the deaf, dumb, and blind.

**HISTORY.** Delaware was so named from Lord de la Warr, who explored Delaware Bay in 1611. The history of the State is closely linked with the early settlement and development of America. A company of Dutch traders, in 1631,

planted a colony near the present site of Lewes. In 1638 a number of Swedes and Finns made the first permanent settlement on the site of Wilmington, where they built Fort Christina. The Swedish claim was under a grant from Sweden. Peter Minuit, a Dutchman, was sent to purchase the land west of the Delaware River, situated between Cape Henlopen and Trenton Falls, from the Indians. The Dutch laid claims to a portion of this district and built Fort Cassimir, and in 1655 secured control of the entire Swedish possessions.

Delaware, together with New York, passed into the hands of England in 1664, and became vested in William Penn by purchase in 1682. In 1693 it was organized as a part of Pennsylvania, but was separated as a distinct colony in 1711. It adopted a constitution as a separate State in 1776, supported the Declaration of Independence in the same year, and in 1787 was the first State to ratify the Federal Constitution. Though holding slaves, it did not secede from the Union at the time of the Civil War, but many of its citizens joined the Confederate army. The Legislature denounced the fourteenth amendment to the Constitution, and an ill feeling prevailed against the negroes for many years after the Civil War. In the development of commerce and industrial enterprises it has made great strides of progress since 1865.

**DELAWARE**, county seat of Delaware County, Ohio, 23 miles north of Columbus, on the Whitstone (Olentangy) River. It is on the Pennsylvania, the Hocking Valley, and the Cleveland, Cincinnati, Chicago, and Saint Louis railroads. Among the chief buildings are the high school, the courthouse, the public library, and the Ohio Wesleyan University (Methodist). The manufactures embrace woolen goods, earthenware, furniture, machinery, and vehicles. Gas and electric lights, waterworks, telephones, and pavements are among the improvements. It was incorporated in 1827. Population, 1900, 7,940.

**DELAWARE BAY**, a large extension from the Atlantic Ocean, separating Delaware from New Jersey. It is about 50 miles long and 27 miles wide, and is important as an avenue of commerce. Besides receiving the waters of the Delaware River, it receives the inflow of the Maurice and other streams. The Delaware River is about four miles wide at the mouth, and the bay at the entrance between Cape May and Cape Henlopen has a width of about thirteen miles. The Federal government constructed an extensive breakwater from the latter point, by which the bay, at Lewes, is made an excellent harbor. It facilitates the safe pas-



sage of the largest vessels to Philadelphia and other commercial centers.

**DELAWARE RIVER**, an important river of the United States. It rises in southern New York, forms a part of the boundary between that State and Pennsylvania, the boundary between the latter State and New Jersey, and a portion of the boundary between Delaware and New Jersey. Its general course is southward, though it makes several bold turns, and it discharges into Delaware Bay. It passes through the Kittatinny Mountains near Stroudsburg, Pa., flowing through the Delaware Water Gap, a place remarkable for its beautiful scenery and rock gorges. Trenton and Philadelphia are the most important commercial centers on the river; the former is at the head of navigation and the latter is at the point reached by the largest vessels. The entire length of the river is about 300 miles. Its principal tributaries are the Schuylkill and the Lehigh. Several canals connect it with the Hudson River. The fisheries, consisting principally of shad, are noted for their commercial value.

**DELAWARES** (děl'á-wârz), an Indian tribe of the Algonquin family. They dwelt originally on the Delaware River and were largely under the control of the Five Nations. William Penn bought a large tract of land from them, and important trade relations were maintained with them by the Swedes, Dutch, and English. Their warriors fought at Braddock's defeat, aided in the war with Pontiac, and assisted the Union in the Civil War. Large numbers were converted to Christianity by the Swedes and Moravians, beginning in 1740. Shortly after the Revolution the tribe emigrated to Ohio, in 1818 to Missouri, in 1829 to Kansas, and in 1868 to Indian Territory (now Oklahoma). The United States granted to them the privileges of citizenship in 1866, divided their money and lands among them, and gave them educational aid. They are well advanced in the industries and professions, own their homes, and fill useful functions in life. At present they number about 1,000. Tammany was among their best known chiefs. His name has been given to an influential political society of New York.

**DELAWARE WATER GAP**, a narrow gorge in the course of the Delaware River, near Stroudsburg, Pa., on the borders of New Jersey and Pennsylvania. It is a low gap in the Kittatinny Range of the Appalachian Mountains, which rise in abrupt cliffs a height of 1,400 feet above the water. The region has been converted into a popular summer resort and is reached by rail from New York and Philadelphia.

**DELFT** (dělft), a city of Holland, on the

Schie River, about six miles southeast of The Hague. It is important as a commercial center, being situated on a number of railways and intersected by numerous canals. A Gothic church, called the Oude Kerk, dates from the 15th century. Another Gothic church, the Nieuwe Kerk, has a tower 375 feet high and contains 500 bells. William I. of Orange was assassinated in the Prinsenhof, which now serves as a museum. Among the educational institutions is a polytechnical school with an attendance of 700 students. The manufactures include delftware, a celebrated kind of earthenware, carpets, ammunition, soap, and cotton and woolen goods. Electric lights, waterworks, and extensive electric railway lines are among the public utilities. Population, 1906, 33,916.

**DELHI** (děl'hî), a city in the Punjab district of India, on the Jumna River, about 830 miles northwest of Calcutta. Solid stone walls secure three sides, through which entrance to the city is effected by ten gates, the other side being protected by the water front. The site of the city is on a high eminence, being clean and healthful, and it has important railroad connections with the principal commercial centers of India and Southern Asia. The former extent of this metropolis is marked by vast ruins of gardens, pavilions, palaces, and mausoleums. Among the noteworthy buildings is the celebrated Shah Jehan palace, commenced in 1631, located in the eastern part of the city. It has a length of 3,200 feet and a breadth of 1,600 feet. Its carvings and decorations are among the finest in the world. The Great Mosque, or Jamma Musjid, is a famous structure after the Byzantine-Arabic style, erected in the 17th century by Emperor Shah Jehan. Another structure of note is the Minar, built in the 13th century, containing pillars 48 feet in diameter at the bottom and 10 feet at the top, with a height of 240 feet. Numerous inscriptions from the Koran and fine fresco work adorn the winding staircases and the walls. The city has been improved greatly within recent decades. It has broad streets, electric lights, and street railways, and is noted as an extensive wheat market. Its bazaars are famous for trading in fabrics, precious stones, and gold and silver work. A public school system is maintained and a government college, founded in 1792, constitutes a center of higher learning. It has a number of Protestant churches, government buildings, and numerous Eastern places of worship.

Delhi was formerly the largest city of Hindustan and for some years was the capital of the Afghans, but subsequently became a part



of the Mongol Empire. In 1803 it was made a part of the territory of the British, who have controlled it since that time, except for a brief period during the Sepoy mutiny of 1857. More than one-half of the population are Hindus. Population, 1906, 219,468.

**DELIRIUM TREMENS** (dê-lîr'î-ûm trê'měnz), a derangement of the mind attended by extreme nervous agitation and hallucinations, due chiefly to the excessive use of alcoholic liquors. The disease is most prevalent among spasmodic drunkards, the principal symptoms being delirium and trembling. The former is constantly present, while the latter is not perceptible in many instances. At certain stages the sufferer is impressed by seeming to see frightful and extraordinary objects, during which he suffers great fear and mental agitation, which put him in a state of extreme terror. Total abstinence, rest, and wholesome nourishment are the chief requirements in the immediate treatment.

**DELOS** (dê'lôs), the smallest island of the Cyclades, in the Grecian Archipelago, with an area of about twelve square miles. The surface is a rugged mass of granite, and near its center the rocky peak of Mount Cynthus rises to a height of 350 feet above sea level. The island is celebrated in the song, myth, and history of Greece. Myths make it the scene of the birth of Apollo and Artemis, and, though once a floating mass, it was fixed to the bottom of the sea by Zeus that it might become celebrated by the birth of these noted personages. It was the scene of a festival to Apollo, at which the Greeks from many nations gathered. In 477 B. C. the Confederacy of Delos was formed with Athens at its head, the name being derived from the meeting of its deputies at the temple of Apollo, in which the treasures of the confederation were stored. Delos became a commercial center after the fall of Corinth in 146 B. C., and was famed for its favorite markets and fine harbors. Excellent palm groves grew in its public places, and brazen vessels abounded in vast numbers. In the year 87 B. C. it was laid waste by the Mithridatic War. At present brushwood is quite common and small fields of corn are cultivated by the natives.

**DELPHI** (dêl'fi), a celebrated town of ancient Greece, in the territory of Phocis, noted principally on account of the most important temple and oracle of Apollo. Its location was about six miles from the Corinthian Gulf, hemmed in on the north by the wall-like cliffs of Mount Parnassus, on the south by Mount Cirphis, and on the east by smaller ridges.

The Plistus flowed from east to west and drained the region of its surplus waters. The site of the ancient town is occupied at present by the village of Castri. The main point of interest still remains distinguishable, though it was somewhat altered by an earthquake in 1870.

Delphi was noted as the meeting place of the Amphictyonic Council and near it the Pythian games were held. The celebrated oracles were delivered by a priestess, who occupied a tripod over an opening in the ground, from which came intoxicating vapors accompanied by the inspiration of the Delphian god. The replies that came from the oracle were quite obscure and dual in meaning, but served in the regulation and support of the political, civil, and religious autonomy of the Greeks. These oracles grew in fame from the 9th century B. C. until they were abolished, long after the Christian era, by Emperor Theodosius. The temple of Apollo was destroyed, but rebuilt, and added to at various times. The last structure was built in the 5th century B. C., which was the most beautiful and magnificent, costing 300 talents, about \$575,000. In it were statues by the great sculptors of Greece, and it was decorated by paintings of the foremost masters of the Grecian art. In the times of Pliny, Delphi contained more than 3,000 statues, and a golden cast of Apollo stood within the temple. It was plundered at various times, but principally by Nero and Constantine.

**DELPHOS** (dêl'fôs), a city of Ohio, in Allen County, fifteen miles northwest of Lima, on the Pennsylvania, the Toledo, Saint Louis and Western, and other railroads. It is finely located on the Miami and Erie Canal and is surrounded by a farming section. Mineral oil is obtained in the vicinity. The manufactures include lumber products, machinery, and farming implements. It has a system of waterworks, electric lights, and several fine school buildings. The first settlement on its site was made in 1834 and it was incorporated in 1851. Population, 1900, 4,517.

**DELSARTE SYSTEM**, the name applied to a method of general physical culture now highly popular in America and Europe. It has been adopted in the schools of many cities, in colleges, and in private institutions, and is largely employed in regular courses of instruction. The originator, François A. Delsarte, asserted that every outward manifestation is the expression of an inner state. He classed the head as the *mental* organ, the trunk as the *emotional* organ, and the limbs as the *primary vital* organs. The mental movements proceed



toward the center, the normal around the center, and the vital from the center. In general the laws of force, rhythm, direction, reaction, succession, velocity, and opposition should govern bodily movements. The influence of systematic application has been efficient in developing the high quality of orators, dramatists, and elocutionists, giving them a fine quality of vocal utterance, gesture, and expression in accordance with the higher art of elocution. Besides the effect upon physical development, it has had a wholesome influence upon delivery and expression.

**DELTA** (děl'tà), the name of the Greek letter which corresponds to the letter D. The term was applied to the deposits of silt at the



DELTA OF THE NILE.

mouth of the Nile, on account of its resemblance to that letter. Since then the same name has been given to the alluvial tracts deposited by many of the great rivers, the waters of which flow into the sea by two or more branches. Deltas occur only where the mouth of a river is sheltered from the ocean and the tides and oceanic currents are weak, or in inland lakes and seas where the movement of tides and ocean currents are entirely absent. The delta of the Mississippi is the largest in America. It has an area of 12,300 square miles, two-thirds of which is permanently above water, while the remaining portion is a sea marsh. It begins a short distance south of the confluence of the Red River and extends far into the Gulf of Mexico. The delta of the Nile, which has its outlet into the Mediterranean, has an area of about 9,000 square miles, and is enlarging continually by the sediments deposited annually, which are carried from inundated regions. The delta of the Ganges and the Brahmaputra, in the Bay of Bengal, exceeds the size of the delta of the Nile. Countless islands have been formed by the deposits and numerous streams wind their way among them in various directions. Among the most important deltas of Europe are those of the Po, Rhone, and Rhine; in Africa, those of the Nile, Zambezi, and Sen-

egal; in Asia, those of the Ganges, Brahmaputra, Euphrates, Indus, Yang-tse-Kiang, and Hwang-ho.

**DELUGE** (děl'új), a flood or torrent of water, lava, fire, or melted stone. The name is applied in particular to the flood mentioned in Genesis vi-ix. This remarkable flood was predicted by Noah and is generally credited to the year 2348 B. C. There are various stories of vast floods similar to those mentioned in the Bible. They have been handed down from remote antiquity by various races. In the Hindu story the god Vishnu is represented as giving warning to Prince Satyavarata of an approaching flood, and a vessel was furnished to him in which he and a number of others were saved. The person told of in the Chaldaean history as surviving a flood is Xisuthros, who was carried by a ship over a deluge which is said to have lasted seven days, and he, like Noah, is said to have sent birds out for the purpose of ascertaining whether the flood had subsided. The people who lived prior to the flood of Noah are usually spoken of as antediluvians.

**DEMOCRACY** (dě-mök'rá-sỹ), that form of government in which the ruling power or the principle of sovereignty is exercised by the people. It first existed in Greece, where it was advocated by Pericles, and is mentioned in the writings of Herodotus and Aristotle. The result of experience in government for ages has demonstrated that public virtue and good intention are most likely to abound where the people have a voice in making and executing the law. The people as a whole generally mean to be just and do right, and are, as a rule, possessed of a degree of patriotism and public spirit. A pure democracy is impracticable in a large and populous country, but its principles may be embodied in a representative form. In such a government the people are represented by the voters, whose qualifications to vote are generally defined in a constitution called the fundamental law of the nation.

**DEMOCRATIC PARTY** (dēm-ō-krät'ík), one of the most important political parties of America, having been in continual existence for more than a hundred years. The rise of such a party in the nation under the new Constitution was natural. In the minds of most Americans the love of individual liberty was native, rather than the desire for a strong central government. Those who felt this need most strongly were naturally quite likely to look with apprehension upon the possibility of its being encroached upon by the Federal government. For this reason they advocated a strict construction of the Constitution and



states' rights. These elements of political thought drew the Anti-Federalists together in 1788, and party feeling was further extended by the strong sympathy of many Americans with the French revolution. The view that the government should extend aid to France in its contest with England greatly quickened the public pulse. Thomas Jefferson put himself at the head of the party drawn together by agreement in these views and led the opposition to the Federalists. The party became known as the Democratic-Republican, which is still its official title. Its members were commonly called Republicans before Monroe's administration and since then most commonly Democrats.

The party was in opposition to the administration from its origin in 1792 to 1801, and from the first was strongest in the Southern States. With the election of Jefferson in 1800 it came into power. Among the chief tenets of the party was belief in the freedom of speech, of the press, of religion, of politics; in economical government, popular rule, hospitality to immigrants, and the avoidance of foreign complications. The Federalist party went out of existence after the War of 1812 and the Democratic party came into the chief possession of the field. Later questions regarding commercial revenues, free trade, national banks, and other nationalizing measures divided the party and caused the organization of the Whigs. In 1829 Andrew Jackson led a new element into the party and gave to it the popular character under an enlargement of suffrage. From this time it won every presidential election but two until 1860, when it was divided regarding the slavery question. The Southern leaders advocated slavery, while the Northern portion favored preserving the Union, thus making it possible for the newly organized Republican party to elect its President.

Among the important measures obtained during the Democratic administrations may be named legislation favorable to agricultural interests; the purchase of Louisiana, Florida, and the Gadsden tract; and the enlargement of the commercial influence of the nation. It promulgated the Monroe Doctrine. The Democratic party carried the nation through the War of 1812 and the Mexican War, secured the annexation of Texas, discontinued the United States bank, and greatly widened civil service reform. Among the tenets in regard to which it differs from the Republicans at present are those relating to a tariff revenue, those in opposition to a large standing army, those relating to conquests in foreign countries, and the organization of the national system of finance.

It advocates the election of United States senators by a direct vote, strict adherence to the merit system in civil service, an opposing policy to trusts controlling productions and prices, and favors public ownership of various institutions of public utility. The presidents elected by the party, or representing Democratic views, include Thomas Jefferson, James Madison, James Monroe, John Quincy Adams, Andrew Jackson, Martin Van Buren, James K. Polk, Franklin Pierce, James Buchanan, and Grover Cleveland. These presidents represent administrations which cover a total of sixty years.

**DEMON** (dē'mōn), a name applied anciently to a spirit or immaterial being of supernatural powers, supposed to hold a middle place between men and the celestial deities. The ancient Greeks regarded demons in the same light that Christians look upon angels, but the name is now applied to an evil spirit or a fiend. Evil spirits are termed demons in the New Testament, but in making translations the name has come to be displaced by the word *devil*. *Demonology*, that branch of the science of religion which relates to demons, is obscured in the treatises of old writers in that the sources of information are related wholly to the civilized nations, instead of at least in part to the primitive and barbarous tribes. Ideas of demons still prevail to some extent even in civilized life, as is evident by the so-called spirit manifestations of modern times.

**DEMURRER** (dē-mūr'rēr), in law, a suspension of the proceedings in a cause until some point is determined by the court. A demurrer is a plea filed to a petition, answer, or reply, and raises a question as to the sufficiency of the case as stated by the opposite party, or some particular part thereof. Only questions of law are raised by a demurrer, which are tried by the court. When a demurrer is sustained, the effect is to lay the pleadings demurred to out of the case, unless the petition is so amended as to avoid grounds on which the court sustains the demurrer.

**DENARIUS** (dē-nā'rī-ūs), a silver coin used by the Romans. Originally it contained ten and later sixteen of the monetary denomination called *as*, which was a small copper or bronze coin. It had a monetary value equal to about fourteen cents of the money used in Canada and the United States. The gold *denarius* was equivalent to twenty-five silver *denarii*.

**DENISON** (dēn'ī-s'n), a city of Texas, in Grayson County, situated near the northern boundary of the State. It is on the Saint Louis and San Francisco, the Missouri, Kansas and Texas, the Texas and Pacific, and other rail-



roads. The noteworthy features include the Washington School, the public library, and the Saint Xavier's Academy. Among the manufactures are ice, ironware, canned goods, earthenware, and machinery. It has systems of electric lighting, sewerage, waterworks, and street pavements. The vicinity was settled in 1872 and the city was chartered in 1891. Population, 1900, 11,807

**DENMARK** (dĕn'märk), a kingdom in the northwestern part of Europe, including the peninsula of Jutland and an archipelago lying east, and comprising among others the islands of Laaland, Zealand, Falster, Fünen, Samsö, Lessö, Langeland, Aerö, Bornholm, and Moen. It is bounded on the north and west by the North Sea; east by the Cattegat, the Sound, and the Baltic Sea; and on the west by Germany. A part of the northern shore is on the Skager-Rak. The area, including the Faroe Islands and the islands of the Baltic Sea, is 15,592 square miles. Nearly the entire country is surrounded by the sea, the peninsula of Jutland being connected with the continent by a narrow neck of land which is less than forty miles wide.

**DESCRIPTION.** The North Sea washes the northwestern coast, which is low and cut up by bays, but the eastern coast is slightly more elevated and indented by a series of fjords. Limfjord, in the northern part of Jutland, extends across the peninsula from the Cattegat to the North Sea. The interior of Jutland is crossed by a ridge of hills, extending from the southern frontier to the Limfjord, and forming the watershed between the Cattegat and the North Sea. Guden Aa, the largest river of Denmark, has a length of 100 miles and flows into the Cattegat. About eighty per cent. of the soil is productive, the surface having no elevations higher than 600 feet above sea level. The coast is largely uninhabitable on account of drift sands that form a narrow line of unproductive flats called klitter.

Formerly Denmark had extensive forests of pine and fir, but these trees are now confined chiefly to cultivated lands. The fir was the prevailing tree in former ages, but now the oak and the beech are the most numerous. Other trees in the forests include the aspen, ash, elm, birch, willow, and pine, the last mentioned having been planted to some extent in the marshy and sandy districts. At Copenhagen the mean temperature is about 60° in summer and 32° in winter, and the islands have a somewhat milder climate than that of Jutland. Mists are frequent in summer and heavy rains occur in autumn. Aquatic birds are numerous, and salmon, oysters, and herring abound in the waters off the coast.

The climatic conditions are temperate and favorable to health and commercial activity, owing largely to the modifying influence of sea breezes.

**AGRICULTURE.** Much of the land is divided into small holdings and the system of tenure is largely peasant proprietorship. The importance of agriculture is constantly increasing, owing to the remarkable care and skill exercised in maintaining fertility and redeeming waste and unproductive lands. Dairy farming is the chief source of profit; the production of milk, butter, and cheese greatly exceeds the home consumption of these products. The coöperative plan is used in fostering the dairy industry as well as some departments of general farming. Oats, rye, barley, and wheat are the principal crops. Potatoes and beet roots are grown extensively. The culture of fruits and small gardening receive much attention. Cattle are raised chiefly for dairying purposes. Other live stock grown extensively include sheep, horses, and swine.

**MANUFACTURING.** Denmark has few mineral deposits, hence its manufacturing enterprises are conducted chiefly on a small scale. Salt, gypsum, and coal are found to a limited extent, though the output of the last mentioned is not sufficient to supply the demand of the industries. Copenhagen is the chief manufacturing center and is noted for its output of porcelain, locomotives, and spirituous liquors. Other manufactures include sugar, pottery, cotton and woolen fabrics, boilers, leather goods, and machinery. Iron smelting is carried on to some extent and fish and oyster canning is a productive industry.

**TRANSPORTATION AND COMMERCE.** All parts of Denmark have convenient railroad facilities, the lines aggregating about 1,950 miles, most of which are under government ownership and control. The chief commercial centers are located on the coast or navigable streams, or are connected by a network of canals. Telegraph and telephone lines furnish communication facilities with all urban and interurban points. The imports exceed the exports. At present the principal trade is with Germany, Great Britain, the United States, Sweden, and Russia in the order named.

**EDUCATION.** An excellent system of public schools is maintained. Attendance is compulsory from the age of seven to fourteen years. Practically the entire adult population has been educated in the elements of learning, while a large per cent. has enjoyed the benefits of higher education. The public schools, colleges, and universities under state or municipal control are maintained by public taxation. Schools for instruction in the industries and agricultural arts in the provinces are liberally attended.



Hulberg Academy at Sorö and the splendid university of Copenhagen are the chief institutions of higher learning.

**INHABITANTS.** The people of Denmark are almost exclusively Danes, including only a small per cent. of Jews and others. They are a Teutonic people of the Scandinavian group, and are characterized by a light complexion, blue eyes, and light brown or chestnut hair. Lutheran is the state religion and is the faith of nearly the entire populace, though religious liberty is extended to all. Copenhagen, the capital and largest city, is located on the island of Zealand, on the Sound. Other cities of importance include Aalborg, Aarhus, Frederiksberg, Odense, Randers, Horsens, and Fredericia. Population, 1906, 2,605,268.

**GOVERNMENT.** The government is a constitutional monarchy. Legislative authority is vested in the national legislature or *Rigsdag* which is composed of the upper house, or *Landsting*, and the lower house, or *Folkething*. At present there are 66 members in the Landsting and 114 deputies in the Folkething. The king is the chief executive and has power to veto bills. He is assisted by the eight ministers of finance, foreign affairs, interior, navy, justice, war, public instruction and worship, and agriculture. The supreme court of twenty-four judges is the highest judiciary, under which justice is administered by the courts of appeal and the officials in rural communities. The nominal war footing is 60,000 men and a standing army of 10,000 men is maintained. Its navy serves only for purposes of coast defense.

**COLONIES.** The foreign possessions of Denmark embrace Greenland, Iceland, and the Danish West Indies. The last mentioned include Saint Croix, Saint Thomas, and Saint John. These colonies have a total area of 87,614 square miles and a population of 121,500. The colonial trade is chiefly with the mother country, and Iceland is the most important colonial possession.

**LANGUAGE AND LITERATURE.** The Danish language is a branch of the Scandinavian division of the Germanic family of languages, and is closely associated with the Swedish and Norwegian. It was modified by the addition of foreign words in the 11th century, particularly by the introduction of Anglo-Saxon terms, and in the 18th century it was again affected by the extension of German culture. As a whole it may be classed as the most modern of the Scandinavian tongues, being influenced more largely by foreign elements than either the Icelandic or Swedish, and, as a whole, is soft and monotonous, making some of the sounds quite

difficult for foreign students to learn. Both the German and Roman characters are used in writing, and the language as a whole had a large modifying influence on the spoken language of Norway, owing to the fact that these countries were long united for governmental purposes. The literature dates from about the 12th century, when the codes of the ancient kings were collected, and many of the songs and ballads of the Scandinavian Sagas were incorporated with local folklore and short poetic productions. Christian Pedersen (1480-1554) translated the New Testament into the Danish at the time of the Reformation, and later published the complete Bible and various treatises written by Luther. Ludvig Holberg (1684-1754) founded the Copenhagen Theater and not only wrote poems and plays, but induced interest in other writers. He may be regarded the founder of the Danish stage, and from his time dates the modern period of Danish literature. His several writings include "Arabian Powder," "The Pewter Statesmen," and "History of Denmark."

Johannes Evald, a writer of considerable note, wrote the national song, "King Christian at the High Mast Stands," and several plays, including "Harlequin Patriot" and "Baldu's Death." Jens Baggesen holds first place among the song writers; Peder Andres Heiberg, among the comic dramatists, and Adam Oehlenschläger (1779-1850) is the most celebrated poet of the last century. The latter adapted many of the interesting details in the mythology of Scandinavia and was the means of bringing the tales of the Edda and the old Norse heroes to the favorable attention of the stage. Adolf Wilhelm Schack Staffeldt (1770-1826) was a contemporary of the former, and took first rank as a lyric poet, while Bernhard Ingemann produced lyric poetry and dramatic works of value.

Hans Christian Andersen ranks among the most famous Danish novelists. His works are largely in the form of short fairy tales, but they are charming to a large class of readers, and have been widely translated. Steen Blicher (died, 1848) is a novelist of note, and his writings are popular because of the beauty with which he describes the customs and characteristics of the people of Jutland. Carl Edvard Brandes (born, 1847), one of the leading recent writers, is the author of "The Remedy" and "Under the Law." Many Danish writers have contributed much of value to the general store of history, astronomy, mathematics, geography, and music.

**HISTORY.** The history of Denmark dates back to the remote past, when the Saga heroes were



noted for daring voyages and deeds of bravery in defense of their country. The oldest inhabitants of which we know were the Cimbri, who joined the Teutons and brought terror to Rome by successive invasions of the provinces of Gaul. Later the Angles, Saxons, and Jutes invaded and conquered England, while the Danes came from Zealand to take their places. Denmark was divided into a large number of small provinces for some time, but, invaded by the Franks and preyed upon by the famous vikings, the people were at last driven to the necessity of forming a united federation as a better means of defense. Later Gorm the Old united the islands and mainland under one dominion and opposed the advance of Christianity begun by the preceding rulers, though he greatly strengthened the general government.

Sweyn, grandson of Gorm the Old, began the conquest of Norway and England, which was accomplished by his son, Canute. His successor lost England in 1042 and Norway in 1047, and his reign was further weakened by the growth of the feudal system, by which the poorer class of people were reduced to serfdom. Norway was conquered by Waldemar I. and Waldemar II. made advances upon Germany, though these were lost under his successor. Queen Margaret ascended the throne in 1387 and established the Union of Calmar ten years later, by which Denmark, Norway, and Sweden became united and were governed with marked success. Under the rule of Christian I. Schleswig and Holstein were united with the other three, but in the time of Christian II. Sweden obtained its independence, and under Frederick I., who ruled ten years, beginning in 1523, Sweden was permanently separated from Denmark, while under Christian IV., Denmark took part in the Thirty Years' War and became involved in two unfortunate wars with Sweden.

The peasants asserted their rights in the latter part of the 17th century, and became free from serfdom at the beginning of the 18th. The British fleet bombarded Copenhagen and destroyed the Spanish fleet April 2, 1801. To avoid an alliance with France a second fleet was sent by the British in 1807, who demanded a defensive alliance or the surrender of the Danish fleet, which resulted in a second bombardment of the capital. Denmark was in the hands of Napoleon from that time until 1814, when it was forced to cede Helgoland to England in exchange for the Danish West Indies, and Norway passed over to Sweden. The German Confederation, headed by Prussia and Austria, in 1864 obtained the cession of Holstein, Lauenburg, and Schleswig.

Since 1864 the country has enjoyed a period of peace, its people being contented and the national conditions decidedly prosperous. Christian IX. succeeded to the throne in 1863, after the death of Christian VIII., and his reign of 43 years witnessed the material growth of Denmark in national and commercial importance. Through the marriage of his children, the reigning family became related with the sovereigns of many countries of Europe. Among the chief events of his time is the establishment of constitutional government in Iceland. He died in 1906 and was succeeded by his son, Frederick VIII.

**DENSITY** (dĕn'si-tĭ), that quality of a body which depends upon the close cohesion of its constituents. It is estimated by the proportion which the bulk bears to the weight. Thus, in two bodies of equal bulk, but differing in weight, the body of greater weight is also of greater density. In two bodies of equal bulk, but of different density, the body which is of greater density contains the proportionately greater amount of matter. In the case of two bodies containing the same quantity of matter, but differing in bulk, the greater density is ascribed to the one which is of less bulk; from this it is seen that the density is directly proportional to the quantity of matter and inversely proportional to the bulk. By a study of astronomy and the laws of gravitation the datum for ascertaining the density of the earth has been secured, which is now assumed to be about five times that of water. Since the surface consists chiefly of oxygen, it has been suggested that the nucleus may be largely of metals. The density of gases, fluids, and solids, as compared with that of water, is their *specific gravity*.

**DENTIST** (dĕn'tist), one engaged in the profession of cleaning, extracting, or repairing the teeth, or replacing them with artificial ones when necessary. Dentistry rose to a profession in the last century. The work now done by a dentist was largely in the hands of physicians prior to that time. The first institution founded in America to further knowledge in this profession is the College of Dental Surgery, Baltimore, which was chartered in 1839. Since then other excellent schools devoted to this branch of knowledge have been founded in the large cities, numerous periodicals are published in its interest, and many dental societies are maintained in Canada and the United States.

In dentistry there are two distinct departments—*mechanical dentistry* and *dental surgery*. The former is concerned with the artificial substitution of lost teeth, while the latter requires an extended medical knowledge of the diseases of



the teeth and the general system, and of the effects upon the body resulting from operations on and treatment of the teeth. The chief operations involved in dental surgery are scaling the tartar, regulating displaced and overcrowding teeth, filling the hollows of decaying teeth, and extracting teeth that are decayed to such an extent as not to warrant filling. Crown and bridge work are done largely by the use of gold, but shell crowns and porcelain are used to some extent. Tin and platinum were employed for filling broken or decayed teeth in the early history of dentistry, but now *amalgams* have come into general use. They are made by a combination of one or more metals with mercury.

**DENVER** (dĕn'vĕr), an important city of the United States, capital of Colorado. It is situated at the junction of Cherry Creek and the South Platte River, 1,025 miles west of Chicago and 1,456 east of San Francisco. It is the converging center of many trunk railways, which afford transportation facilities in all directions, and has an extensive system of urban and interurban electric lines. Among the principal railroads are the Union Pacific, the Denver and Rio Grande, the Missouri Pacific, the Chicago, Burlington and Quincy, the Atchison, Topeka and Sante Fé, the Chicago, Rock Island and Pacific, and the Colorado Southern.

The site is on a level plain located 5,250 feet above the level of the sea and about twelve miles from the foothills of the Rocky Mountains. It is noted as a healthful city, owing to its clear air and dry climate, and is a favorite center for the residence of retired and wealthy people. The atmosphere is remarkable for its clearness, owing to which many of the prominent mountain peaks may be discerned in clear weather, though located seventy miles and more from the city.

Denver is divided by Cherry Creek and the South Platte River into three natural divisions. North Denver is located west and north of the South Platte River, between that river and Cherry Creek is West Denver, and East Denver, the larger part of the city, is situated east of these streams. City Park, in the eastern part of the city, has an area of 320 acres. It is adorned with flowers and shrubbery, has fine statuary and zoölogical gardens, and is beautified by many lakes and driveways. The entire park system consists of twelve public parks, including Congress, Lincoln, Jefferson, and Highland parks. In the field of education it occupies a high position, having a fine school system and many charitable and higher institutions of learning. These include Denver University (Methodist), Baptist Female College, College of the Sacred Heart (Roman Catholic),

Wolfé Hall (Episcopal), and a number of medical, theological, and manual training schools. The hospitals and sanitariums are adequate to the demand and are well-managed institutions. A public library of about 100,000 volumes is maintained by the city, and in addition may be mentioned the State library and a number of others supported by societies and institutions of learning.

Denver owes its commercial importance largely to its favorable location in the proximity of productive iron, lead, silver, gold, coal, and copper mines. These natural products make the city important as a smelting center. About one-fourth of the manufactured products come from the smelting and refining works. Those of next importance are the machine shops, flouring mills, breweries, railroad car shops and foundries. The city is noted as a live-stock market and has a large jobbing and wholesaling trade, especially in dry goods and groceries. The architecture is substantial and includes many large buildings, such as the Tabor Opera House, the Equitable Building, the Denver Club, and the Brown Palace Hotel.

The first settlement in the vicinity of Denver was made in 1858. It was named in honor of Gen. J. W. Denver, at that time Governor of Kansas, of which Colorado was a part. The two villages, Auraria, west of Cherry Creek, and Saint Charles, east of Cherry Creek, were united in 1859 and incorporated, but the incorporation of Denver properly dates from 1861, when it received its charter from the Territory of Colorado. In 1867 it became the capital of the Territory. South Denver was annexed in 1894. Denver was the county seat of Arapahoe County until 1902, when its government was reorganized and it became the city and county of Denver. It has had a remarkable growth since 1870, when it had a population of 4,759. Population, 1900, 133,859; in 1910, 213,381.

**DENVER, University of**, an educational institution at Denver, Colo. It was founded in 1864 as the Colorado Seminary, but was reorganized in 1880, when the present name was adopted. The university comprises a preparatory school and seven colleges, the latter including a college of liberal arts, the Iliff School of Theology, a graduate school, the Denver and Gross College of Medicine, the Colorado College of Dental Surgery, a college of music, and the Denver College of Law. Three of its twelve buildings are in the heart of Denver and the others are in University Park, a suburb of the city. The university has a library of 12,500 volumes, a faculty of eighty professors and instructors, and an enrollment of 1,350.



**DE PAUW UNIVERSITY**, an educational institution located at Greencastle, Ind. It was organized by the Methodist Episcopal Church in 1837 under the name of Indiana Asbury University, but changed to the present name on account of an endowment of \$1,500,000 given by W. C. De Pauw. The campus comprises about 150 acres and the annual income is \$56,000. It has an advanced curriculum, in which elective studies and courses are permitted. The faculty consists of thirty instructors, and the attendance is about 825 students. It has a library of 35,000 volumes. The alumni number more than 2,000.

**DERBY** (dĕr'bi), a city in New Haven County, Connecticut, ten miles west of New Haven, at the junction of the Housatonic and Naugatuck rivers. It is on the New York, New Haven and Hartford Railroad and several electric lines. The noteworthy features include the public library, the town hall, the Housatonic Dam, and several schools. It manufactures cotton goods, furniture, machinery, and earthenware. The first settlement was made in 1646, when it was known as Paugasset, and it was incorporated as Derby in 1675. Population, 1900, 7,930; in 1910, 8,991.

**DERBY**, a city of Derbyshire, England, about 120 miles northwest of London, on the Derwent River. Among the chief buildings are the county hall, a school of art, an infirmary, and numerous churches. The chapel of Saint Mary's is a very old building, and the noted Tower of All Saints is an excellent specimen of architecture with a tower 175 feet high. Numerous railway lines furnish extensive inland connections. It has electric lights and street railways, public parks, and several fine monuments. The manufactures include porcelain, silk and cotton goods, paper, machinery, chemicals, ironware, marble, and spirituous liquors. It is surrounded by an agricultural country, in which fluorspar abounds. A station was built on the site of Derby by the Romans, to whom it was known as *Derwentio*. It became a royal borough in the time of Edward the Confessor. The city was the home of Herbert Spencer. Population, 1907, 125,774.

**DERRICK** (dĕr'rik), an apparatus for lifting and transporting heavy weights, such as stone in a quarry. It consists of a tall mast fastened on a pin, on which it may revolve, and is anchored by ropes extending from the top to the ground. A boom is hinged near the bottom of the mast, so constructed that the upper end may be raised or lowered by suitable rope tackle, which works through blocks fastened respectively near the outer end of the boom and near

the top of the mast. At the foot of the mast is a system of wheels, with which the tackle block is attached by a rope, and the weight is moved by turning the mast, which causes the boom to swing around. The traveling crane has displaced the derrick in most manufacturing establishments.

**DERVISH** (dĕr'vish), a Mohammedan devotee, who takes a vow of poverty and austerity of life. Numerous different orders are maintained. Some dwell in monasteries, others live as hermits, and some lead a life as wandering mendicants. The dancing dervishes are a class that accustom themselves to spin or whirl around for hours at a time, uttering *Allah*, and making violent motions of the body. After they reach a state of exhaustion, they claim to be inspired and to possess the power of curing diseases and interpreting dreams.

**DESCENT** (dĕ-sĕnt'), in law, a passing from an ancestor to an heir, a transmission by inheritance or succession. The laws of most countries are founded upon the principle of equal distribution, both of personal and real property, among the heirs in the nearest surviving degree. The three classes of kindreds are direct descendants, ancestors, and collateral relatives; the latter include those who have descended from the same common ancestors. There are two sets of collateral relatives, as well as two sets of ancestors, the *paternal* and the *maternal*. *Lineal descent* is where property descends directly from father to son and from son to grandson; *collateral descent* is where it proceeds to a brother or sister, nephew or niece, or to other collateral representatives. If an individual dies *intestate*, that is, without relatives or without leaving a will, his property usually escheats to the state.

**DESERT** (dĕz'ĕrt), a region in which plant and animal life is very scant or entirely absent. Some writers class the regions that are barren from cold or lack of soil as deserts, such as Greenland and the lands of the Arctic and Antarctic zones. However, the name is usually applied to the localities of continents that have a climate quite favorable, but whose barrenness is due to the lack of soil or the supply of moisture. Arid deserts are most extensive in Asia, Africa, and Australia, are almost entirely unknown in Europe, and occupy only a small part of the continents of North and South America. The Sahara Desert, which crosses the north central part of Africa, from the Red Sea to the Atlantic, is the largest arid belt of the world. It extends under different names into Asia, where it is known as the Arabian Desert, the Desert of Gobi, and the Salt Desert. The



Kalahari Desert, in South Africa, is bounded by the Orange, Zambezi, and Limpopo rivers. A large part of the interior of Australia is a desert. The Colorado Desert, in California, and the Atacama Desert, in northern Chile, are among the barren regions of North and South America.

Deserts vary considerably in the character of their surface. Some consist chiefly of sand and gravel, which frequently drift to form dunes, and others have a rocky surface. Oases are located in many desert regions owing to the presence of springs, or to the streams that rise from the precipitation of high mountains, irrigating the valleys below. Deserts are due to various causes, such as the direction of prevailing winds, which deprive them of moisture; long distance from the oceans; and isolation through surrounding mountain systems. The soil in many parts of the desert is quite fertile, needing only a supply of moisture to render it productive. See **Arid Region**.

**DES MOINES** (dĕ-moin'), the largest river in the State of Iowa. It rises in the southern part of Minnesota, flows in a southeasterly direction, and discharges into the Mississippi about four miles below Keokuk, after a course of 500 miles. Among its principal tributaries are the Raccoon and Boone rivers. It drains a fertile agricultural country. Belts of hard wood timber are on either side in Iowa, and it passes through regions rich in coal and limestone deposits. Among the cities on its banks are Fort Dodge, Des Moines, and Ottumwa. It forms the boundary between Lee County, Iowa, and Missouri.

**DES MOINES**, the capital and largest city of Iowa, county seat of Polk County, near the geographical center of the State. It is finely situated at the junction of the Des Moines and Raccoon rivers, both of which are crossed by a number of substantial bridges. It is on the Chicago, Rock Island and Pacific, the Chicago Great Western, the Chicago and Northwestern, the Chicago, Milwaukee and Saint Paul, the Wabash, the Chicago, Burlington and Quincy, and other railroads, and has extensive urban and interurban electric railway facilities.

The capitol building, one of the finest in the United States, was erected at a cost of \$3,000,000. Other public buildings include the United States Federal Court and Post Office, the State library, the State historical building, and the city buildings. The new county courthouse, a fine structure of stone, was completed in 1907, and the Auditorium, on Fourth Avenue, has a seating capacity of 3,000. Des Moines is the seat of Drake University, Des Moines College, High-

land Park College, several business collĕges, and a number of parochial schools. The Iowa State Fair Grounds are located in the eastern part of the city and several fine parks are maintained, including Ingersoll and Greenwood parks. The State library has about 50,000 volumes, the public library has 30,000 volumes, and several other libraries are maintained by the educational institutions.

Many of the streets are paved substantially with asphalt, brick, and macadam. Water power is obtained by means of a dam across the Des Moines River and the city supply of water is procured from the Raccoon River. Near the State capitol building is a fine soldiers' monument. The chief hotels include the Savery, Kirkwood, Chamberlain, and Victoria. Among the leading business buildings are the Fleming, Van Ginkle, Equitable, and numerous office and wholesale buildings. The surrounding country is agricultural and stock raising, while the river bluffs are rich in coal deposits, giving the city a large volume of raw material for transportation and use in manufacturing enterprises. Among the chief manufacturing establishments are medical and chemical works, flouring mills, furnaces, clothing and cigar factories, typewriter works, canning and packing establishments, and machine shops. It has a large retail and wholesale trade in manufactures and merchandise, and supplies these commodities to retail dealers in many towns and cities of Iowa. Des Moines occupies the site of Fort Des Moines, which constituted a United States garrison in 1832. It was incorporated in 1851 and chartered as a city in 1857. Fort Des Moines, a United States garrison, is located south of the city. Population, 1905, 75,626; in 1910, 86,368.

**DE SOTO** (dĕ sō'tō), a city in Jefferson County, Missouri, forty-four miles southwest of Saint Louis, on the Saint Louis, Iron Mountain and Southern Railroad. It is situated in a zinc and lead producing region, and is a shipping center of cereals and mineral products. The industries include grain elevators, flouring mills, and machine shops. It has electric lighting, a public high school, and other improvements. Population, 1900, 5,611.

**DES PLAINES RIVER** (dĕ plān'), a river of the United States, rises near Racine, Wis., and after a course of 150 miles joins the Kankakee River to form the Illinois River. The general course is south to Lyons, near Chicago, whence it flows toward the southwest. A low ridge separates its basin from Lake Michigan, and thirteen miles of its lower course is utilized in the Chicago Drainage Canal.

**DESSAU** (dĕs'sou), a city of Germany, capi-



tal of the duchy of Anhalt, eighty miles southwest of Berlin. It is situated in a beautiful valley of the Mulde River, near its junction with the Elbe, and is surrounded by a fertile country. The streets are broad and well improved with substantial paving. Electric and steam railroads furnish ample interurban and general transportation facilities, making it an important commercial center. Among the manufactures are cotton and woolen goods, sugar, carpets, pottery, tobacco products, and machinery. It has a gymnasium, three large libraries, many fine churches, and a number of charitable and educational institutions. In its public places are monuments of Wilhelm Müller, the poet, and Moses Mendelssohn, the philosopher, both of whom were born here. Dessau was the scene of a battle in the Thirty Years' War, in 1626, when Wallenstein defeated Count Mansfield at the bridge over the Elbe. Population, 1905, 55,134.

**DETROIT** (dê-troit'), the chief city and port of entry in Michigan, county seat of Wayne County, on the Detroit River, opposite the Canadian city of Windsor. It is about 18 miles from Lake Erie, 10 miles from Lake Saint Clair, and 285 miles east of Chicago. The site is on a fine eminence, the streets are well paved and shaded by avenues of trees, and the various portions are connected by a system of electric railway lines. It is the focus of many railways, and has dock facilities for large vessels, giving it extensive conveniences for transportation to the chief cities of America. The railroads include the Wabash, the Grand Trunk, the Lake Shore and Michigan Southern, the Michigan Central, and the Péré Marquette.

The city has a river frontage of nine miles and extends about four miles inland from the river. The area is 30 square miles, and the site rises gradually from the river toward the north. Most of the streets are platted to cross each other at right angles, but are intersected by broad avenues which radiate from a semicircular plot within the city known as Grand Circus. This park is crossed by Woodward Avenue, which divides the city into nearly equal parts, and is the principal business street. It becomes a residence street farther from the center of the city and is connected with Campus Maritus, a fine plot of ground a short distance from the river. Griswold Street is the banking center, Lafayette and Michigan avenues have notable buildings, and Jefferson Avenue and West Fort Street contain many fine residences.

**PARKS AND BUILDINGS.** The parks embrace about 1,200 acres and are well distributed in the different parts of the city. Belle Isle Park

is located on Belle Isle, an island in the Detroit River, and is one of the finest. It is connected with the city by a substantial iron bridge, has a number of interior lakes and canals, and contains about 700 acres. Palmer Park is located on Woodward Avenue, six miles north of the city hall. Clark and Voigt parks are beautiful grounds. Among the principal buildings are the city hall, in City Hall Square, the Majestic Building, near the city hall, the post office, the county courthouse, the Y. M. C. A. Building, and the Cadillac Hotel. The churches include Saint John's Protestant Episcopal, First Presbyterian, Trinity Protestant Episcopal, Sacred Heart of Mary, Fort Street Presbyterian, Woodward Avenue Baptist, and the Jewish Temple. A fine library is maintained in the Museum of Art, which occupies a commodious building.

**EDUCATIONAL.** Detroit is noted for its finely graded system of public schools, which are supplemented by a number of higher institutions of learning. Detroit College, a city normal school, Detroit College of Medicine, Detroit College of Law, and Michigan College of Medicine and Surgery are among the higher and professional institutions. The city library has about 200,000 volumes, and books are distributed in several branches for the convenience of reading and reference. Many charitable and benevolent institutions are maintained. It is the seat of the Saint Vincent's Orphan Asylum, Florence Crittenden Home, Protestant Orphan Asylum, Deaconess's Home, and many others.

**COMMERCE.** Detroit is favored in the expanse of its commerce and industry by its favorable location on navigable waters and numerous railroads. Among the northern ports it takes second rank in foreign trade, much of which is with Canada. The exports include cereals, live stock, hides, lumber, and machinery. It is favored as a center of wholesaling and ships large quantities of manufactures and merchandise to points in Michigan and adjoining states. Among the leading manufactures are automobiles, furniture, wagons and carriages, matches, chemicals and drugs, steel and iron products, and machinery. It is a slaughtering and packing center and has large establishments for the manufacture of paint and varnish. Large shipments of ore are received from points in northern Michigan and Minnesota, and coal is obtained from the mines of Ohio and Pennsylvania, hence its iron and steel industries have been making marked advancement.

**HISTORY.** The first settlement on the site of Detroit was made by the French in 1701, when Cadillac, governor of the French territory, built



Fort Pontchartrain. It remained a French trading village until 1760, when it was captured by the British. At the close of the French and Indian War, in 1763, it became British territory, and finally passed to the United States in 1796. It was incorporated as a town in 1802, but its charter as a city dates from 1824. In 1805-37 it was the capital of the Territory of Michigan, and remained the capital of the State until 1848, when it was superseded by Lansing. Population, 1904, 317,591; in 1910, 465,766.

**DETROIT RIVER**, the channel or strait which connects Lake Saint Clair and Lake Erie, by which the waters of the three upper Great Lakes reach the Saint Lawrence. It is about twenty-five miles long, three-fourths of a mile wide, and navigable by the largest vessels. For four months in the year it is ice-bound. Within the river are many islands and much fine scenery. The commerce is very extensive. It was named from the French, the name meaning strait.

**DEUTERONOMY** (dū-tēr-ōn'ō-mŷ), the fifth book of the Pentateuch and of the Bible. It is thought that Moses himself wrote this part of the Holy Scriptures, with the exception of the last four chapters, in which the closing events in the life of the great lawgiver are narrated. It repeats the laws which had previously been promulgated, hence the name. In it is the history of what passed in the wilderness during about five weeks, from the beginning of the eleventh month to the early part of the twelfth month, in the fortieth year after the Israelites departed from Egypt. Moses recounts in Deuteronomy the events which had taken place in the Israelitic history, and makes comprehensive references to particular phases in the law received at Sinai. The books which precede Deuteronomy are *Genesis*, *Exodus*, *Leviticus*, and *Numbers*.

**DEVIL** (dev'1), in theology, the sovereign spirit of evil, corresponding to the *Satan* of the Hebrews and the *Iblis* of the Mohammedans. In the Bible the devil is represented as the evil one and the father of lies. He is regarded a rebel against God, a being who is perfect in every kind of skill and knowledge, which he uses to pervert man and entangle him in the meshes of sin. In the Middle Ages, even as late as the 17th century, the belief in evil spirits was very common. In many instances, when a man of genius had made a scientific discovery or accomplished some extraordinary feat, it was supposed that his mind was assisted by the devil in some mysterious way.

As sovereign of the demons, the devil held a prominent place in the practice of magic and

in many of the poetical legends. In the mysteries (q. v.) he was often represented on the stage with flaming eyes, hooked nails, cloven hoofs, spreading horns, black complexion, and sulphuric odor. Milton and Klopstock, the former in the character of *Satan*, and the latter in that of *Abaddon*, introduced the devil as a fallen angel, still somewhat dignified amid the disfigurements of sin. The doctrine of the fathers of the church, founded upon certain passages of the Scriptures, makes him the leader of a rebellion among the angels, the enemy of God, the author and constant promoter of sin, now suffering chastisement for his crimes, and destined to eternal punishment. He is called the prince of this world and regarded the cause of man's fall from grace, yet his power was broken by the work of Christ, hence Christians can rise superior to the might of his influence.

**DEVIL FISH**, the name of a fish belonging to the ray family, common to the waters of the Atlantic and Pacific coasts. It has a winglike process on each side and the head is truncated in front, giving it a peculiar appearance when moving in the water. Divers dread it as a dangerous inhabitant of the sea.

**DEVILS LAKE**, a city of North Dakota, in Ramsey County, on the north shore of Devils Lake. This lake is forty miles long, about ten miles wide, and its surface is 1,465 feet above the sea. The water is saline and shallow in many places and the lake has no visible outlet. The city is the county seat of Ramsey County, located on the Great Northern Railway, and is surrounded by a fertile farming country. It has a growing trade in produce and merchandise. Among the chief buildings are a county courthouse, a high school, and several fine churches. Population, 1900, 1,729; in 1910, 5,157.

**DEVONIAN** (dê-vō'nĭ-an), one of the rock systems of the Palaeozoic period, located between the Silurian and Carboniferous systems. It is so named from Devon, England, where its strata were first distinguished from those of the Silurian and Carboniferous by Sir R. Murchison. Geologists usually divide it into three groups, the *Lower*, the *Middle*, and the *Upper*, of which the last mentioned is notably distinguished by the presence of large deposits of old red sandstone. The fossil remains are very abundant, especially those of fishes, and include crustaceans, corals, mollusks, crinoids, and cephalopods. The rocks of this system are especially abundant in the Catskill Mountains of New York, where they approximate a thickness of 2,000 feet. They are distributed in many parts of North America, being found in the Black Hills of South Dakota, in Utah and Ne-



vada, in many sections of the Appalachian Mountains, and in Ontario and other localities of Canada. See **Geology**.

**DEW** (dū), a condensation of moisture from the atmosphere in the form of minute globules upon the surface of certain bodies. On a glass filled with cold water, set out on a warm day, small drops of water form, which are derived entirely from the air. This is caused by the temperature of the air, coming in contact with the cold side, being lowered below the dew point; thus, it deposits the surplus moisture beyond its power of retention. The dew seen on plants and other objects has a similar origin. The earth absorbs more heat during the day than it emits, and at night, when the supply of warmth is cut off, it continues to radiate heat. Objects above the surface of the earth cool more rapidly than the air or the earth, thus resulting in a formation of dew as the air or radiated warmth comes in contact with plants and other objects above the surface. Dew is deposited as hoarfrost when the objects are colder than 32° Fahr.

Dew accumulates much more readily on some objects than on others, because some substances radiate their heat more rapidly than other bodies. The deposit is greater during a clear night than when it is cloudy, for the reason that the earth and air cool more readily when it is clear. The reason that more dew is deposited on a still night than when it is windy is due to the fact that air must remain for some time in contact with cold objects to enable them to lower its temperature and collect its moisture. The amount of dew deposited in warm countries greatly exceeds that of cold regions, and in some regions it is one of the principal sources of moisture for the growth and development of plants. Air is said to have reached its dew point when it contains all the moisture it is capable of holding. The dew deposited is from a comparatively thin stratum of air in the immediate proximity of the cool object. The general precipitations, including rain, snow, and hail, are caused by the cooling of large masses of air.

**DEXTRIN** (dēks'trīn), a brownish-white compound found in nature, as in the sap of plants, and formed by the action of heat or acids on starch. It is soluble in water and may be purified by precipitating it with alcohol. Dextrin is used in medicine as a substitute for gum arabic, in calico printing, and in stiffening textiles. It is employed to a large extent on the back of postage stamps.

**DHAWALAGIRI** (dā'wā-lā-gē'rē), or **Dhaulagiri**, an elevated peak of the Himalaya Mountains, in Nepal. Its height is 26,825 feet,

the fourth in height of that great system, being exceeded by mounts Everest, Kinchinjunga, and Shumalari.

**DIABASE** (dī'ā-bās), a crystalline rock of the igneous group, composed of feldspar, pyroxene, and lime soda. The texture is crystalline throughout and the composition is hard and compact. Feldspar found in diabase is usually formed in bladed crystals, which give the rock a mottled appearance, especially if the grains of pyroxene are coarse. Some specimens have a green color, owing to the presence of olivine. Diabase formations are widely distributed. They occur in the Keweenaw Peninsula of Lake Superior, in the Palisades of the Hudson River, in the Deccan of India, and in several sections of the Scandinavian Peninsula.

**DIAL** (dī'al), an instrument for ascertaining the time by means of the shadow of a stile or gnomon, through the agency of the rays of the sun or moon thrown upon a graduated plate or disk. It is certain that the dial is the invention of the Asiatics. When Ahaz went to Damascus in 771 B. C., he saw a beautiful altar and sent plans of it to Jerusalem. On his return an altar was constructed. He set a dial which is mentioned in connection with the cure of his son Hezekiah thirteen years after the death of Ahaz. This is, perhaps, the first dial on record, and is some earlier than the eclipse of the moon observed at Babylonia as recorded by Ptolemy.

Dials were in general use before watches and clocks became common as timekeepers. They are of various construction, either upright, horizontal, or inclined. The common dial has a horizontal plane, or dial plate. The stile, pointing toward the North or South Pole, north or south of the Equator respectively, is adjusted to retain its parallelism to the earth's axis. This form becomes a polar dial at the Equator. The hour lines intersect each other and the stile intersects the plane of the dial at all latitudes, except at or near the Equator. The shadows of the stile or gnomon cast upon the figures of the dial mark the several hours of the day, indicating the sun's distance from the meridian. Similar dials are made to indicate the time of the night by the shadow of the moon or stars. These instruments are not serviceable during cloudy weather.

**DIAMETER** (dī-ām'ē-tēr), a straight line drawn through the center of a circle or sphere, terminating at two opposite points of the circumference. A circle is divided into two equal parts by its diameter, which is its greatest chord. A diameter of a cylindrical body is that of one of its circular sections. The diameter



of a body is found by dividing its circumference by 3.1416.

**DIAMOND** (dī'ā-mūnd), one of the most valuable and the hardest of precious stones, being the purest form in which carbon is found. Its crystals are cubical in form and most commonly have twelve faces. Diamonds of the finest quality are colorless, perfectly clear, and said to be of the *first water*. Some varieties are green, orange, red, yellow, or blue, these being highly prized, if the tint is decided and equal throughout. It is transparent and translucent, and is so hard that it can be cut only by itself, and will scratch any other substance. When cut and polished, a diamond of the purest water weighing one carat is valued at about \$100, and the value increases as the square of the weight in carats is multiplied. Its commercial value is affected by the slightest tinge of color, though blue-colored diamonds are exceedingly rare and have commanded enormous prices.

The annual production of diamonds in South Africa is about 2,750,000 carats, equal to about five-eighths of a ton. The amount realized by the sale of this production is estimated at \$18,500,000. However, the output varies greatly from year to year, being greatest in 1901, when the production of the Kimberley fields was sold for \$23,144,225. Other productive diamond fields are located in Brazil, Australia, and India, though small quantities are found in various other regions, especially in the Ural Mountains, California, and several other states of the United States. The diamond fields of Brazil were discovered in 1728, and the largest single specimen found there weighed 254 carats. It was sold to the Gaikwar of Baroda for \$400,000, and became known as the "Star of the South."

Diamonds are found in the sand and gravel of river, lake, and sea beds, and in diamond-bearing rocks. The stones are separated from the sand and rock by washing; this requires elaborate machinery and a large water supply. The principal uses of diamonds are for polished gems, cutting glass, ornaments, and boring or drilling. Engravers use diamonds as etching points, for which purpose they are cut in various forms, the value depending largely upon skill in cutting. Recent experiments tend to show that diamonds may be produced by bringing carbon in contact with fused silicate mineral. It is thought that the African diamonds were formed in this way, since they are found in igneous rock adjacent to carbonaceous shale.

Among the diamonds celebrated in history is the Great Mogul, found in 1550, in Golconda,

which weighed 793 carats and was cut to 279 carats. The Austrian is a rose cut diamond weighing 140 carats. The great Russian diamond, now in the scepter of Russia, weighed 193 carats. It was purchased by Count Orloff for \$500,000 and presented to Catharine on her birthday in 1772. The Kohinoor, meaning "Mountain of Light," belonged in turn to Shah Jehan, Aurungzebe, Nadir Shah, the Afghan rulers, and afterward to the East Indian Sikh chief, Runjeet Singh. It was surrendered to the Queen of England in 1849 by the last ruler of the Punjab, when the annexation of his dominions to Britain took place. Originally it weighed 800 carats, but was reduced by unskillful artists to 279 carats. It was recut in 1852 and now weighs 103 carats. The Regent or Pitt diamond, now in the Louvre, Paris, weighs 136 carats and is said to be worth \$2,500,000. Among the largest diamonds found in South Africa is one that weighed 302 carats and another weighed 3,000 carats.

**DIANA, Temple of**, an architectural structure of Ephesus, in Asia Minor, one of the seven wonders of the world. It was built at public expense under plans made by Chersiphron of Cnossus, the chief architect. Pliny thought that it required 120 years to complete the building, which was 225 feet wide and 425 feet long, and had 126 columns that were 60 feet high and constructed of Parian marble. These columns were in four rows, two rows of eight columns each across the front and two rows of twenty columns each on the sides, with an additional number set near the main entrance. Herostratus is said to have burned it in 356 B. C., when a part of the temple was destroyed. The Goths plundered it in 262 B. C. Excavations made in 1869 led to a discovery of the site, and a number of sculptures and fragments of the architecture are preserved in the British Museum and other collections.

**DIAPHRAGM** (dī'ā-frām), the broad, almost circular muscle which separates the cavity of the thorax from that of the abdomen. It is thin and in its center has some fibrous tissue. Because of the constant pressure of the abdominal viscera and muscles, it arches up in the thorax. Through it pass the oesophagus, aorta, thoracic duct, inferior vena cava, and a number of the large nerves. During inspiration it ascends, thus increasing the capacity of the thorax, whose vacuum is filled with air, and in expiration it assumes its former position. Expulsions of air are governed largely by the diaphragm, hence it is a factor in laughing, crying, sneezing, and coughing. Sudden contraction of the diaphragm cause hiccoughing.



**DIARBEEKIR** (dĕ-är'bĕk-ēr), or **Diarbekr**, a city of Asiatic Turkey, capital of the vilayet of Diarbekir, on the Tigris River. Most of the architecture is inferior, constructed chiefly of rough stone or of sun-dried brick, but it has a number of fine bazaars, mosques, and Christian churches. The manufactures consist chiefly of utensils and silk and cotton textiles. Copper is mined in the vicinity. Anciently it was known as Amida. Constantinus fortified it, but it was captured by the Persians in 502 A. D. Population, 1907, 46,500.

**DIATOMS** (dī'ā-tōmz), a family of microscopic plants, widely distributed in nearly all parts of the world. They were first discovered by O. F. Müller near the beginning of the last century, and by 1824 only 49 species were known. It is thought that not less than 9,000 species exist. For some time writers differed as to whether they should be classed with the vegetable or animal kingdom, but from a study of their general structure, and more especially their modes of reproduction, they are now universally classed as plants. The diatoms are common to most fresh and salt waters, and are devoured in large numbers as food by the lower forms of marine animals. When examined by the microscope, it is seen that the cells are solitary, or united into colonies, and each cell has a small shell or covering, which in many species is beautifully ornamented.

**DICE** (dis), the plural of die, small cubes of bone, ivory, or serpentine stone, used in playing the game of dice. The faces are marked with a different number of points, from one to six, in such a way that the numbers on any two opposite sides count seven. In playing they are shaken and thrown from a box on a table, and the game depends upon the number of points presented by the upper faces. It is thought that the game was first used by the Lydians; and was played quite extensively among the Greeks, Egyptians, and Romans.

**DICKINSON**, a city of North Dakota, county seat of Stark County, 115 miles west of Bismarck. It is nicely located on the Heart River and the Northern Pacific Railroad. The surrounding country is agricultural and stock raising. It has a number of fine school and county buildings, several churches, and a large trade in produce and merchandise. It is important as a grain shipping point and has a number of large elevators and lumber yards. Population, 1905, 3,188.

**DICTATOR** (dik-tā'tēr), the highest magistrate in the ancient Roman Republic. The dictator was an extraordinary magistrate, endowed with absolute authority, and it lay with the

senate when the services of such an officer were necessary. The first dictator was appointed in 501 B. C., nine years after the Tarquins were expelled from Rome. Only those who had been previously consuls were eligible to the position. Originally the office could be filled only by a patrician, but later eligibility was extended to the plebeians. No one could legally hold the office longer than six months, but Sulla and Caesar were dictators for a longer period. The dictator had absolute power without any appeal, and his official acts could not be questioned by the senate. He was prohibited from leaving Italy, could not use the public funds, and was not permitted to ride on horseback without special permission from the people.

**DICTIONARY** (dik'shūn-ā-rĭ), a book which contains a large list of words in any language, arranged alphabetically, and treated in a systematic order. The equivalent words in another language are usually given, with the spelling, pronunciation, etymology, definition, and other illustrative features. The term is frequently applied to works on special subjects, such as law, medicine, music, biography, etc. Dictionaries of the English language were first published in 1573 by John Baret, in 1616 by John Bullokar, and in 1755 by Dr. Johnson. Noah Webster published the first edition of his dictionary in 1828, and the "American Unabridged Dictionary" by Joseph E. Worcester was published about the same time. The dictionary of Webster is issued at present under a number of titles, including "Webster's International Dictionary" and "Webster's Imperial Dictionary." Among the newer dictionaries are the "Oxford English Dictionary," published in England, in 1888, the "American Encyclopaedic Dictionary" (1888), "The Century Dictionary" (1891), and "The Standard Dictionary" (1895). The last mentioned is among the largest, containing about 320,000 words. It is thought that the earliest German dictionary was published by Hrabanus Maurus, a contemporary of Charlemagne. The most extensive German work is that of Wilhelm Karl Grimm and in the French, that of Maximilien E. Littré.

**DIDYMIUM** (dī-dīm'ĭ-ŭm), a metallic element discovered by Mosander in 1842, found chiefly in the mineral cerite. It is closely related to bismuth. Its chemical symbol is Di, and its atomic weight is 145.4. Chemists have separated it into two elements, *neodymium* and *praseodymium*.

**DIES IRAE** (dī'ēz' ĭrē), the title given to a Latin hymn whose first line is "Dies irae, dies illa." Its authorship is generally credited to Thomas of Celano, a native of the kingdom of



Naples, whose death occurred in 1255. The poem is dedicated to the last judgment, and was first published in Venice in 1250. Many of the eminent scholars of Germany translated it, among them Fichte, Schlegel, and Busenbaum. No religious poem has undergone as many translations in various languages, owing to the difficulty in producing its exquisite religious fervor. Several stanzas were introduced by Sir Walter Scott into his "Lay of the Last Minstrel," the first of which is as follows:

The day of wrath! that dreadful day,  
When heaven and earth shall pass away.  
What power shall be the sinner's stay?  
How shall he meet that dreadful day?

**DIET** (dī'ēt), the name of several political bodies of Europe, corresponding to the Parliament of Great Britain and the Cortes of Spain and Portugal. It is derived from the Latin *dieta*, and signifies a day fixed for the national deliberations of public affairs. In this sense it is used to designate the Reichstag of Germany, the Riksdag of Sweden, the Rigsdag of Denmark, and the Rijksdag of the Netherlands. The word *diet* is frequently applied by English writers to the legislative assemblies of Germany, Austria, and Hungary.

**DIET**, the food commonly eaten to compensate for the waste of tissue and provide means for the growth and development. See **Food**.

**DIFFRACTION** (dīf-frāk'shūn), in physics, the deflection and decomposition of light, causing the appearances of parallel bands or fringes of prismatic colors. It occurs when light passes by the edges of opaque bodies or through narrow slits, as by the action of a grating of fine lines or bars. A glass screen, commonly called a *diffraction grating*, is used in physical laboratories to illustrate these phenomena. It consists of from 10,000 to 20,000 parallel lines to the square inch ruled on glass, and as the light passes through brilliant spectrum colors result. A diffraction grating made by ruling lines on speculum metal produces a similar effect by reflecting the light from the polished and ruled surface. Such gratings are used in place of the prism in spectroscopic work, and with them it is possible to obtain spectra of wide dispersion. The spectrum given by the grating is called the *normal spectrum*, since in it the distribution of the different wave lengths is uniform. Diffraction gives rise to the play of colors seen in mother-of-pearl and the feathers of some birds.

**DIFFUSION** (dif-fū'zhūn), the property possessed by liquids of intermingling with each other when brought in contact. It may be illustrated by placing water colored with blue litmus into a glass jar, and then pouring a

small quantity of sulphuric acid, by means of a thistle tube, into the bottom of the jar. The acid will change the blue of the litmus to red wherever they come into contact. If the jar remains in a quiet place, the acid will intermingle with the litmus solution, and after a short time the entire contents of the jar will be red. Diffusion is more rapid where the surfaces of the two liquids are increased, as by placing them in a shallow vessel, or by stirring with some solid object, such as a spoon or a glass rod. Alcohol and water mix readily when placed together in a vessel, but water and mercury or oil and water do not mix, since there is no adhesion between their molecules. This may be illustrated by pouring oil and water into a bottle and shaking thoroughly, after which the two will separate into two distinct layers, the separation being nearly perfect. Diffusion takes place between gases, which may be demonstrated by filling two flasks, one with chlorine and the other with hydrogen, and connecting the two by means of a long tube through the corks fitted tightly into their necks. There being a difference between the color of chlorine and hydrogen, it is possible to observe the diffusion with the eye as the intermingling takes place.

**DIGESTION** (dī-jēs'chūn), the process by which foods are converted into soluble and diffusible products, capable of being absorbed by the blood. It may be said to begin in the mouth, where the solids are broken into small pieces, moistened with saliva, mixed with air and saliva, and formed into a bolus for swallowing. The saliva, by its active principle known as *ptyalin*, changes some of the starch at once into sugar. The glands of the stomach are excited to activity by the entrance of food, which has been made somewhat alkaline by the saliva and mucus, and the presence of acid lessens or stops the action of the ptyalin. A slight churning process in the stomach thoroughly mixes the ingredients, which are subjected to the action of pepsin, the active principle of the gastric juice. The starches and fats are loosened, the protoplasm is dissolved, and the proteids are converted into peptones. Food is acted upon in the stomach from three to four hours, depending upon its quality and quantity, as well as upon the condition of mind and physical health, both of which exercise a marked influence.

The partly digested food which passes from the stomach through the pylorus into the duodenum is known as *chyme*, and is a grayish liquid and is mixed somewhat with large lumps. By the action of the bile, the pancreatic juice,



and the intestinal secretions, in the small intestines, the starches are converted into sugar and the remaining proteids into peptones, and the fats are made into an emulsion, or a soapy substance. The digested food, known as *chyle*, is absorbed by the portal blood vessels and by the lacteals. The contents that pass into the large intestine again become acids, owing to fermentation, and a small amount of cellulose is digested. The absorption of the liquids contained in the fluid mass is an important function of the large intestine.

**DIGHTON ROCK** (dī'tŭn), a large mass of granite on the east bank of the Taunton River, near Dighton, Mass. It is remarkable for an inscription deeply cut with mysterious characters and has been the subject of much discussion among antiquarians. Mention was made of it by colonists as early as 1730. Some writers have expressed the view that the inscription was made by the Norseman in 1008, while others regard it the product of Indians.

**DIJON** (dê-zhôn'), the capital of the department of Côte d'Or, France, on a plain near Mount Afrique, 1,915 feet above sea level. It is conveniently located on a number of railroads and electric railways. The noteworthy features include a Gothic cathedral with a spire 300 feet high, dating from the 13th century. Other noted structures are the Church of Saint Michael, the theater, and the university. The public hall was begun in 1366 and served as a palace of the Burgundian dukes. It has an excellent museum, a library with 85,000 volumes, and several institutions of advanced learning. Among the manufactures are hosiery, chemicals, cotton and woolen goods, leather, machinery, and the celebrated Dijon mustard. The Romans knew the city as Dibia. It passed from Burgundy to France in the 5th century, was ruled by counts in the 9th century, and was united to the duchy of Burgundy in 1007. After the death of Charles the Bold it became a French possession. The German army occupied it in 1870. Population, 1906, 74,113.

**DIKE** (dik), in geology, a wall of trap or some similar form of igneous rock, which traverses other rocks, and appears to have been produced by the flowing of melted matter into a deep rent or fissure. Dikes differ from veins in being larger, and in their contents having greater uniformity. They frequently project above the surface like a wall, owing to the rocks around them being somewhat softer. In thickness they vary from a few inches to a mile. Dikes that occur between the layers of a sedimentary formation are called *intrusive sheets*. They consist chiefly of basalt and quartz porphyry.

Dikes are found in volcanic regions and are widely distributed.

**DILEMMA** (dī-lēm'mà), in logic, an argument which contains two or more alternatives, equally conclusive against an opponent which ever alternative he chooses. A person who is confronted by a dilemma must admit one or the other, hence is said to be caught between the horns of a dilemma. The following dilemma may serve to convey a clearer notion than could be formulated in a definition: "If this man were wise, he would not speak irreverently of Scripture in jest; and, if he were good, he would not do so in earnest; but he does it, either in jest or earnest; therefore, he is either not wise, or not good."

**DINAPUR** (dē'nä-pōor), a city of British India, in the province of Behar, twelve miles northwest of Patna. It is nicely situated on the Ganges River and a railroad, and has strong fortifications. The surrounding country is fertile, producing cereals and fruits, and the city has a large trade in produce and merchandise. In 1857 it was the scene of a mutiny. Population, 1906, 35,046.

**DINARIC ALPS** (dē-när'ik), a mountain range in southwestern Austria, trending parallel to the coast of the Adriatic Sea. It forms a connecting line between the western extremity of the Balkan Range and Mount Klech, at the southern extremity of the Julian Alps. The highest peak, Mount Dinara, is 6,010 feet above sea level.

**DINGO** (dīn'gō), the wild dog of Australia, thought to have originated from a breed of the domestic dog. It is from two to three feet long and about two feet high, and has an appearance somewhat resembling that of a wolf. The color ranges from pale brown to black, usually with tawny markings, the ears are erect, and the tail is bushy. In a wild state it utters a howl like a wolf, but when domesticated it soon learns to bark when placed in company with other dogs. The natives have domesticated the dingo and use it in hunting, but also hunt wild dingoes for their flesh, which they prize as an article of food.

**DINORNIS** (dī-nôr'nīs), a genus of extinct birds of the ostrich family, fossil remains of which are found in New Zealand. It is reasonably certain that six species existed and that the largest specimens had a height of from twelve to fourteen feet. They were stupid and indolent, incapable of flying, and subsisted on vegetable food. Fossils are found in the deposits of the post-Pliocene period.

**DINOSAURIA** (dī-nō-sā'rī-à), a group of large fossil reptiles, classed with the extinct



lizards. Remains of these animals are found in the Jurassic system of rocks. They resembled the crocodile on the one hand and the birds on the other, and most of the species walked on their hind legs. To this group belonged the *Clasaurus annecteus*, a birdlike animal whose body was thirty-five feet long. The



CLASSAURUS ANNECTEUS.

smallest of the group were three feet long, while the largest, such as the *Megalosaurus*, attained a length of forty to sixty feet. This animal was carnivorous, feeding on the animals that lived in the haunts it frequented, but the *Iguanodon* was herbivorous.

**DINOTHERIUM** (dī-nō-thē'rī-ŭm), a genus of extinct mammals allied to the modern elephant and the extinct mastodon. Fossil remains are found in the Miocene and Pliocene rocks of Europe, in the region lying between Greece and northern Germany. They had no tusks in the upper jaw, but two tusks projected downward and slightly backward from the lower jaw. It is thought that these animals did not inhabit America, but they were in Southern Asia, from Asia Minor to India.

**DIPHTHERIA** (dīf-thē'rī-à), a blood disease characterized by a false membrane composed of elastic fibers, found chiefly on the pharynx, tonsils, nostrils, palate, tongue, and gums, and sometimes on the oesophagus. The membrane is of an ashy color and leaves a bleeding surface when detached, often terminating in blood poisoning. It is a disease of all ages, spreads by contagion, and is highly dangerous. It frequently accompanies typhoid fever, croup, and scarlet fever, the chances of recovery in such cases being very doubtful. The fatality has frequently been as high as ninety per cent. in past years, but with the newer modes of treatment it has been materially reduced.

The treatment in diphtheria is both constitutional and local, in which iron, chloride of potash, cinchona bark, and quinine are largely employed, though carbolic acid, glycerin, and chlorine are used more or less extensively. The newer method is to use antitoxin in the treatment. In aggravated cases a tube is employed, through which the patient is enabled to breathe while the soreness and swelling are greatest. Accurate reports made in 1900 show that the mortality has been reduced very largely by the use of this remedy. In 1900 it was estimated that the death rate in Paris was thus reduced from 72 to 12 per 1,000 population; in Berlin, from 125 to 32 per 1,000; and in New York, from 187 to 45 per 1,000. It is estimated that fully 1,150 lives were saved in Chicago in the two years 1899-1900. This estimate is fully borne out by the experience in London in 1908. See **Antitoxin**.

**DIPHTHONG**, the union of two vowels which are pronounced together in one syllable, with one impulse of the voice, as in *out*, *soil*, and *low*. The term *improper diphthong* is applied to a word in which two vowels are written together, but only one representing a sound, as in *beat*, *bean*, and *bread*. Many diphthongs in modern English were developed from monophthongs, or simple vowel sounds, as the modern *mouse*, which was derived from the old English *mus*.

**DIPLOMACY** (dī-plō'mā-sī), the term applied to the art of negotiating and arranging treaties between nations. This branch of knowledge relates to the forms of international negotiations, the relation of independent states to one another, and the management of envoys accredited to foreign courts. Intricate diplomacy like that of modern times did not exist in the nations of antiquity for the reason that the scope of civilization was often confined within the limits of a single empire. In Greece, Rome, Persia, and other ancient nations political agents were employed to discuss national affairs. The primitive movement in bringing about the regular intercourse existing between civilized powers has been accredited to the efforts of Cardinal de Richelieu, though the representatives sent by the Florentine republic to Charles V. tends to show that he was not the first to perceive the benefits to be derived from such a system. Among the diplomatic agents recognized are ambassadors, envoys extraordinary, ministers plenipotentiary, ministers resident, *charge d'affaires*, secretaries of lega-



tion, and *attaches*. The powers and dignities of these agents are graded successively in the order named.

**DIPPER** (dīp'pēr), a bird of the thrush family, but quite similar in appearance to the wrens. The bill is sharply pointed and almost straight, the plumage is compact, and the tail turns slightly upward. Several species are noted for their song. They live near the banks of streams and the shores of lakes, and feed on mollusks and aquatic insects. The dippers are so named from their habit of dipping the head, which is accompanied by an abrupt up-jerking of the tail. Several species are found in the highlands of the United States and Canada, and others frequent many parts of Asia and Europe.

**DIPPING NEEDLE**, an instrument to test the magnetism of the earth at different places. It consists of a magnetic needle supported by a stirrup or within a frame so as to be free to move vertically. When placed horizontally and then magnetized, the needle will not remain horizontal, but will dip toward the nearer pole of the earth. The angle of dip decreases as the distance from the magnetic equator increases. There is no dip at the magnetic equator, but the needle will assume a vertical direction at the magnetic poles, hence the distance increases from zero to ninety degrees.

**DIPSOMANIA** (dīp-sō-mā'nī-ā), the morbid craving for alcoholic drinks, classed as a form of insanity. The attacks are periodical and when they occur the patient has an uncontrollable desire to drink excessively, but during the intervals he seems mentally sound and may abstain entirely from the use of liquor. The disease has been treated successfully in asylums for the inebriates. Institutions of this kind are maintained successfully in many states and countries.

**DIRECTORY** (dī-rēkt'ō-rŷ), the name applied to the government in France which was established by the constitution of Aug. 22, 1795. This body was composed of five members, who ruled in conjunction with two chambers—the Council of Ancients and the Council of Five Hundred. It was deposed by Napoleon Nov. 9, 1799, who assumed the government with Charles F. Lebrun and Jean J. Cambacérès as three consuls, on Dec. 15, 1799, his office being that of first consul.

The name directory is applied to a book which contains the names of the inhabitants of a city or district. Directories are published at frequent intervals. In them the names of citizens are given in an alphabetical order, together with the place of abode and business or

profession of the individual. Various directories are issued by the government, the principal and most used work of this kind being the "Official Postal Guide." Such a directory contains a list of all the post offices, giving the counties and political divisions in which they are located.

**DISCOUNT** (dīs'kount), a deduction from a sum of money due at a future date, or from the price at which a commodity is generally sold. Banks usually deduct a small per cent. from the face of a note when purchasing such a paper, called *bank discount*, and this deduction is an item of profit in addition to the rate of interest specified in the note. When a loan is made to a customer by a bank, it is quite usual to deduct the interest in advance, hence the person borrowing receives a sum slightly less than the face of the note he gives at the time the loan is made. Merchants usually get a discount from the wholesaler when they pay cash within ten days from the date of shipment, or a smaller discount if they pay within thirty or sixty days, and quite frequently the merchant has a similar system in giving his customers a small discount where a bill is paid cash or within a short time. Deductions of this kind are said to be based on trade or commercial discounts.

**DISEASE** (dīz-ēz'), a state of ill health, usually applied to the absence of health from all causes except old age. *Organic* diseases arise from an unhealthy condition of the organs of the body, while *functional* ailments are due to causes which prevent the organs from doing their work properly, though they may be sound. Diseases may exist without pain or uneasiness in the ordinary meaning of these words, but hardly without functional disturbance or incapacity of some kind. Bacteria, sudden exposure, and foreign substances that cause poisonous products within the body are among the prolific causes of physical ailments. Diseases are either *diathetic* or *enthetic*, the former arising from predisposition and the latter from without the patient.

**DISEASES OF PLANTS**, the ill health of plants, which causes their death or interferes with their normal development. The importance of this topic has been developed under a systematic study of plant life, and writers have become able to group and treat plant diseases with a high degree of accuracy. They are usually classified according to their causes, which are fungi, insects, bacteria, and physiological. The *fungi* include such diseases as mildews, grape rot, potato rot, and the smuts and rusts of grains. Diseases of this kind are spread by minute spores, which are carried from plant to



plant by insects, by the wind, and by other agencies. The plant on which they lodge is attacked, if the conditions are favorable, and the diseases make rapid progress when they are developed, causing either death or decay of a part or of the entire plant.

The diseases due to *insects* are numerous, especially in the forests and orchards. The phylloxera (q. v.), a prolific cause of disease among grapes and orange trees, is much dreaded in many parts of Europe. Carnations and many other flowering plants are attacked by the aphides, and eelworms attack the roots and cause galls in many economic plants. Diseases due to *bacteria* include the black rot of cabbage, the blight of apples and pears, and a wilt disease in cucumbers and melons. *Physiological* diseases are due chiefly to unhealthful conditions that surround the plants, such as unsuitable light and heat and improper nutrition. Plants subjected to ill health from these and similar causes turn yellow and rarely develop their fruit.

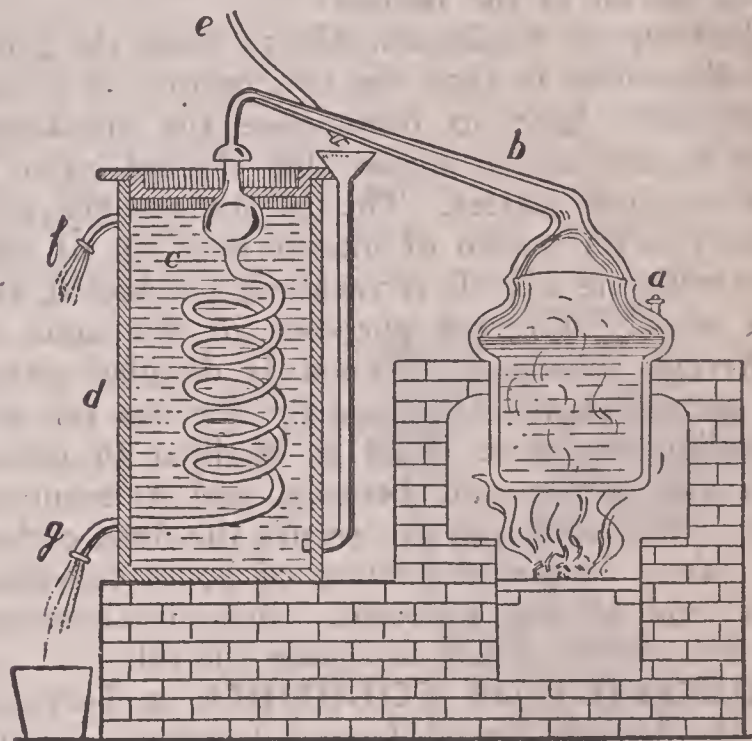
**DISMAL SWAMP**, a tract of marshy land located in North Carolina and Virginia. Formerly it was forty miles long and twenty miles wide, but it has been reduced somewhat by draining. It is covered largely with trees, consisting mostly of cypress, juniper, and cedar, with dense brushwood underneath. In the most elevated portions oak and beech trees abound. Canals have been constructed through it, being utilized for shipping timber for the manufacture of railroad ties, lumber, and shingles. Lake Drummond, six miles in length, is a sheet of water in the midst of the swamp. A navigable canal connects this region with Albemarle Sound and Chesapeake Bay.

**DISTAFF** (dĭs'taf), a simple instrument used in spinning, employed extensively by the people in ancient times. It is in the form of a staff, on one end of which the wool was rolled. The spinner held it in the left hand while the right hand was occupied in drawing out the fibers of the wool and at the same time twisting them. A small piece of wood called a *spindle* was attached to the thread, the weight of which continually carried it down as it was formed. When the spindle reached the ground it was unfastened, the thread which had been formed was wound around it, and it was then again fastened near the new thread. A modified form of the distaff is still used by the peasants of Greece. The Fates are represented in ancient and modern art with the distaff, with which they are busied spinning the thread of life.

**DISTEMPER** (dĭs-tĕm'pĕr), a mode of painting, in which the colors are coarser than

those used for higher artistic purposes, and are mixed in a watery glue, such as sizing and whiting. Formerly it was employed in the higher departments of art, but now it is used chiefly in making wall paper and in scene painting.

**DISTILLATION** (dĭs-tĭl-lā'shŭn), the process of heating solids or liquids in a retort or vessel so constructed that the vapors thrown off are collected and condensed. A representation of the apparatus used is shown in the accompanying illustration. The retort or vessel,



DISTILLING APPARATUS.

marked *a* in the figure, is called the body of the still, in which the vaporization takes place, and from it the vapor is carried by pipe *b*, to the refrigerator, which is cooled for condensing purposes by a stream of cold water flowing in through pipe *e*, and out through pipe *f*. The worm tub *d* contains the coiled tube, or worm *c*, in which the condensation takes place, and the distilled liquid flows out at *g*. Distillation is of great value in manufactures and the arts. It enables the chemist to obtain pure or distilled water. Sea water can be rendered wholesome by distillation, while essences and volatile oils may be extracted from plants by this process with alcohol or water. It is utilized most extensively in manufacturing alcoholic spirits. In the process of manufacture a wort is prepared from malt or some other substance at a temperature not above 160° Fahr. After separating it from the grain and cooling, a quantity of yeast is added. Fermentation takes place readily at about 65° Fahr., in which process the saccharine matter of the wort is resolved into carbonic acid and alcohol, the latter remaining in the liquid. The alcoholic mixture is run into



a still as soon as the liquor ceases to ferment and submitted to distillation.

The character and strength of the distilled product depend upon the construction of the still; the first distillation is quite weak, while the second has the effect of greatly strengthening it. In the process the easily vaporized parts are separated from the rest and retain the flavor of the juice from which they are made. The malt liquor is flavored with the essential oil of barley, rum with the oil of the sugar cane, brandy with the oil of the grape, and gin with the oil of the juniper.

*Destructive distillation* differs from the process described in that the temperature is raised sufficiently high to decompose the substance, and bodies are produced that do not exist in the original matter. The substances are subjected to the action of intense heat out of contact with the air. It is variously conducted, and for widely different purposes in the same or different substances. Wood is distilled partly to secure charcoal and partly for the tar and pyroligneous acid. Coal is distilled to obtain the gas, anthracene, benzole, and ammoniacal water, and sometimes to secure the fixed carbon or coke. In the distillation of bones the charcoal and oil are collected. Shale is submitted to the process solely to obtain the oil.

**DISTRICT OF COLUMBIA**, a Territory of the United States, located between Virginia and Maryland, on the east bank of the Poto-



mac River. The area is 64 square miles. It has a gently rolling surface, except along the Potomac, where flat and marshy tracts occur.

The southern part is crossed by the Anacostia River, which flows into the Potomac, and the northern part is traversed by Rock Creek. About one-fifth of the surface is in farms and gardens, although the soil is light and sandy. The remainder is occupied by the city of Washington, Uniontown, and a number of villages. Fruit, flowers, hay, and vegetables are the chief products.

Originally the District of Columbia contained 100 square miles, of which 64 were ceded by Maryland in 1788 and 36 by Virginia in 1789. It received the official name of the Territory of Columbia in 1791, and the capital was removed thither in 1800. The portion south of the Potomac was given back to Virginia in 1846; thus it lies wholly east of that river. Congress administered the affairs of the district prior to 1871, but in that year it was placed upon a territorial basis. Henry D. Cooke served as Governor from 1871 to 1873, and Alexander Shepherd from 1873 to 1874. Since 1874 the government has been vested in the hands of a local corporation, with an executive branch consisting of three commissioners, one of whom must be an officer of the engineer corps and the other two are appointed by the President of the United States. Subordinate municipal officers are appointed by the commissioners, while the recorders, justices of the peace, and judicial officers are appointed by the President.

The inhabitants are centered very largely in the city of Washington and the villages are properly suburbs. Though Georgetown was formerly a separate corporation, it has been a part of Washington since 1878. In 1900 the total population was 278,178. Of this number 218,196 were in the old limits of Washington; 14,529, in the old limits of Georgetown; and 45,973, in the remainder of the district. In 1905 the population was 323,143, including 95,695 negroes. See *Washington*.

**DIVERS** (dī'vērs), a family of swimming birds remarkable for their power and habit of diving. They are known by their webbed toes, short and rounded tail, short wings, and straight, strong, and pointed bill. In flight they are remarkably rapid, and their movement under water is speedy and well directed. They pursue fish for food by moving rapidly, propelling themselves by their feet and wings, and frequently remain under water for some time before emerging. Divers are most common in the north, where they breed in the summer, and they move southward in the autumn. Large numbers are found in Northern Europe and America. The *great northern loon* of Europe is the largest of the various species, being



nearly three feet long. It and several closely allied birds are valued for fine plumage.

**DIVIDE** (dī-vīd'), or **Watershed**, in physiography, the crest line which divides the slopes of two drainage systems. Divides are characterized by various physical features, ranging from the low watersheds in regions slightly elevated above the sea to the crest lines of mountain systems, where the slopes are usually quite abrupt or precipitous. However, gentle slopes are abundant even in regions elevated greatly above sea level. North America has three marked divides, those of the east, of the central part, and of the west. The Appalachian Mountains, in the eastern part of the United States, form the divide between the rivers of the Atlantic coastal plain and those flowing into the Mississippi from the west. The Height of Land, situated in the north central part of the United States, is the watershed between the northern section of the Mississippi valley and the rivers of Central Canada, and the Rocky Mountains, in the western part of North America, separate the headwaters of the streams flowing into the Pacific from those of the central part of the continent. In some places the divides are low and channels are cut through them by streams, causing them to change their direction, while in others a slight overflow occurs only during high water. Instances of this kind occur in the Des Plaines River, Illinois; the Twin River Lake, Yellowstone Park; and the Cassiquiare River, South America.

**DIVINATION** (dīv-ī-nā'shūn), the art of foretelling future things by revelations from oracles or omens. Those who profess the power to divine or foretell future events rely upon observing the flight of birds and clouds and the movement of the planets, or base their belief on the influence of spirits or supernatural causes. Various forms of divination were practiced by the ancient Romans and Greeks, who probably came to believe in the art from the practices which prevailed in Egypt and Chaldea. The laws of Moses prohibited it among the Israelites, who were not permitted to perform any kind of divination. The medicine men among the Indians of America practiced it to some extent, and it still has adherents in some countries.

**DIVINE RIGHT OF KINGS**, the claim made by some sovereigns that they hold their office by divine appointment. According to this view, they assert the right to govern their subjects without interference, opposition to the government being regarded in the light of a sin. This doctrine was held by numerous English sovereigns and princes, especially in the

time of the Stuarts. It is a tenet pleasing to despotic rulers, and proportionally displeasing to the mass of their subjects. It is spoken of by Pope in these words, "The divine right of kings to govern wrong."

**DIVING** (dīv'ing), the art of descending and remaining for a certain period of time under water, especially when using a diving bell. As an art diving is important, being highly serviceable in fishing for pearls, sponges and corals, and in examining the bottom of rivers and the sea. It is utilized largely for engineering purposes, recovering valuable stores of sunken ships, and raising or removing sunken vessels. A skillful diver may remain under water from two to three minutes without the aid of artificial appliances. This form of diving was practiced in early times near the shore, but has gone largely out of use. In order to do effective service, it is necessary to supply the



DIVING DRESS AND TUBES.

workman with apparatus by which fresh air can be conveyed in sufficient quantities to enable him to remain under water for some time. This is done successfully by various appliances.

The diving bell, though used in quite ancient times, was first made of material value in the 18th century. It is so named from its form, being shaped like a bell. The principle employed may be illustrated by inverting a tumbler and pressing it down into a vessel of water. While the water rises to some extent in the tumbler, yet the upper portion remains perfectly dry, and in it a candle will burn for



a short time with even increased energy, on account of the air being condensed by pressure. The diving bell is connected above the surface of the water by flexible pipes, making it possible to inject pure air by a force pump, while the impure air escapes at the upper part of the bell by a cock. It is generally made of cast iron, containing strong convex lenses in the roof or upper side for the admission of light to the person within and is suspended by chains from a vessel above. In the newer forms are provisions by which the workmen may move the apparatus or raise or lower it at pleasure.

A waterproof diving dress is another appliance used by divers. It is made of India rubber cloth inclosing the entire body, except the head. The head is covered by a helmet containing three eyeholes covered with glass and protected by guards. An air pump above supplies air by means of a flexible tube connected with the helmet and the impure air passes off through another flexible tube to the surface of the water, though in some the air escapes through a valve. The diver sinks to the bottom by leaden weights attached to the soles of the shoes or to the feet. A speaking tube enables him to converse with those above quite as conveniently as through a telephone. Recently an apparatus utilizing compressed air has been introduced. In this form the air is supplied by means of a self-regulating device corresponding to the water pressure. This and other classes of diving apparatus frequently have an appliance attached by which bubbles indicate the condition of the diver, and assistants stationed at the top are informed of his safety. A diver rarely remains under water more than an hour and a half, and about 150 feet is usually the greatest depth at which extensive work can be conducted with safety.

**DIVISION OF LABOR**, the term applied in the industries to a classification of the work done by the workman. The more or less clearly defined inclination in each individual, especially so far as it relates to occupation, and various desires in different persons, have led to the modern diversification in trade and industry. The consequent division of labor has given to modern industries enlarged and enormous productiveness. It has been found that a given number of persons can produce a greater total of wealth by confining themselves individually to one thing than if each person worked by himself, endeavoring to produce everything he desires.

To illustrate the advantage, each man of a thousand working by himself might produce a

coat, a barrel of flour, and a pair of shoes in a certain time, and the one thousand men might produce one thousand of each of these articles. However, if each one-third of the men devoted themselves to the production of one of the three different commodities, the output would be considerably larger. In this way a workman, producing more than one thing which others want, can get in exchange more of the things he himself wants, and in the end be the producer of vastly greater quantities of wealth. This principle has been acted upon to such an extent that a great diversity of occupation has been caused in every community, and by means of it the necessity of greater exchange has been created.

Among the several advantages coming from the division of labor may be enumerated economy of time, strength, skill, and tools. Besides, it facilitates economy of material and supplies, and improves, diversifies, multiplies, and cheapens the product. The general improvement in tools and machinery may be largely attributed to the principle underlying it, and the massing of labor and capital has likewise resulted, though it has had the effect of limiting somewhat the usefulness of the workman as an all-round laborer.

**DIVORCE** (dī-vōrs'), the partial or total dissolution of a previously contracted marriage. The former constitutes the judicial separation of the two parties, while in the latter the marriage itself is set aside. The ancient Spartans rarely granted divorces, while the Athenians and other Greeks allowed them frequently for trivial causes. During the early epoch of Roman history divorce proceedings were extremely rare, though in the later period, especially in the republic, they became common. The right to institute divorce proceedings in the Roman court was vested both in the husband and wife. The Scriptures limit the separation of husband and wife to very narrow channels, while in the Catholic theology marriages are indissoluble, though special dispensations have been granted in exceptional cases.

General provisions were made for the legal separation of husband and wife in the early history of the American colonies. All the states followed this course with the single exception of South Carolina, where divorces are not granted by law. The proportion of divorces to marriages in the United States is one to fifteen. However, provisions for granting divorces and the conditions justifying them under the laws of the several states are extremely various, though a divorce decreed by any of the states having competent jurisdiction is recognized as



effective by the other states. The general complexity of divorce codes has led to a discussion favorable to uniform legislation in all the states. It is thought that the divorce laws of the District of Columbia are generally satisfactory to the various states, and the agitation has been largely favorable to modeling the divorce laws of the several states after them. A proposition to change the Constitution whereby Congress would be given power to pass uniform divorce laws has been considered at various times, but has been uniformly rejected as impracticable.

In Canada the divorces are less common than in the United States. Only 135 were granted in the period of 21 years ending in 1905, and the larger number of these were in Nova Scotia and New Brunswick. This function of the government is vested in the courts or in the legislative bodies, and the number of divorces are uniformly larger where they are granted by the courts. In some instances the divorcees are not permitted to remarry. An *alimony* is an allowance made to the wife out of the estate or income of her husband, after she has been legally divorced or separated from him.

**DIXIE** (dīks'y), the name of a popular song, which became a rival of *Yankee Doodle* in the Southern States during the Civil War. The name was first applied to a negro melody originated in New York, where a man named Dixie was a slaveholder. As the abolition sentiment grew stronger, he shipped his slaves south, and the refrain expressed their regrets on account of leaving Dixie's Land, as his plantation was called. Later the term was applied in a happy way to all the Southern States.

**DIXON** (dīks'n), county seat of Lee County, Illinois, on the Rock River, about ninety miles west of Chicago. It is on the Illinois Central and the Chicago and Northwestern railroads. The noteworthy features include the high school, the county courthouse, and the Northern Illinois Normal School. The manufactures include condensed milk, musical instruments, furniture, lumber products, machinery, flour, and implements. It has systems of waterworks, sewerage, electric lighting, and street pavements. The surrounding country is a fertile farming district. It was settled in 1836 and incorporated in 1869. Population, 1900, 7,917; in 1910, 7,216.

**DNIEPER** (nē'pēr), an important river of Russia, next to the Volga and Danube the largest in Europe. Its source is in the government of Smolensk, at the foot of the Valdai Hills. It has a southerly course to Kiev, thence makes a bold curve toward the southeast, thence south,

and thence southwest, flowing into the Black Sea. The total length is 1,325 miles, and it is navigable from a point some distance above the city of Smolensk. Among its principal tributaries are the Pripet, Beresina, and Desna. The government of Russia removed the rocks forming a cataract between Kiev and Alexandrovsk, and otherwise improved it for the enlargement of internal navigation. It also caused the building of numerous canals, among them one connecting the Dnieper with the Dūnā, thus making a continuous water route from the Baltic Sea to the Black Sea. The Dnieper is crossed by many bridges, has on its banks numerous commercial centers, and is itself of vast value in commerce. The lower course is noted for valuable fisheries. In the early history of Europe it was regarded the largest river in the world, except the Nile.

**DNIESTER** (nēs'tēr), a large river of Eastern Europe, rises in the Carpathian Mountains, in northeastern Austria. The main course through Russia is toward the southeast, passing from near Chotin toward Odessa, near which it flows into the Black Sea, after a course of about 850 miles. Owing to numerous rapids and shallows, it is navigable only for small vessels, though canals have greatly increased its service to commerce. It is subject to overflow from the effect of snow melting in the mountains in May and June. The principal cities on its banks include Bender, Mohilev, and Akerman.

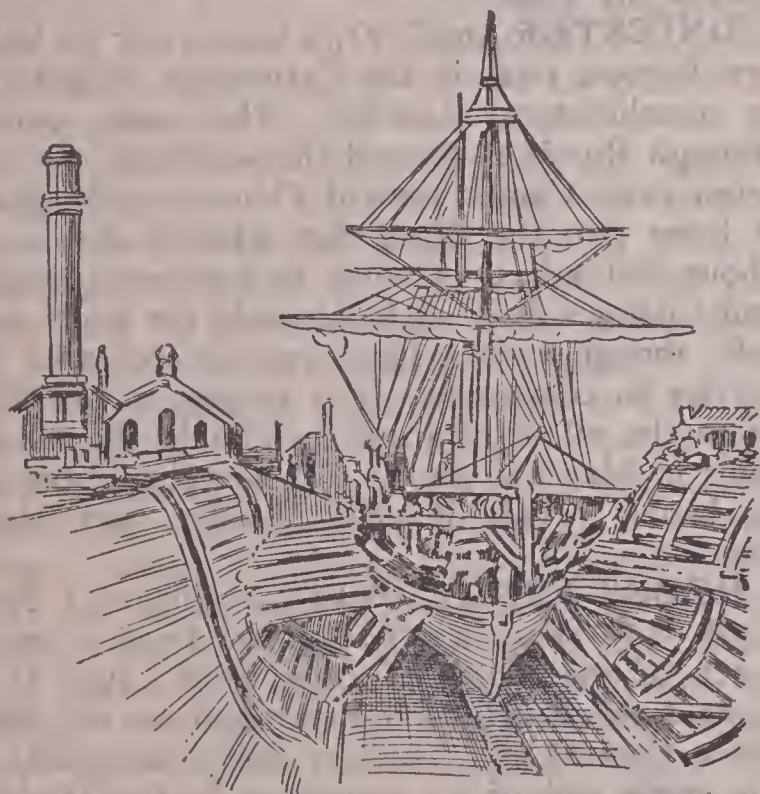
**DOBBS FERRY** (dōbz), a village of New York, in Westchester County, twenty miles north of the center of New York City. It is located on the Hudson River and on the New York Central and Hudson River Railroad, at the south end of an expansion in the Hudson known as Tappan Bay. Many New York business men reside here. It has a number of fine churches and many modern public utilities. Washington and Rochambeau met in the old Livingston mansion at Dobbs Ferry to plan the Yorktown campaign. Another conference was held at the same place in 1783, between Washington, Clinton, and Carleton, to consider the withdrawal of British troops from America. Population, 1900, 2,888.

**DOCK**, an artificial excavation or structure for receiving ships to be repaired, loaded, or unloaded. There are several classes, the most common being the wet docks, dry docks, and hydraulic docks. *Wet docks* are intended for loading and unloading vessels. They are made either by excavations near the shore, or by constructing walls of timber or solid masonry. The latter kind is used where tides cause ma-



terial changes in the level of the water, the ship entering at the time of flood tide, and, when closed, the water is kept at the desired level. This class of docks provides protection for ships against storms and the action of tides.

*Dry docks* are used to admit vessels to be examined and repaired. They are of such construction that gates can be closed after the vessel enters, when the water is pumped out, leaving the vessel resting on timbers while the shipwrights are engaged on the repairs. A *floating dock* is a form of dry dock. It is sunk below the surface of the water, allowing the vessel to float into it, after which it is raised and the water is pumped out of the surrounding tank. *Hydraulic docks* are likewise a kind of dry docks. They ordinarily have a system of iron columns, each containing a



DRY DOCK.

hydraulic press, by means of which the vessel is raised above the surface of the water. The hydraulic presses are worked simultaneously by powerful steam engines. The presses, working on iron pontoons, are first properly adjusted, and the ship is raised and securely suspended above the water by means of girders. After the vessel has been raised and secured in its position, the pontoon may be floated away and used for elevating other vessels, thus furnishing means whereby a number of vessels may be inspected and repaired at the same time.

Wet and dry docks are maintained in all important seaports. They are usually in charge of a dock master, the official who has control and general superintendence. *Dockyards* are inclosed magazines near harbors, in which all

kinds of necessary stores and material are deposited. Among the principal dockyards of the United States are those of New York, Washington, Boston, Pensacola, Portsmouth, N. H., League Island, Pa., Mare Island, Cal., New London, Conn., and Portsmouth, Va. The dockyards of Canada include those of Montreal, Quebec, Saint John, and Vancouver. Glasgow has the most extensive dockyards in Europe.

**DODDER** (dō'dēr), a genus of parasitic plants native to the temperate regions. They are leafless, climbing plants, and the flowers grow in dense clusters. The young plant begins its growth in the ground and twines upward, fastening itself to the plant from which it derives nutriment, and later the rootlets become severed from the soil. About fifty species have been classified, including those that are parasitic on hops, flax, clover, alfalfa, nettles, and leguminous plants. Some are very injurious to wheat and clover, especially in Europe. About twenty species occur in the United States.

**DODO** (dō'dō), a large bird that became extinct about two centuries ago. It inhabited Mauritius, an island in the Indian Ocean, east of Madagascar. Writers class this bird with the pigeons, though it was an extreme modification of that type. It had strong but ill-shaped legs,



DODO.

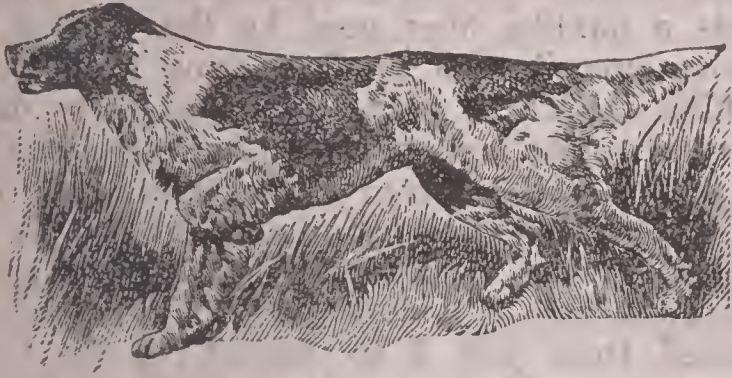
functionless wings, and a clumsy aspect, and the upper mandible was hooked like that of a bird of prey. The plumage was hairlike. In size and weight it was larger than a swan. Its extinction was caused by its inability to fly and the excellent quality of its flesh for food.

**DODONA** (dō-dō'nà), an ancient city of Epirus, in Greece, about eleven miles southwest of the site of modern Janina. It was located near Mount Tomarus, surrounded by rugged



hills, and was the seat of an ancient oracle dedicated to Zeus. The priestesses received their communications by listening to the rustling of the leaves of an oak tree, which was supposed to be the seat of the deity. In 1887 extensive excavations were made, when an acropolis and the temples of Zeus and Aphrodite were located.

**DOG** (dög), the common name of a family of quadrupeds of the genus *Canis*, with which are included the wolf, jackal, and fox. How-



SETTER.

ever, the last mentioned is termed a subgenus by some writers. The origin of the dog family is not known, but the animal is thought to have resulted from a crossing of various extinct and living species of quadrupeds, as wolves and jackals. The question of descent has been debated for many years among writers and naturalists. Though wild dogs inhabit several parts of the world, such as the *dhole* of India and the *dingo* of Australia, they are regarded merely domestic species that have merged into the wild type by being isolated from settlements for long periods of time. The dog has been a domestic animal from times far remote. Among the earliest allusions to it are those found in the books of Moses and in the writings of Homer. The figure of a mastiff is carved on an Assyrian monument, while an Arabian boarhound with its tightly curled tail is represented in Egyptian sculptures. From numerous Roman, Greek, and Celtic writings it is learned that dogs were sacrificed to certain deities. They were employed very early as executioners, and as living tombs for the consumption of carrion and human corpses.

In size and other respects dogs differ very largely, which fact has given rise to many species and different classifications. Some are not more than a few inches high, while others attain a height of from two to four feet, and are correspondingly proportioned in other respects. They represent all colors, have variously formed ears, heads, and limbs, and differ largely in the size and character of their hair. A species of dogs found in India has no hair

at all. Some have smooth, others straight, others curly or shaggy, and some long, wavy hair. The difference in voice and habit is fully as great as in size and appearance, and consequently they serve many widely different purposes.

Hamilton Smith arranged domestic dogs in six sections or groups as follows: 1. Wolf dogs, including such as the Saint Bernard, Newfoundland, Eskimo, Nootka, Siberian, and shepherd dogs. 2. Watch and cattle dogs, embracing the German boarhound, mâtin, dog of the North American Indian, and Danish dog. 3. Greyhounds, including the Irish hound, greyhound, brinjaree dog, lurcher, and Egyptian street dog. 4. Hounds, embracing the old southern hound, bloodhound, staghound, harrier, pointer, setter, spaniel, beagle, springer, cocker, poodle, and Blenheim dog. 5. Cur dog, including the terrier and their allies. 6. Mastiffs, embracing the different kinds of mastiffs, bulldog, and pug dog. In this classification he does not reckon the dingo, dhole, and several other species of wild dogs. These he does not include in the genus *Canis*. Besides, all the recognized species are not named under each division of this article. Other writers have made different classifications, but the one given here is among the most commonly accepted.

Cuvier regarded the dog as one of the most valuable domestic animals, owing to the useful purposes that it serves. It is true that each individual dog is devoted to his master, assuming largely his manners. It distinguishes and



SAINT BERNARD.

defends his property against intruders, often at the expense of life. The attachment formed remains until death, and springs rather from true friendship than from necessity. The highly developed sense of smell, strength, and swiftness has made the dog a powerful assistant of man in subduing other animals, and in serving many conveniences in society. The hunter is given valuable service by not only having the whereabouts of game located, but, after being



slain, it is brought to him, even if the danger of flood and precipice have to be undergone.

As a watcher of property in all hours of the night and under all circumstances, the dog serves a useful purpose and designs to protect life and property against the encroachment of enemies and the elements. The labor of man has been greatly lightened in that the dog has been employed in the economy of life and in various industries. It is not only an aid in securing wild animals for food, but furnishes means of conveyance, as in the case of Eskimos and Siberians, and in the lighter service of going on errands and carrying parcels in cities.

As a source of relief in danger the ability of dogs is illustrated by many adventures in saving life at sea and in prolonged and terrific snowstorms and blizzards. The acuteness of scent in some species is so highly developed, particularly in the bloodhound, that they are able to follow in the track of a pedestrian at some distance. The story is told that Robert Bruce, in order to escape capture by being tracked by bloodhounds, walked in the water of a stream for some distance, lifted himself out by the branches of a tree, and from its trunk proceeded on his course of escape. Bloodhounds were employed in many regions of the slaveholding states for the purpose of finding the whereabouts of fugitives and making their capture possible.

Dogs are used in some of the European army corps for service as guards in outpost work and for carrying ammunition and dispatches. They are favorite animals for performance in animal shows, and happily entertain audiences with many skillful and intelligent actions. They render good results in police work in the larger cities, where homes for lost dogs are kept, in order that those going astray may be killed or returned to their owners. In most countries a dog is regarded personal property, and the owner may be indemnified for willful injury, but may be held liable for damage done to others by the animal. During the warm summer season dogs are required to be muzzled in most of the larger cities to prevent injury on account of madness.

Most dogs have a long tail, which is curled upward. The teeth are well developed and enable the animal to pursue its carnivorous habits, though a portion of the food of some species consists of tender vegetable matter. The young are born with eyes closed, attaining sight in from eight to twelve days. Full maturity is reached at about two years, and the average life is from ten to twelve years, though a period of twenty years is not rare. The hide is

valuable in making wearing apparel, such as gloves, light shoes, and fur coats.

**DOGBANE** (dōg'bān), a perennial plant native to North America, found in open barren places from Canada to Alabama. A large number of species have been classified, including both herbs and shrubs. The common dogbane grows to a height of two feet, has a smooth stem, ovate leaves, pink flowers, and milky juice. It is valued for its medical properties, obtained chiefly from the bark of the root. The Indian hemp, a species quite common in Canada, yields a flaxlike fiber used by the Indians in making utensils and small wearing apparel.

**DOG DAYS**, a period of about forty days set apart by the ancients as the hottest season of the year, which occurred at the time Sirius, the dog star, rose in conjunction with the sun, about July 1. Owing to the precession of the equinoxes, the time is now different, and is usually counted from July 3 to August 11, the time being twenty days prior to the heliacal rising and twenty days after. The ancients looked upon the period of heliacal rising as having an evil influence on the earth.

**DOGFISH**, a species of fish allied to the shark and noted for its voracious and destructive habits. They are common near the American coast, especially off Massachusetts, and in the oceanic waters of Europe. Their characteristics include more or less spotted skin, blackish-brown color, length from three to five feet, and rough skin in some species. In weight they vary from six to twenty-five pounds. Some species are valued as food, but they are caught mostly for their oil.

**DOGGER BANK** (dōg'gēr), a large sand bank near the middle of the North Sea, about midway between Denmark and England. It is about 50 miles wide and 175 miles long, extending in a northeast and southwest direction. Near the coast of England it is about 50 feet below the surface of the water and the general depth is less than 120 feet. Important cod-fishing grounds extend across the Dogger Bank.

**DOGMA** (dōg'mā), a word used originally to indicate an opinion, but now applied generally to an article of belief derived from authority. In the latter sense it is applied to the essential doctrine of Christianity, based upon the Scriptures or the writings of the Fathers of the Church. The English-speaking people prefer to use the term *doctrine*, but in many countries of Europe dogma is preferred. A separate professorship in the study of science of dogmas (Ger. *Dogmen*) is maintained in many of the universities of Germany.



**DOG STAR.** See *Sirius*.

**DOG VIOLET,** or *Dog's Tooth Violet*. See *Violet*.

**DOGWOOD.** See *Cornel*.

**DOLL,** a toy usually representing a little girl, but sometimes a boy or man. Dolls are made largely in Europe of jointed wood, and elsewhere of stuffed cloth, wool, and India rubber. Their heads and hands are usually of porcelain or wax. The custom is thought to be more ancient than civilization, having been found largely among savage peoples. With the invention and perfection of phonography came the talking dolls. These dolls laugh, whistle, sing, and talk, and are almost as common as the wax dolls so long favorites with children. Dolls were displaced to some extent in the United States in 1908 by a toy figure representing a small bear, called the *Teddy Bear*, so named from President Roosevelt. This toy is inclosed in fur or a furlike cloth.

**DOLLAR** (döl'lër), a monetary unit of value, equal to one hundred cents in the United States and Canada. It is coined of silver and gold, though the latter is rarely used. The dollar is the smallest denomination of paper money now in circulation, and the largest issued in silver. The same name is given to coins in Mexico, the Philippine Islands, and in many countries of South America. Some writers assume that the name was abbreviated from *Jochimsthaler*, a coin circulated in 1518, in Bohemia, but some German writers derive the term from *talent*, the name applied to a pound of gold in the Middle Ages. The Dutch name is *daler*, and the German, *thaler*. The sign \$, generally used at present to signify a dollar, is supposed to date from the celebrated Pillar dollar of Spain.

**DOLLART** (döl'lërt), a gulf on the northwestern coast of Germany, at the mouth of the Ems River, on the boundary of the Netherlands. It is about seven miles wide and twelve miles long, and was formed by inundations of the North Sea. The land began to be worn away in the latter part of the 13th century and the inundations continued until about 1540. Many villages were destroyed within this period, but some of the land has since been reclaimed as polder by the construction of dikes.

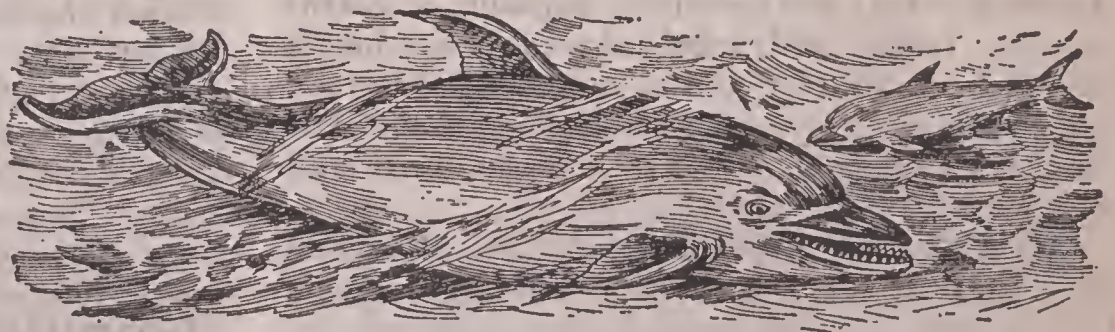
**DOLLY VARDEN TROUT,** a large fish found in the cold rivers of the Pacific Coast. It has a large head and mouth and a stout body, and the sides are marked with round red spots. The tail is almost truncate and the adi-

pose fin is large. It is found in the northwestern part of North America, from the northern part of California northward to Kamchatka. In Oregon it is called bull trout and toward the Russian border it is known as *malma* or *golet*.

**DOLOMITE** (döl'ô-mīt), or **Magnesium Limestone**, a mineral composed of carbonate of lime and carbonate of magnesia, found widely distributed in all parts of the world. The colors are various, including reddish-white, brown, and yellowish-white. Pearl spar, so called from its luster, is a crystallized variety. Reddish dolomite contains manganese and cobalt, and brown spar owes its coloring to the presence of iron. Dolomite rock is employed extensively for building purposes. It is one of the materials that was used largely in the construction of the houses of Parliament in London. Large quarries are worked in Vermont, Tennessee, Georgia, and in the southeastern part of Canada.

**DOLPHIN** (döl'fîn), a genus of fish belonging to the same family as the porpoises and narwhals. They are distributed widely from the Equator to the poles and commonly swim in companies of large numbers, their habits being largely gregarious. Their movement is skillful and with much velocity, often swimming beside the fastest vessels. They display their agility by many graceful movements, leaping into the air and then plunging through the water with a playful and rapid motion. Tourists are often delighted by their gambols as they come to the surface or may be traced by a slender wake of foam beneath the surface.

The snout is sharp and long, and there are



DOLPHIN.

numerous teeth in both jaws, but no organ of smell, dolphins being the only mammals having this distinction. The flesh is coarse and rank, although it is used as food by savages. Their food consists chiefly of mollusks, fish, and other water animals. A blowhole of a semilunar form is located nearly over the eyes, and they come to the surface at short intervals to breathe. The length varies from six to ten feet. The young are watched with care and anxiety by the females, who suckle them for some time after birth. A species known as the *bottle-nosed dol-*



*phin* is most common on the eastern coast of North America, extending southward from New Brunswick. Other familiar species are the *black dolphin* and the *spotted dolphin*. A fish of the mackerel family, celebrated by poets on account of changing its color when dying, has been given the same name, though it is not a true dolphin. This species of fish is called *Dorado* by the Portuguese. It is native to tropical waters, attaining a length of from three to five feet.

**DOME**, the name given to a vaulted covering of the whole or a part of a building. It is applied more properly to the external part of a spherical roof, while the term *cupola* is used to designate both the external and interior parts. Most domes or cupolas have a circular form, though some are elliptical or polygonal, this depending on the figure of the base. A lantern or small dome is usually built at the top of a large dome, and is supported by the framework of the latter. In former times domes were constructed largely in the form of hemispheres of stone masonry, while those of modern construction are largely of timbers covered with a metallic surface protection. However, the newer domes have a framework almost entirely of iron or steel. The Rotunda or Pantheon at Rome, constructed under Augustus, is the largest masonry dome in the world, having an internal diameter of 142 feet and an internal height of 143 feet. It is still in a perfect condition. Other noteworthy domes are those of the Cathedral of Florence, Saint Peter's at Rome, Saint Sophia at Constantinople, and Saint Paul's at London. The finest dome in America is that of the capitol building at Washington. It is constructed of cast iron, has a diameter of 96 feet and a height of 180 feet, and is 288 feet above the base line of the east front. The weight of the iron in the dome and tholus is 8,009,200 pounds.

**DOMESDAY BOOK** (dōmz'dā), the name by which an old record of the lands of England is known. It contains an account of the statistical survey made in 1085-86 under William the Conqueror. There are two volumes written on vellum, a folio of 382 pages and a quarto of 450 pages. These books contain the names of the chief landowners, the value and extent of the estates, the kind and value of different personal property, and the name of the tenants. The record was made by a number of commissioners, who canvassed the country, being assisted in the work by the people of different sections. It furnished a basis for the organization of military forces and gave an account of the wealth and population, as well as

titles to property. It was printed in facsimile in 1783 and 1816, and since 1861 has been converted to metallic plates. The Domesday Book furnishes a valuable record for the investigation and study of many questions relating to the early history of Great Britain.

**DOMINICA** (dōm-ĭ-nē'kà), or **Dominique**, the largest island of the Leeward group, comprising a part of the British possessions in the West Indies. It is located between Martinique on the south and Guadeloupe on the north, and has an area of 291 square miles. The surface is mountainous, including some of the highest peaks in the Lesser Antilles. Morne Diablotin, the most elevated summit, has an altitude of 5,900 feet. Many of the valleys are fertile and well watered. Few indentations characterize the shore, hence the island has few good harbors. Among the principal products are indigo, coffee, cotton, sugar, and fruits, all of which are exported. Roseau, the capital, has a good trade and is well fortified. Columbus discovered Dominica on Nov. 3, 1493. In 1814 it became an English possession. Population, 1906, 29,695.

**DOMINICAL LETTER** (dō-mĭn'ĭ-çal), one of the first seven letters of the alphabet, that is A, B, C, D, E, F, G, used in calendars to mark the Sundays throughout the year. The marking begins with the first seven days of the year, and all the succeeding days of the year are marked consecutively in sets of seven days; hence the 1st, 8th, 15th, etc., of the year are marked by A; and the 2nd, 9th, 16th, etc., by B, and so on. The dominical letter would be the same year after year, if the number seven divided the number of days without a remainder but since this is not the case, the dominical letters go backward one day every common year and two every leap year. Hence, the series repeat themselves in four times seven, or 28 years. The dominical letters are used to discover on what day of the week any day of the month falls in a given year.

**DOMINICAN REPUBLIC.** See **Santo Domingo**.

**DOMINICANS** (dō-mĭn'ĭ-kans), the name of an order of friar preachers founded by Saint Dominic at Toulouse in 1215. Owing to a black cloak formerly worn by them, they were called Black Friars in England, and in France they were known as Jacobins, from the first establishment of the order in the church of Saint Jacques in Paris. The rules of the order are based on those of Saint Augustine. They are bound to observe silence and abstinence from fresh meat, and their vows include observance of poverty, chastity, and obedience.



The special aims of their institutes are the study of sacred sciences and ministerial duties. The order was confirmed by a bull of Pope Innocent III. in 1216. In the Middle Ages they divided the paramount influence in the church with the Franciscans, and in the 16th century the Jesuits took possession of the intellectual supremacy exercised by them. They gave to the church four popes and about seventy cardinals.

**DOMINOES** (döm'i-nōz), a game played by two or more persons, with flat, rectangular pieces of wood, bone, or ivory. The pieces are about half as broad as they are long, 28 in number, and usually are plain black on the back and white on the front, but the latter face is divided by a line across the center, on each side of which are black dots, except that the ends of one set from 1 to 6 are left blank, so that upon each domino there is a different combination of numbers. Each player takes an equal number of the dominoes, selecting them after they have been mixed with their backs up. The person who has drawn the one which has the highest number of points puts it down. The next domino played must be one with a number the same as one of the two numbers represented by the first, and the two similar ends are joined. The third player may match the remaining number of either the first or second domino, and thus the game continues until one of the players has put down all his pieces and can neither draw nor match. The winner scores the number of points equaled by the dots on the pieces held by his opponent. This game depends partly on chance and partly on the memory and calculation.

**DON**, a large river of European Russia, having its source in Ivan Lake, a small sheet of water in the government of Tula. It has a southerly course to the Sea of Azov, which it enters after flowing about 1,150 miles. The Don is navigable for large vessels during the spring floods, and at other times is fit only for small craft. Owing to numerous shallows, the water is spread in some places to a width of 1,750 feet. It is connected by a canal with the Volga system of navigation, and as a whole carries a large interior traffic. The principal tributaries are the Koper, Donetz, Manitch, and Sal. Productive fisheries abound in the larger portion of its course.

**DONALDSONVILLE**, a town of Louisiana, capital of Ascension Parish, on the Mississippi River, 64 miles above New Orleans. It is on the Texas and Pacific Railroad and is surrounded by a rice and cotton growing country. The industries include cotton mills, sugar works, tobacco factories, and machine shops. It has

municipal waterworks and an electric light plant. The place was settled in 1760 and incorporated in 1806. Population, 1900, 4,150.

**DONELSON, Fort**, an important fortification of the Confederates, on the Cumberland River, in the northwestern part of Tennessee. Grant moved his forces to the Cumberland and attacked Fort Donelson, after he had captured Fort Henry on the Tennessee, Feb. 6, 1862. The Confederates at first drove the Federal gunboats off, but General Grant's prompt action made it necessary for the fort to surrender. In a memorable letter General Grant demanded the surrender to be unconditional. About 15,000 Confederates were made prisoners and the fall of Nashville and Columbus became inevitable. General Wheeler made an attempt to recapture the place from the Federals on Feb. 6, 1863, with a force of 4,500 of Bragg's army. The garrison of the fort was held by 600 Federals, and by successful skirmishes the attack was delayed until a gunboat came up the river, causing the Confederates to withdraw.

**DONGOLA** (dōŋ'gō-lā), a province of the Egyptian Sudan, in the eastern part of Nubia, on both sides of the Nile. The surface is level and fertile. Wheat, dates, and cattle are the leading exports. The inhabitants consist chiefly of a mixture of Nubians and Arabs. Mohammedanism is the chief religion. The province was settled by Mamelukes in 1812, after they had been expelled from Egypt, but in 1821 it was retaken by the Egyptians under Ibrahim Pasha. In 1886 a force of British and Egyptians under Kitchener quieted a rebellion, and since then the country has been enjoying an era of peace. Dongola, or El-Ordeh, the capital, is situated on the west bank of the Nile.

**DONKEY** (dōŋ'kŷ). See *Ass*.

**DORCHESTER** (dōr'chēs-tēr), a city of New Brunswick, capital of Westmoreland County, at the junction of the Memramcook and Petitcodiac rivers. It is nicely situated on Shepody Bay and the Intercolonial Railway, 115 miles northeast of Saint John, and is important as a port of entry. Coal and building stone are obtained in the vicinity. It has shipbuilding yards and is the seat of the penitentiary of the Maritime Provinces. Among the prominent buildings are several fine schools and churches, and it has electric lights and other public utilities. Population, 1906, 7,108.

**DORDRECHT** (dōr'drēkt), or *Dort*, a city of the Netherlands, in the province of South Holland, ten miles southeast of Rotterdam. It is located on an island in the Meuse River, and has extensive transportation facilities by canals and railways. A large Gothic church, a public



library, a theater, and several fine schools are among the chief buildings. The industries include flouring mills, shipyards, sugar refineries, tobacco factories, and iron and salt works. Dietrich III. of Holland founded the city in 1018, and its commercial importance is due largely to its membership in the Hanseatic League. It was the seat of the Synod of Dort in 1618, by which the doctrines of Calvin were affirmed. Population, 1906, 44,449.

**DORIANS** (dō'rī-anz), one of the two principal branches of the Greeks, the other being the Ionians. According to legend, they descended from Dorus, a son of Hellen, and made settlement in the Peloponnesus. Among the cities of importance founded by them were Argos, Sparta, and Messenia. Their colonies included Sicily, Crete, and settlements in Asia Minor. The dialect of the Dorians was harsh and rough, while the Ionian was mild and polished, yet some admirable features of the former caused it to enter largely into hymns and choruses. Their philosophy and character are visible in the Pythagorean school, which shows a strong attachment to the aristocracy. The Dorian architecture is distinguished by strong and unadorned pillars, while the Ionian pillars are slender and profusely decorated. See **Column**.

**DORIC ORDER** (dōr'ik), the earliest and strongest of three Grecian orders of architecture. It is noted for its proportions being the same as that of a man; that is, the height of a man is about six times the length of his foot. In the Doric style the columns are six times the diameter. The simplicity and harmony in this order are remarkable, and render many of the excellent temples, such as those built to Mars, Minerva, and Hercules, celebrated on account of their long, unbroken lines. Simplicity marks the Doric capital, while the frieze and cornice are massive, but plain. See **Column**.

**DORMANT** (dōr'mant). See **Hibernation**.

**DORMOUSE** (dōr'mous), a rodent animal appearing to be intermediate between the squirrels and the mice. These animals inhabit all

temperate and warm countries, but are most common in Eurasia and Africa, where twelve species are found. The fur is soft, the eyes and ears are large, the tail is long and hairy, and the fore limbs are short. In habits they are quite



DORMOUSE.

timid and in size are larger than a common

mouse. The winter is spent largely in a dormant state, from which they have been named *dormice*. Their food consists of nuts, vegetables, and grains. They are easily domesticated and seem to enjoy moving about in a cage. During the warmer days of summer they are active in fields and woods laying up a store for winter, but in the rainy or cold seasons they lie curled up in their nests and sleep. The young, from three to four in number, are brought forth in the spring, and by winter are quite able to take care of themselves.

**DORTMUND** (dōrt'mōont), a city in the province of Westphalia, Germany, on the Ems River, about 48 miles northeast of Cologne. Its rapid growth the past several years is due to the development of large coal mines in the vicinity and the building of numerous railroads. Several thousand persons are engaged in mining, while as many more are employed in manufactures and railroad enterprises. Among the products are machinery, tobacco, porcelain, textiles, woolens, cigars, clothing, iron and steel utensils, and railroad cars. It has an interesting city hall, a large public library, and municipal baths and gymnasiums. The central railway station is an excellent building, and the churches and institutions of learning likewise include expensive and valuable structures. The city has well-paved streets, a large park, and many modern facilities, including electric lights, sewerage, and rapid transit. It was a member of the Hanseatic league and still has a large trade. Population, 1905, 175,577.

**DOUAY** (dōō'ā), or **Douai**, the name by which the version of the Bible used by English-speaking Catholics is known. The translation was made by divines connected with the College of Douay, France, under the direction of Cardinal Allen, the founder of that institution. It is based on the Vulgate and is authoritative among Catholics, having received the sanction of the Pope and the approval of the Council of Trent. The Old Testament was published in 1609, about two years before the authorized edition of King James's Protestant Bible appeared. The New Testament now published with the Douay version of the Old Testament was first issued at Rheims in 1582. Both have been revised at different times.

**DOUBLE STARS**, or **Binary Stars**, a pair of stars that revolve about each other, or both about a common center. Sir William Herschel discovered the first of these stars in 1803, and since a large number have been added to the catalogues, though the periods of revolution have been determined of only a few. About 10,000 apparently double stars have been cata-



logued, and it is reasonably certain that 250 are binary; that is, they have a revolution round their common center of gravity. It requires from five and one-half years up to perhaps a thousand to complete their periods of revolution, hence it is difficult to study them with any degree of precision. The double stars reveal a duplication of the spectral lines, hence they afford curious instances of contrasted colors. The color of the smaller star complements that of the larger one, the former being blue or green and the latter red or orange.

**DOUGLAS** (dūg'lās), a city of Great Britain, capital of the Isle of Man, on the east shore of the island, eighty miles northwest of Liverpool. It is located on a picturesque bay, near which is a fine promenade, and the city is popular as a watering place. The streets in the older part are narrow and tortuous, but in the newer section they are straight and finely improved. A public library, city waterworks, electric and gas lights, and a number of fine schools are among the public utilities. It has several slaughterhouses and a large trade in merchandise. An extensive breakwater and a lighthouse afford safety for steamships, with which regular communication is maintained with Belfast, Dublin, Liverpool, and Glasgow. Population, 1907, 23,530.

**DOUM PALM** (dōōm). See **Palms**.

**DOURO** (dō'rōō), a large river of the Spanish peninsula, rises in the northern part of Spain, and flows west through a portion of Spain and the whole of Portugal. The entire course is 500 miles and the most important tributary is the Pisuerga. Owing to rocks and sand banks, only about seventy miles are navigable. The mouth of the river is three miles below Oporto, where it flows into the Atlantic Ocean.

**DOVE** (dūv), a pigeon, especially the familiar species known as the *mourning dove* of North America and the *turtle dove* of Europe. Among the domestic doves are the tumblers, fantails, and carrier pigeons. In poetry the dove is regarded a symbol of gentleness, while in Christianity it typifies the Holy Spirit. See **Pigeon**.

**DOVER** (dō'vēr), the capital of Delaware, county seat of Kent County, about eight miles west of Delaware Bay, on the Philadelphia, Wilmington and Baltimore Railroad. It is located on elevated ground and has well-improved streets. In the State capitol, which is the largest building in the city, is a library of 35,000 volumes. Other noteworthy features include the county courthouse, the post office, the high school, and the Wilmington Conference

Academy. It has a number of monuments dedicated to prominent men of the Revolution. The manufactures consist of flour, canned fruits, glass, clothing, vehicles, and machinery. The surrounding country is largely devoted to fruit growing. Electric car lines furnish ample means of conveyance. It was made the State capital in 1777 and was incorporated in 1829. Population, 1900, 3,229.

**DOVER**, county seat of Strafford County, New Hampshire, on the Cochecho River, ten miles northwest of Portsmouth. It is on the Boston and Maine Railroad. The streets are broad and well paved. Among the chief buildings are the courthouse, the public library, the town hall, the opera house, the Joseph's Hill School, and the Franklin Academy. The manufactures include boots and shoes, cotton and woolen goods, machinery, earthenware, and prints. It has waterworks, sewerage, and electric street railways. Dover is one of the oldest cities in the State, dating from about the middle of the 17th century. It was incorporated in 1855. Population, 1900, 13,207.

**DOVER**, a town of New Jersey, in Morris County, 27 miles northwest of New York City. It is located on the Rockaway River, the Morris Canal, and the New Jersey Central and the Delaware, Lackawanna and Western railways. The manufacturing enterprises include iron works, machine shops, knitting and silk mills, and stove and range works. It has a fine system of waterworks and a number of good schools. Several summer resorts and a national powder depot are near the town. The first settlement was made in its vicinity in the middle of the 18th century. It was incorporated as a town in 1869. Population, 1905, 6,353.

**DOVER**, an important seaport of England, on the Strait of Dover, about sixty miles southeast of London. It is the nearest to France of the English seaports, being only twenty-one miles from the French coast. Numerous railroad lines join it with the interior cities, while electric railways furnish ample urban and suburban connections. Among the noteworthy buildings are the churches of Saint James and Saint Mary, the Dover College, the public library, and the town hall. The Castle of Dover, located on the chalk cliffs east of the city, was founded by the Romans. It has extensive systems of waterworks, sewerage, and stone and macadam pavements. The manufactures include fabrics, soap, machinery, clothing, and food products. Its harbor has been put in excellent condition by recent improvements, while the Admiralty Pier protects the entrance. The city and surrounding districts are rich in



relics of ancient times. Population, 1907, 43,792.

**DOVER, Strait of**, the sea channel which separates England from France, and connects the English Channel with the North Sea. The length is 24 miles. It is 25 fathoms deep at the time of the spring tides. The narrowest point is at Dover, where it is 21 miles wide. Chalk cliffs are more or less prevalent on both sides, and indicate that at remote ages Great Britain was connected with the mainland. The strait is the site of an important commercial life.

**DRACHMA** (dräk'mà), or **Drachm**, the name of a silver coin and of a measure of weight in ancient Greece. The measure of weight was composed of six *oboli*, or a handful. A *mina* contained 100 drachmas and a *talent* contained 1,000. As a unit of weight it varied somewhat at different times, from 6 to 6.5 grams. The *silver drachma* had a value of from 15.20 to 17.05 cents. The drachma is the name of a silver coin now used in Greece. It has the same value as the franc of France. The dram, a unit of the apothecaries' weight, contains three scruples, or sixty grains.

**DRAFTING**, or **Conscription**, the system or method of enlisting men for military service under compulsion. In modern times drafting men for the army has been resorted to only in cases of emergency, especially when the country was involved in a formidable military contest. The modern system is based upon the military constitution of ancient Rome, where conscription was resorted to each year as a means to recruit the army. In most countries of Europe military service is obligatory on every man of sound mind and normal physical development. The United States enacted a compulsory service law at the time of the Civil War, when President Lincoln recruited the Federal armies by levying drafts of men. In July, 1863, when the Union was in need of more soldiers, such a conscription act caused a riot in New York, known as the Draft Riots. This act required all able-bodied male citizens between the ages of 20 and 45 to serve in the army, but they were permitted to procure exemption by the payment of \$300.

**DRAGON** (dräg'ün), the name applied to several species of lizards found in South America, Asia, and Africa. The flying lizard is the best type of the genus. It is about ten inches in length, has a long tail, and is entirely harmless. On each side the skin is expanded in the form of a parachute, enabling it to make long leaps in passing from branch to branch, though it cannot fly in the ordinary sense. Most spe-

cies live in trees and feed almost entirely on insects, which they catch with much skill.

The name *dragon* applied in mythology to an animal or serpent of abnormal form. This fabulous animal is represented as serving various purposes, among them watching the garden of the Hesperides, and whose destruction was included with the seven labors of Hercules.



FLYING DRAGON.

In various paintings the dragon has the form of a winged crocodile, and is said to have dwelt in caves among cliffs and mountains. The fossils of the pterodactyl found in the rocks of the Mesozoic time show some resemblance to the flying dragon of mythology.

**DRAGON FLY**, the popular name of a large number of insects which are widely distributed, including not less than 2,000 species, of which about 300 occur in North America. They have a large, broad head loosely attached to the thorax. Their eyes are prominent, often meeting upon the crown of the head. The horny mandibles are toothed, the wings are closely articulated, and in many species the hind wings are about the same size as the anterior. They are remarkable for their voracity and feed on insects, which they catch with much skill. They deposit their eggs on plants growing beneath the surface of water, where the larvae and pupae lead an aquatic life. Their larval state occupies a year, after which the skin bursts along the back and the developed insect makes its appearance. Many species are from two to three inches long, of numerous colors, and not dangerous in any way. The common dragon fly of North America is known as the *devil's darning-needle*. About 75 species of fossil dragon flies have been described, appearing in the Lias and more recent formations. See illustration on following page.

**DRAGON TREE**, a tree native to the Canary Islands. The stem is usually short in proportion to its thickness, and the short branches terminate in tufts of sword-shaped



leaves. A celebrated specimen on the island of Teneriffe, near Orotava, was visited by Humboldt in 1799 and had a stem over forty feet in circumference. It yields a resinous substance known as *dragon's blood*, but this product is also obtained from a number of other trees, including several species native to the



DRAGON FLY.

East Indies and North and South America. This product is a colorless and tasteless substance, and is used in the preparation of varnishes and lacquers.

**DRAINING** (drān'ing), a term applied extensively in agriculture to the process of drawing off superfluous water by artificial means. Through the agency of draining, large tracts of otherwise wet and waste lands have been rendered susceptible to cultivation and the production of plants and cereals. The common way in extensive flats is to excavate a great open channel or ditch, through which the water passes off freely after rains or the melting of snow or ice. Lands used for cultivation are usually drained by the construction of tile drains. The common draintile is manufactured of clay, is circular in form, commonly twelve inches long, and has an inside diameter measuring from three to fifteen inches. The larger sizes, which range from eighteen to forty inches in diameter, are generally made two feet long, either of clay or concrete. In order to construct a proper tile drain it is necessary to make a careful survey of the district to be drained, forming an estimate of the approximate amount of water to be carried from the region, and locate the tile so a proper fall will insure the unobstructed passage of the water. A complete system of drainage requires a number of minor drains or laterals, which carry the water to the main drain. The number of

such laterals depends upon the character of the surface and the nature of the soil, since a hard clay soil is not so easily penetrated by the moisture as the loose and sandy formations.

In the colder countries the tile drain should be sufficiently deep to be below the frost in the winter, else water freezing within will burst the tile and impair the drain. The best drains are at least four feet deep at the shallowest places, which necessitates placing them at great depths through moles or hills. It has been found that the system of draining lands, though quite expensive in some cases, is a profitable investment, owing to the fact that the lands redeemed are usually the richest and most fruitful. Tile factories are operated in practically all of the states where drainage is necessary and the proper clays are found. By the use of this method the amount of arable land has been increased largely. There are other forms of drainage, such as open ditches made by plows, layers of stones covered by earth, and perforated drainpipe of circular sections covered by stones and earth, but the most common is the one employing tiles made of clay or concrete.

**DRAINAGE CANAL.** See **Chicago Drainage Canal.**

**DRAKENSBERG** (drä'kens-bërg), an elevated range of mountains in South Africa, extending through the eastern part of Cape Colony and along the borders of Natal and the Orange River Colony. Champagne Castle, one of the highest peaks, has an elevation of about 11,500 feet. Several railroads cross through its passes. During the Anglo-Boer War it was the scene of many battles.

**DRAKE UNIVERSITY**, a coeducational institution at Des Moines, Iowa, the largest independent endowed institution of higher learning in Iowa. It was organized in 1881. The chief benefactor, Gen. Francis Marion Drake, made a gift of \$20,000 to establish it. Afterward he made other donations at different times, the total amount of his gifts aggregating nearly \$250,000. As a mark of appreciation of his beneficence the institution was named Drake University. Another leading spirit in the founding of the university was George Thomas Carpenter, the first president, who was made chancellor and held that office until his decease, in 1894. Barton O. Aylesworth succeeded him as president, but resigned in 1897, when William Bayard Craig was chosen chancellor. He was succeeded in 1903 by Hill McClelland Bell, under whose presidency the institution has made phenomenal growth in resources and attendance.

The chief buildings include the Main Build-



ing, the Auditorium, Science Hall, the University Church, Howard Hall, the Medical Building, Cole Hall, Memorial Hall, and the Carnegie Library. Six colleges have been established in the university, the College of Liberal Arts, College of the Bible, College of Law, College of Medicine, College of Education, and College of Music. In the College of Liberal Arts, the work is largely elective, leading to the three degrees of A. B., Ph. B., and B. S. The library has a capacity of 150,000 books, a hall of history, and a number of rooms for officers and for recitations. Drake University, in 1908, had 110 instructors and 1,875 students.

**DRAMA** (drä'mà), a literary production which embodies a picture of real life and is to be represented on a stage by action. There are two principal classes of dramas, tragedy and comedy, with a number of minor kinds, such as the farce, burlesque, tragic comedy, and melodrama. A *tragedy* is a production intended to interest the mind in the highest degree, while a *comedy* is designed merely for amusement and merriment. The others are mixtures of the two chief classes, and alternately seek to interest, instruct, and amuse. Dramatic performances of some kind are found among all peoples, and their origin is to be attributed to the love of imitating the actions of others or of some deified personage. The Old Testament contains a number of compositions that partake of a dramatic nature, among them numerous dialogues in the Book of Job and the lyric poems in the Song of Solomon.

The dramatic literature in ancient India and China was particularly characteristic, each country possessing a drama peculiar to itself. The Greeks originated the European drama in both the tragic and comic forms. It is thought that the first comedy was given by Susarion and Dolon in Athens on a movable scaffold in 562 B. C. The first production in tragedy was from the pen of Thespis in 536 B. C. Aeschylus introduced dresses on the stage, by which means the imitation of action was rendered much more natural. The three greatest writers of tragedy in Greece are Aeschylus, Sophocles, and Euripides, while Aristophanes is the most eminent writer of comedy. In Rome the early drama was derived from the Greeks, though it never attained to so high a degree of perfection, even under Terence and Plautus, the most celebrated of Roman writers of comedy, and Andronicus, the writer of tragedy. The only dramas of ancient Rome extant are a few specimens coming to us from Seneca.

The drama of modern European countries took rise in the moralities, miracle plays, and

masterpieces of the Middle Ages, though the Italian drama began with the reproduction of classical models. Performances at banquets became common in most countries in the 12th century, and later scenes from the Bible were acted on stages in churches by priests and their assistants. The morality plays were fables, in which impressive moral lessons were recited with the view of overcoming vice and its baneful influences. Among the celebrated Bible plays is the famous Passion Play, illustrating the life of Christ, which is still counted among the most interesting and popular of the sacred dramas. In the 18th century the Italian drama took a new form of interest, both in comedy and tragedy, the later writers including Monti, Goldoni, Alfieri, and Manzoni. The other nations developed a taste for dramatic art much later than Italy. Spain followed Italy, reaching its acme in dramatic art through the works of Calderon and Lope de Vega, while the English reached their climax in Shakespeare.

The first period in the history of English drama begins with the reign of Elizabeth and terminates with that of Charles I. Within this time Shakespeare, Ben Jonson, Beaumont, Greene, Marlowe, and Fletcher were among the brilliant dramatists. The second period began with Charles II., including among its best writers Otway, Lee, Wycherley, Congreve, and Dryden. At first the plays of the latter period were marked by inferior productions, but later notable changes were made for the better. The most noted of English writers of more recent time include Coleridge, Shelley, Byron, Lord Lytton, Browning, and Tennyson. However, Shakespeare stands preëminent among the English dramatists and his plays are still more popular than those of any other English writer. Goldsmith's "She Stoops to Conquer" and Sheridan's "The School of Scandal" are very noteworthy. In France the drama was greatly improved by the advent of Corneille, who is regarded the founder of the higher drama in that country. Among the most distinguished of the later French dramatists are Hugo, Racine, Voltaire, and Molière.

The German drama was at first largely instituted by adaptations from the Italian and French, but scholarly additions were made by Lessing in 1755. He was followed by Schiller and Goethe, who rank among the best dramatists of modern times, the latter being regarded equal to Shakespeare by many critics. Schiller's "Wilhelm Tell" and Goethe's "Faust" and "The Sorrows of Werther" hold the stage with unceasing interest. Other noted German dramatic writers are Brentano, Körner, Schlegel,



Ludwig, Freytag, Laube, Kötzebue, and Von Moser. Hermann Sudermann, author of "Johannesfeuer," is one of the most recent German dramatists. The Dutch drama had its rise in the 17th century by the classical tragedies of Koster, and reached its acme in Vondel. Among the chief Scandinavian dramatists are Heiberg, Ibsen, Oehlenschläger, and Björnson.

The American drama originated by amateur players at Quebec, Canada, in 1694, though it is likely that the Spaniards introduced the stage in Mexico at an earlier date. Puritans looked upon dramatic art with disfavor and passed a law whereby players and spectators were fined five dollars on conviction of having participated in performances. This law was in force for fifty years. A company attempting to give a performance at Philadelphia in 1749 was bound over to their good behavior. The originators next went to New York, where they gave performances for sixteen months consecutively, the advertisement including "The Historical Tragedy of King Richard III., Wrote Originally by Shakespeare, and Altered by Colley Cibber, Esq." In the beginning of the 19th century the drama came into general popularity, first in the larger cities and later in towns and villages. John D. Burke, slain in a duel in 1808, wrote the successful plays, "Joan of Arc" and "Bunker Hill." John H. Payne, author of "Home, Sweet Home," wrote sixteen plays, while both George P. Morris, author of "Woodman, Spare That Tree," and Samuel Woodworth, author of "The Old Oaken Bucket," wrote numerous masterpieces. Among the noted American dramatists are Epes Sargent, W. E. Burton, and John Brougham. Denman Thompson's "Old Homestead" and Harriet Beecher Stowe's "Uncle Tom's Cabin" have been played more extensively than any others.

**DRAVE** (drä've), an important river of Europe, rising in the eastern part of the Tyrol. Its course is through Carinthia, Styria, and Croatia. It forms the boundary between Hungary and Slavonia, after which it joins the Danube a few miles east of Eszek. The entire length is 450 miles, about half that distance being navigable. The valley traversed by it is well populated and noted for its great fertility. Marburg, Lienz, and Eszek are among the cities on its banks.

**DRAVIDIANS** (drä-vīd'ī-āns), the name applied to a group of non-Aryan races in the southern part of India. They include the people who speak a number of dialects, including the Canarese, Malayālam, Tamil, Telugu, and a number of others. The Dravidian languages show no affinity to the Aryan or Indo-Germanic, except that these tongues have been

modified on account of contact with the Sanskrit. About twelve or fourteen dialects are spoken and some of these are intelligible to two or more of the different members of the group, but most of them speak only one dialect. The Tamil and Telugu show the highest degree of culture and are the dialects of about one-half of these Dravidian people.

**DRAWING** (dra'ing), the art of delineating the forms of objects on a flat surface by means of lines drawn with a pen, crayon, pencil, or some similar object. It is taught as a branch of study in many of the common schools and colleges, and is employed in making charts and maps. Architects employ drawing in preparing plans and views of buildings, machinery, and figures. In *geometrical* and *mechanical* drawing instruments are used to guide the hand, while *freehand* drawing is done from objects without an artificial guide, as the name indicates. Mechanical drawing includes *topographical* drawing, *ship draughting*, and *architectural* drawing. Another class of drawing, the *perspective*, aims to represent the aspect of an object from a given point of view as it appears to the eye. It approaches the artistic or freehand drawing in its results. This branch of instruction has proved of inestimable value and is an aid in determining relative proportions and forms. Paintings in water colors and sketches or colors in oils, in the arts, are usually called drawings. See **Painting**.

**DREAMS**, the ideas or images of a sleeping person, in which he seems to see things real and substantial. Dreams are accounted for by some writers as resulting from uninterrupted trains of ideas passing through the mind at all times at night as well as by day, and as being modified and influenced largely by the thoughts of the objects in which the mind is engaged during the period of wakefulness. A man full of projects in business and perplexed with anxieties goes to bed with an active mind, which is excited even in sleep by the importance of his daily occupation. This leads to imperfect sleep and vivid dreams, which remain in the memory after awaking. Irregular meals, eating shortly before retiring, and other irregularities are prolific causes of mental activity during sleep, but the trend of the mind is influenced very largely by the activities experienced during the day.

In dreams the train of ideas appears as a series of events passing before the eye, or as objects affecting the senses. The periods in which dreams occur are often exaggerated, since what appears as a long period of time may be but a few minutes or seconds. The ideas



seeming to pass before the eye may cover a brief period or extend over several years, though the actual time elapsing may be but a few minutes. Pleasurable dreams result to those who live a life of purity and experience an absence of remorse, while the contrary affect those whose minds are engaged frequently in evil thoughts and imaginations. There are cases on record where men claimed to be aided in professional and business engagements by the effect of mental activity during sleep. Benjamin Franklin expressed the view that during dreams he was instructed at various times regarding issues that were subject to mental study. Coleridge asserted that he composed several hundred lines of "Kubla Khan" during a dream and committed them to paper before he awoke.

**DREDGING** (drĕj'ing), a term applied by engineers to the process of excavating material under water and thereby improving the means of navigation. Many machines for this purpose have come into use, but they may be classed either as *dipper* or as *grapple* dredges. The former consist of spoons or scoops for scraping sand, mud, and silt from the bed of a stream, canal, harbor, dock, or some other body of water. On the other hand, the grapple dredges are fitted to close around solid earth or stone. In this way the landing places for vessels as well as channels and inlets are not only deepened, but are made safer and more serviceable for large vessels. The work is done by steam power applied to machinery. The deposits at the bottom of the water are torn up and raised sufficiently to be dumped into dredge boats, which carry them off, depositing them at some distance from the place to be deepened. The process of securing oysters, plants, and shells from the bottom of the water is usually called dredging. The common dredge for catching oysters consists of a scraper attached to an iron frame. A bag fastened to the frame at the rear of the scraper receives the oysters, from which they are taken after being landed on the shore or on boats. Naturalists employ an apparatus for securing specimens of marine forms for examination, which is constructed similar to that of an oyster dredge.

**DRED SCOTT DECISION**, a decision of the United States Supreme Court delivered by Chief Justice Taney on March 6, 1856, regarding a slave named Dred Scott. This slave was in the possession of an owner in Missouri. He was taken to Illinois and then to Minnesota, which was at that time a Territory. Illinois and Minnesota were then free soil, and on this Dred Scott was kept for a number of years, after which he was taken back to Missouri.

After the death of Dr. Emerson, the claimant of the slave, Dred Scott with his family claimed to be free, on the ground that they had been taken to free territory and could not be held in slavery after returning to Missouri. In the decision it was stated that Scott had no right to sue for liberty, because no colored person was regarded by the Constitution as a citizen and that colored persons had no rights which a white man was bound to respect. The decision attracted much attention, because it degraded the slave to the level of a machine and showed no respect for human sentiment.

**DREIBUND** (drĭ'boont), the compact formed between Germany, Austria, and Italy for mutual defense and friendship. Germany and Austria formed the Dual Alliance in 1879, and, by admitting Italy to the compact in 1882, the Dual Alliance was formed into a Dreibund. This compact long remained a balance of power in the continent of Europe and provided an important safeguard in the maintenance of peace.

**DRESDEN** (drĕz'den), a city of Germany, capital of the kingdom of Saxony, situated in the valley of the Elbe River. A number of boulevards lead up to and surround the city, while extensive orchards and vineyards abound in the vicinity. Portions of the city are on both sides of the Elbe, the newer part being especially beautiful by reason of broad streets and fine pavements. The population is largely Lutheran in religion and supports numerous fine churches, many of which have important connection with historical and international events. Many of the government buildings are beautiful in the interior, though rather plain externally. The royal library contains 450,000 volumes, including many rare and valuable specimens of ancient writings and numerous manuscripts. The museum attached to the library is famous for its ancient treasures as well as productions of recent artists and sculptors. Among the municipal buildings are several for local government and for public instruction. Besides the public school system, there are the Polytechnic School, the Conservatory and School of Music, the Academy of Fine Arts, and other noted educational institutions. Dresden is particularly famous for its gallery of pictures, which is counted among the most valuable in the world. It contains 30,000 pictures and 375,000 drawings and engravings.

The recent rapid growth of Dresden is due to its large commerce and industrial establishments. Among the chief manufactures are pianos, porcelain, jewelry, books and stationery, glass, chinaware, clothing, fabrics, and ma-



chinery. Local and general commerce is facilitated by extensive electric lines and numerous railroad connections, as well as by navigation on the river. It maintains systems of waterworks, sewerage, electric and gas lighting, and public baths. The streets are kept in a clean condition and in many places are adorned by monuments and fountains. Among the public parks and gardens are the Zoölogical Garden and the Grosser-Garten.

Dresden is mentioned in history in 1206, and has long been a city of importance, both from a commercial and educational standpoint. The sovereigns made it their residence since 1485. It was almost entirely destroyed by fire in 1491, but subsequently it was extended and improved by Augustus the Strong. The enlargements and valuable improvements made by Augustus I. and II. in the first half of the 18th century gave the city a basis for rapid growth

**DRESS**, the costume or clothing worn by a person as a protection against heat or cold, and at the same time to furnish the conventional covering of the body in the mode or style peculiar to a people. Ideas concerning modesty in dress have differed widely among the people of different ages, but a great majority of the civilized nations have worn garments that cover all parts of the body, except the head and hands. It is quite necessary that wearing apparel should not be uniform in all countries, since the seasons and general climatic conditions vary greatly, making it imperative that the clothing should differ materially according to the requirements of the climatic and other conditions which prevail.

The history of dress is quite as old as that of nations, but the earliest information is based upon traditions and rude sculptures. A good idea of some kinds of costumes is obtained



STYLES OF DRESS.

1, Assyrian. 2, Greek. 3, Roman. 4, German, 14th Century. 5, Spanish, 16th Century. 6, English, 16th Century.

during the last century and the impetus it has at present. During the Seven-Years' War, the Napoleonic wars, and the revolution of 1849 it suffered severe losses by fire and military destruction, which have since been entirely overcome. Population, 1905, 516,996.

**DRESDEN, Battle of**, a battle at Dresden, Germany, on Aug. 27, 1813. The French army of 30,000 men occupied Dresden and the allied army of Austrians, Prussians, and Russians, commanded by Schwarzenberg, appeared before it on Aug. 23. Napoleon came with the main army to relieve it on the 26th and a great pitched battle was fought the following day, in which the allies were defeated. The French lost about 7,500 men in killed and wounded, but the allies lost the same number and 20,000 of their men were taken prisoners.

from the mummies of Egypt and we have reasonably authentic accounts of the garments worn by the Babylonians, Assyrians, and Egyptians. Mention of raiment for the body is made in many places of the Old Testament, such as the vestments worn by the early priests, but the first account we have is of the rude covering of the body made with leaves by Adam and Eve. In Exodus xxviii., 42, this injunction is given: "And thou shalt make them linen breeches to cover their nakedness; from the loins even unto the thighs they shall reach." This passage and many others refer to sacerdotal vestments. Frequent mention is made of the raiment of needlework, of purple and fine linen, and of the sackcloth of sorrow and repentance. The mantles worn by the Hebrews were four-cornered and were bordered with



fringes and ribbons of blue. The Assyrians were advanced in the arts of dyeing, embroidering, and weaving, and their attire was both convenient and beautiful. They wore sandals after the style of the Egyptians, and their fabrics were made quite largely of flax and cotton.

The Greeks sought to maintain grace and beauty in the fashion of their clothing and wore garments that gave perfect freedom of action to the body. The *chiton*, a close-fitting but long garment, was worn both by men and women and corresponded to the modern shirt. Over this the men wore the *himation*, which was open on one side, and the women used a girdle below the bust, using a *peplos*, a sort of woolen shawl, as an outside garment. A kind of breast support was worn by both Greek and Roman women, but this differed from the modern corset in consisting of a single band of cloth, and it did not have the objectionable tendency of compressing the body. Though the character of dress in Greece and Rome was simple, the garments were well adapted to the climate and conditions of life, and the wealthy dignified them by fine embroidery and ornamentations. The *tunic*, a kind of *chiton*, was used extensively in Rome, over which an outer garment, the *toga*, was worn. Considerable attention was given to covering of the feet by *sandals* or shoes, and a legging in the form of the high military buskin furnished protection against extreme cold.

The barbarians of Northern Europe wore loose garments made principally of wool, and their chiefs had shirts with sleeves and striped *pantaloon*s. Their dress was greatly influenced by the Roman invasion, but from them the Romans came to value the *trousers* as of practical utility. However, they are not the originators of this garment, but this distinction belonged to the Aryan people of Asia, who came across the mountains into the valley of the Euphrates, and from them it came to be introduced among the people of Europe. While the Chinese and Japanese have steadily held to the dress worn from a remote period in history, the people of Europe, on the other hand, acquired a love of change in the form of dress. Careful cutting and fitting displaced the simple and loose garments of the early centuries of the Christian era, and the clothing came to be firmly sewed and closely fitted about the hips, bust, and waist. The loose garments gave way to the coat, vest, and pantaloons worn by men, who laced or buttoned their garments tightly and dressed the feet and legs by using tight-fitting stockings and shoes.

Exaggeration in the head gear came into

vogue about the 13th century, when women began to wear the *hennin*, a very large covering of the head. Later the *miter* and the *horned headdress* coverings for the head became celebrated, against which sermons were preached from the pulpit until they went out of use about the 16th century, but were followed by the grotesque and peculiar footwear in the time of Henry VII. The modern *corset* came into use about the time of Catherine de Medici, and starch was employed largely in preparing the absurd dresses and enormous ruffs of the time of Queen Elizabeth. In 1583 Stubbs wrote: "There is a certain liquid matter which they call starch wherein the devil hath learned them to wash and dye their ruffs, which being dry will then stand stiff and inflexible about their necks." The *farthingale*, a contrivance which extended the skirts out at the hips, came into use among women about this time, when all of the clothing tended toward excess in shape and ornamentation.

The French Revolution was followed by a tendency to simplify all articles of apparel, and may be said to be the beginning of the modern era of fashions. At present the older European costumes are worn only in isolated or remote sections, while the styles of European people are more or less similar and are changed quite uniformly. This is made possible through the publication of periodicals devoted to fashions, in which the newer styles are shown in elaborate plates and discussed quite clearly in directions for selecting the materials and making the garments. The style of dress changes more readily among Europeans than among any other class of people, and may be said to be transitory as compared with the styles of the peoples of Asia and those not materially advanced in civilized art. Indeed, a well-concerted movement for dress reform was inaugurated in 1873, under the auspices of the Crown Princess of Saxony, Germany, who pointed out the evils of unhygienic clothing worn by women. The following year an organization was formed at Boston, the National Dress Association, which declared against shoes with high heels and pointed toes, against wearing heavy veils, against the use of tightly laced corsets, and against garments that lodge a heavy weight on the hips. Though all the measures advocated by associations of this kind have not been looked upon with favor, it may be observed that there is a tendency toward more rational styles of dress for women.

DREXEL INSTITUTE OF ART, SCIENCE, AND INDUSTRY, a coeducational institution founded by Anthony J. Drexel at



Philadelphia, Pa., in 1891. This institute was established to train and instruct young men and women in the industrial arts and sciences. The courses include those of mechanic arts, applied and fine arts, commerce and finance, electrical engineering, domestic science, mechanical drawing and machine construction, physics, English, chemistry, and mathematics. Evening classes are maintained in the departments in addition to the regular academic instruction, and educational work is promoted through free public lectures. This institution has a library of 30,000 volumes, an endowment of \$2,000,000, and buildings and equipment worth \$4,000,000. The students in the day classes number 1,250 and in the evening courses, 2,000.

**DRIFT**, a loose accumulation of transported matter, constituting a peculiar geological formation found in the northern part of Europe and Asia and the eastern and central portions of North America. The drift matters consist of various forms of earth, which in many places are from fifty to a hundred feet in thickness. The surface of drifts is usually smooth with parallel ridges extending for some distances, and at places one set crossing another deposited at an earlier age. Extensive beds of gravel, pebbles, and sand that characterize the drifts are thought to have originated from adjacent rocks, while large stones show from their composition that they were carried long distances. Many of the larger rocks and boulders weigh from a hundred pounds to several tons. Those found in the northern drift of Europe extend to about 50° north latitude and in North America to about 40°. A similar drift is found in the Southern Hemisphere, which disappears between 40° and 50° south latitude. These drifts are more marked as one approaches the poles and gradually diminish in thickness toward the Equator. Near the Equator several similar drifts are found, though these are deposited usually around some great mountain, and traces of their movements are evidenced by scratches and erosion on the boulders of the mountain region.

The cause of drifts is attributed to the action of ice moving southward largely in the form of glaciers. The theory includes the view that in ages far remote the polar regions possessed a warm climate, which later gave way to cold, thus causing the formation of great fields of ice in the high latitudes. Fed by the polar snows, immense glaciers moved toward the Equator and melted as they reached the warmth of the lower latitudes. In this movement the great sheets of ice smoothed the surface of the rock and made scratches and erosions until

they melted in the sun of warmer regions. Many of the boulders and gravel found in all portions of the drift region bear evidence that they were moved long distances and dropped from the glacier carrying them as the warmer regions were reached.

**DRILL**, a metallic tool for boring holes in hard substances, such as stone, metal, wood, or ivory. The form and size depend upon the material in which the work is done. In stone drilling the tool has either a rotary movement or is lifted and dropped alternately. The drills for rock boring are made largely with black diamond, which constitutes the cutting edges. In metal and wood the action is rotary and the tool is made with two cutting edges, against which the work is pressed as the drill revolves.

**DRILLING**, a method of sowing seeds in parallel rows instead of planting them in hills or sowing them broadcast. Among the crops commonly drilled are peas, beans, carrots, onions, and other vegetables. These are cultivated more easily and the ground is kept in better condition when drilled so machine cultivation can be introduced. Seeds generally sown broadcast, such as wheat, barley, and flax, are sometimes drilled in rows close together, especially in poor soil, where bone dust or other fertilizing is needed. Corn is sometimes drilled, but is generally planted in hills, as cross cultivation is possible when parallel rows extend in two directions at right angles.

**DROMEDARY** (drūm'ĕ-dā-rŷ), the Arabian camel, so called from its ability to travel with much speed. It differs from the Bactrian camel in that it has a single hump on its back. The name is applied commonly only to one-humped camels that are noted for their swiftness in travel. See **Camel**.

**DROWNING** (droun'ing), the form of death that results from suffocation in water or other liquids. It was employed as a mode of capital punishment in many European countries, but long since went out of use as a form of punishment in practically all parts of the world. This method of execution was abolished in Switzerland in 1652, Scotland in 1685, Austria in 1776, and Iceland in 1777.

The deaths which result from drowning at the present time are due largely to accidents, and by careful treatment life may be restored within a limited time after breathing has ceased. Recovery is possible only so long as the heart beats, after that it becomes impossible. That death resulted from drowning is evidenced by finding water in the lungs, and usually by small objects held in clenched fingers at which the drowning person grasped while struggling to



escape danger. In one or two minutes after submersion complete insensibility ensues and death occurs in from two to five minutes. There are several methods of restoring persons apparently dead from drowning. One of the most common methods is to pull the body, face downward, over a roll of clothing placed under the stomach, by which the water may be expelled from the chest. The head should be supported during this movement, and the body turned on the back occasionally, though when occupying this position the shoulders should be supported.

To restore breathing in persons apparently drowned it is best to kneel over the body and place both hands on the lower part of the chest, immediately below the lowest ribs. By pressing forward the ribs may be raised, thus permitting air to enter the chest as the capacity is enlarged. As soon as the ribs are raised to the greatest possible extent, they are allowed to recoil to their usual position, by which means the air is expelled. By repeating this process at least twenty times per minute a tendency to restore breathing will soon develop. At the same time other persons should be rubbing the body and limbs upward with warmed flannel or their hands for the purpose of stimulating the flow of blood. Small quantities of hot brandy and water, hot coffee, or some other stimulant may be administered as soon as the patient has been restored to a condition in which he is able to swallow. To restore and maintain warmth after a case of apparent drowning is essential. This can be done best by means of rubbing, covering the body with warm clothing, and placing the patient in a suitable bed.

**DRUIDS** (dru'ídź), the priests of the early Celts of Gaul and Britain. Little is known of this class of people, though Julius Caesar gave some details of interest in regard to their worship and manner of living. He described them as a class that possessed chief authority among the Celtic people; that they had some knowledge of mathematics, philosophy, and astronomy; and that their religion was similar to the forms practiced by the Brahmans of India, the Chaldeans of Syria, and the Magi of Persia. They acted as judges, possessed complete control over the people, and were the teachers of the young. Their worship was in groves, and human sacrifice was not uncommon. The mistletoe and oak were sacred in their worship. A chief druid was elected by the people, who held his office for life. Ruins of their stone temples are still found in France and Great Britain. They were suppressed or exterminated at the time of the Roman invasion.

**DRUM**, a musical instrument of great antiquity. Several forms are in use. The common drum is made by stretching parchment over the heads of a wooden cylinder or a metallic vessel, which may be slackened or tightened at will by means of cords attached to screws or sliding knots. The drum mostly used is the *long* or *bass drum* with two heads, on both ends of which playing is done with stuffed-knob drumsticks. Another kind is the *side drum*, having two heads, the upper being the only one played by means of two sticks of wood; the lower head is formed with strings of catgut stripped across its surface. This kind is commonly called a *snare drum*. Another kind is the *kettledrum*, which is usually employed in pairs. It is formed of hollow brass or copper basins, on which a parchment is fastened by means of an iron ring. These instruments are used mostly in orchestras and military bands, where they are called *tympani*. The ancient Egyptians employed them in martial music and, like the Indians, beat their long drums with the hands. Bacchus is said to be the inventor of the drum. It is reputed that he gave the signal of battle by means of that instrument and the cymbal. The sculptures of Egypt and other ancient countries contain numerous inscriptions of drums, illustrating their use in military parades and in the conflict of battle.

**DRUMMOND ISLAND**, an island in Lake Huron, one of the Manitoulin group, forming a part of Chippewa County, Michigan. It is about ten miles wide and twenty miles long.

**DRUMMOND LIGHT**, an intense light invented by Thomas Drummond, of the British navy, in 1826. It is produced by turning two ignited streams of gas, one of hydrogen and the other of oxygen, upon a ball of lime. This light was first used in the coast survey service by placing it in a peculiarly shaped mirror, which served to reflect the rays in converging lines so the entire light was focused toward a central point. The light can be thrown in a straight line a distance of about one hundred miles.

**DRUSES** (dru'zéz), a peculiar political and religious people inhabiting the mountains of Lebanon and Anti-Lebanon. They are of mixed Syrian and Arabian origin and combine certain tenets of the Mohammedan with several of the Christian religion, and constitute a secret religious society. Their origin is found in El-Hakim Biamr-Allah, the sixth Fatimite caliph of Egypt, a fanatical ruler who lived in the 11th century. According to tradition he disappeared from his subjects while walking in



the vicinity of Cairo, and his followers were led to believe in his future return to earth to reign over them, though the natural explanation is that he was probably assassinated. A Russian named Ismail ed Derazi proclaimed the tenets of the Druses with such zeal in Lebanon that the converts were named after him and not after El-Hakim. They number between 75,000 and 100,000, are engaged largely in producing and manufacturing silk, and are noted for their sturdy resistance to Turkish dominion.

The Druses believe in the unity of God, who, they think, was manifested in the person of several individuals, but last of all in El-Hakim. Their day of worship is Thursday and their doctrines hold strictly to the transmigration of souls. In 1860, 12,000 Druses were cruelly massacred by the Maronites, when neither male nor female children were spared. The uprising was about to terminate in a general conflict between Christians and Mohammedans, but was suppressed by the arrival of French and Turkish troops. At present they are guaranteed certain religious and political liberties by Turkey, to which country they pay an annual tax. The three classes into which their adherents are divided include princes, chiefs, and the people. The greatest amount of knowledge obtained of these people was published by a Frenchman named De Sacy in 1838, entitled "An Exposition of the Religion of the Druses."

**DRYADES** (drī'adz), the tree goddesses or nymphs mentioned in the mythology of Greece. Each dryad partook of the characteristics of a particular tree to whose life it was wedded, and ceased to exist when it was felled or so injured that it withered and died.

**DRYING OIL**, an oil used in painting and which has the property of drying quickly. The name is applied in a general sense to linseed oil and other seed oils, but particularly to oils of this class prepared with the special view of hastening the drying, which is done by heating with oxide of lead. They absorb oxygen when exposed to the air, hence become a dry, tough mass. Drying oil is used to paint the woodwork and other parts of buildings.

**DRY TORTUGAS** (drī tōr-tōō'gās), a group of ten small islands of coral formation situated southeast of Cape Sable, Florida. They are low and barren and most of the surface is covered with low brushwood. Two lighthouses are maintained by the government, one of which is 150 feet high. Fort Jefferson is an important fortification on Garden Key, and was used as a penal station for Confederate prisoners in the Civil War. Prisoners under sentence for court-martial are still occasionally confined in

the fort. For local government the island belongs to Monroe County, Florida.

**DUBLIN** (dūb'lin), the metropolis and capital of Ireland, in Dublin County, on the Liffey River, at the entrance to Dublin Bay. The city is divided into two parts by the river which is crossed by numerous stone and iron bridges. Extensive docks and wharves are located at the mouth of the river. It has many beautiful streets and thoroughfares, the most noted being Sackville Street, which passes through the city at right angles to the river, and is 660 yards long and forty yards wide. The principal public buildings include the castle, the official residence of the chief officer of Ireland; Trinity College; the bank of Ireland; the customhouse; the court of justice; the post office; the commercial buildings; the city hall; and other large structures. Among the most important educational institutions are the Dublin University, Royal College of Science, College of Surgeons, Roman Catholic University, Royal University, Royal Irish Academy for Promoting the Study of Science, Literature, and Antiquities, Royal Hibernian Academy of Painting, Sculpture, and Architecture, and the Royal Zoölogical Society. Phoenix Park is a fine public resort northwest of the city, with an area of 1,760 acres.

The railroad facilities of Dublin are extensive. It has excellent harbor improvements and a considerable commerce. Electric car lines furnish convenient connection with all parts of the city and many suburban districts. All the principal streets are finely paved, beautified by trees and statuary, and lighted by gas and electricity. The chief manufactures are textiles, earthenware, machinery, and sailing vessels. Trinity College, founded by Queen Elizabeth, has a library of 200,000 volumes. Besides this library, there are reading rooms and libraries under the control of the city and educational institutions, and as a whole comprise collections of books, manuscripts, and antiquities of much value in educational arts. The city was captured by the Danes in the 9th century and taken by the English under Henry II. Large portions of the city were destroyed by fire in 1190 and visited by several great conflagrations since. The royal party of England captured the city during the protectorate of Richard Cromwell. James II. held a parliament here in 1681. In 1800 the flag of the United Kingdom was raised over the city, when Ireland became united with England. Population, 1907, 291,842.

**DUBLIN, University of**, an institution of higher learning at Dublin, Ireland, established



by Queen Elizabeth in 1591. The first University of Dublin was established in 1320, but perished from a lack of an endowment and the dissolution of Saint Patrick's Cathedral by Henry VIII. The official title is College of the Holy and Undivided Trinity, so named in the charter of incorporation. James I. granted it representation in Parliament, and it now is represented by two members in the House of Commons. The senate has power to elect the chancellor and grants degrees. This body consists of "the chancellor of the university, or, in his absence, of the vice chancellor, or such doctors and masters of the university as shall have and keep their names on the books of Trinity College." At present the faculty consists of a prevost, seven fellows, twenty-six junior fellows, and seventy foundation scholars. The fellows are of two grades, senior and junior, the former comprising the chief officers and the latter the larger part of the tutorial force of the college. Instruction is divided into a course covering four years. Students are admitted by examination. The library contains 260,000 volumes. At Dunsink, five miles from the college, is located the astronomical observatory. The total attendance is about 1,350 students.

**DUBOIS** (du-bois'), a borough of Clearfield County, Pennsylvania, on Sandy Lick Creek, about 125 miles northeast of Pittsburg. It is on the Pennsylvania and the Buffalo, Rochester and Pittsburg railroads. Among the noteworthy features are the high school and the public library. The principal manufactures are machinery, flour, railroad cars, spirituous beverages, leather, window glass, cotton and woolen goods, and hardware. Large quantities of coal and gas are produced in the surrounding country. It was settled in 1873 and incorporated in 1887. Population, 1900, 9,375; in 1910, 12,623.

**DUBUQUE** (du-bük'), a city of Iowa, county seat of Dubuque County, on the Mississippi River, 200 miles northeast of Des Moines. It is on the Chicago Great Western, the Illinois Central, the Chicago, Milwaukee and Saint Paul, and the Chicago, Burlington and Quincy railroads. Regular communication is maintained by steamboats with ports on the Ohio and the Gulf. It is regularly platted with wide streets. Several bridges cross the river. The manufactures include wagons, farm machinery, lumber, cigars, utensils, soap, flour, clothing, and hardware. An extensive grain market has caused the building of large elevators. The pork packing establishments produce packed and cured meat. It has large interests in lead,

being a depot for the lead-producing districts of northeastern Iowa.

The noteworthy buildings include the courthouse, the post office, the public library, and the city hall. It is the seat of Wartburg Seminary (Lutheran), the German Presbyterian Theological Seminary, an Episcopal seminary, Saint Joseph's College and Academy, Iowa Institute of Science and Art, Saint Mary's Academy, and a number of convents and business colleges. Electric street railways, public waterworks, stone and asphalt pavements, a sewer system, and public lighting are among the improvements. The site of the city is a portion of the region occupied by the first permanent settlement in the State. John King established the *Dubuque Visitor* in 1836, the first periodical published in Iowa. It was incorporated as a town in 1837 and was chartered as a city in 1840. Population, 1910, 38,494.

**DUCAT** (dük'ät), a coin of different value, chiefly of gold, and formerly used extensively in Europe. Ducats were first made in the 11th century by the emperors of Byzantine, and by the next century were used generally in the southern part of Europe, especially in Sicily and Italy. In 1559 the diet of Germany adopted the ducat, and it soon came into use in all parts of Northern Europe. At present it is not issued, except in Austria-Hungary, where the gold ducats are coined for use in foreign trade. The silver ducat used formerly had a value of seventy-five cents to \$1.10 and the gold ducat was valued at about \$2.32. Ducats coined in ancient Venice were valued at about \$1.46.

**DUCK**, the common name of a large family of widely distributed web-footed birds. They include many species and are met more or less in all portions of the inhabited world.



MALLARD DUCK—MALE AND FEMALE.

Many ducks are migratory, going to higher latitudes to breed in the summer season. They deposit from six to twelve eggs in a nest built among the reeds near the edge of bodies of fresh water, or in the hollows of trees or crev-



ices of rocks. Ducks are peculiarly awkward in walking, having a waddling movement, but their flight is brisk and their ability to swim is quite highly developed. The wild species are classed as sea ducks and true ducks. Ducks of the former class are migratory, being seen frequently in large flocks moving to and from the higher latitudes. The most common wild duck of Central North America in the primeval period was the *mallard*, a fine game bird, and it is still found in many regions. The female is of a grayish color, while the male has an attractive plumage. In the latter the head is bluish-green, the neck is chestnut colored with a fine ring of white, and the body is finely marked in various light, blue, and greenish shades. In the duck family the bill is large, though it is greatly diversified as to size and shape. Some are flat and rounded at the top, others are quite sharp, while the *scaup duck* has a spoon-shaped bill. The *pintail* is characterized by a pointed tail. The flesh of ducks is a wholesome and favorite food and is much sought at all times, except in the season of breeding. Domestic ducks have been developed from the wild species, probably largely from the *wood duck* and the *mallard*. They are grown extensively for the flesh and feathers. The eggs, though excellent food, are not as well liked as hens' eggs. Besides, ducks do not produce eggs abundantly. The *musk duck*, a native of South America, often erroneously called *Muscovy duck*, is almost as large as a goose and is the largest of the duck family. The drake or male of all domestic ducks and of many wild species is distinguished by marked differences in plumage, is somewhat larger than the female, and has four curved tail feathers. Its voice is low and basslike and quite different from the quack of the female.

**DUCKBILL**, or **Water Mole**, an aquatic egg-laying animal, the only living species of the order *Monotremata*. It is native to Australia and the adjacent islands, including Papua and Tasmania. The body is about twenty inches long, which includes the bill and tail, and is thickly covered with a brown fur. The head is small, the teeth are near the base of each mandible, and the males have spurs on the hind legs. This animal has a horny bill similar to that of a duck, but it breathes through nostrils at the tip of the bill. Though an aquatic animal, it can climb trees with facility, and is able to dig long burrows with its feet. The fore feet are strong and have five toes, and the hind feet are smaller and the five toes are armed with claws. It feeds chiefly on worms and insects and prefers to live in large colo-

nies. Reproduction is by eggs, which are covered with a soft and flexible shell, and only a few are laid at a time. At birth the young are blind and naked, but grow rapidly, subsisting on milk drawn from the milk glands of the mother. The duckbill has a gentle disposition and its voice resembles that of a young dog.

**DUCKING STOOL**, a kind of stool used for punishing scolds, especially scolding wives. It came into common use in many European countries in the 15th century, and was employed as an apparatus for inflicting punishment in Europe and America until the beginning of the 18th century. Many forms of ducking stools were in use, but the most common kind consisted of a mechanical arrangement whereby the culprit was fastened in the chair and moved up and down in the water, the head alone remaining above the surface, though it was sometimes submerged momentarily. Addison speaks of its use by saying, "Reclaim the obstinate and virulent woman, and make the ducking stool more useful."

**DUCKWEED**, the name of a small plant that floats upon the water, the rootlets hanging loosely beneath. It consists chiefly of flat green fronds and is found widely distributed on the surface of stagnant waters. The flowers are unisexual, destitute of calyx and corolla, and the fruit is rarely seen, since it propagates chiefly by new fronds budding from those already developed.

**DUCTILITY** (dŭk-tĭl'ĭ-tĭ), the quality of some substances by which they may be drawn into wire. Soft metals possessing only slight ductility cannot be drawn into wire, but may be converted into that form by a process of squirting or pressing. The degree of ductility in the important metals is in this order: gold, silver, platinum, iron, copper, zinc, tin, lead, and nickel. These metals are malleable, that is, they may be beaten into leaves or sheets, but in a relatively different order, as follows: gold, silver, copper, tin, platinum, lead, zinc, iron, and nickel.

**DUEL** (dŭ'ĕl), a word derived from the Latin *duellum*, signifying a premeditated and prearranged mortal combat between two persons for the purpose of deciding some point of difference, or establishing some question of honor. Dueling was practiced in early ages and is referred to by some writers as a trial by battle. In a modern duel at least four persons are required to be present, including the two *combatants* or *principals* and a *second* for each principal. The seconds arrange the time, place, and mode of fighting the duel, though



the choice of arms belongs exclusively to the person receiving the challenge. In former times it was thought a mark of honor to resent an insult by issuing a challenge, but modern public opinion has rendered dueling cowardly and disgraceful and has caused it to become almost obsolete. However, the practice is still regarded as honorable in some countries, particularly in the Latin states of Europe and some countries of Asia.

It is thought that the practice of dueling in modern Europe was the outgrowth of the custom of wearing a sword, and was most common in the 16th century. In many countries, particularly in France, challenges were issued on the most trivial and commonplace grievances, and the practice still occurs among students in the German army and some of the universities. In the reign of Henry IV. of France the number of persons falling in duels is estimated at fully 6,000. Sully, minister of Henry IV., opposed the practice with much energy, but the king favored it, because he thought it tended to maintain a spirit of militarism among the people. A decree was issued against it in 1602, but with little effect. More than 4,000 nobles lost their lives during the minority of Louis XIV. From France the practice was carried to England in the reign of James I., where it became quite common. Among the well-known men who fought duels in England are included William Pitt and the Duke of Wellington. The most celebrated duel occurring in America was the mortal combat between Alexander Hamilton and Aaron Burr, in which the former was slain. Great indignation was aroused among the people in the United States on account of the death of Hamilton, and the practice grew less common. It is now looked upon as a foolish and inhuman act to issue a challenge.

**DUERO**, or Douro. See Douro.

**DUGONG** (dū-gōng'), an herb-eating sea mammal of the genus *Halicore*. Cuvier classed it with his order of *Pachydermata*, which includes the rhinoceros and other thick-skinned animals, but the order is not recognized at present. The eyes are small, the upper lip is thick and fleshy, and the upper jaw bends downward almost at a right angle. It has a whitish color below and a slate-brown or bluish-black above. The common length is eight or ten feet, though some are twenty feet long. It is widely distributed in tropical seas, but is most common in the waters of Southern Asia and the East Indies. Its food is marine vegetation, principally algae, which it finds in shallows or at the river estuaries. The natives pursue it

for its flesh, which resembles the beef of young cattle and is highly nutritious. The mother has



DUGONG.

a feeble voice and shows intense affection for her young.

**DUISBURG** (dōō'is-burk), a city of Germany, in Rhenish Prussia, fifteen miles north of Düsseldorf. It is finely located between the Ruhr and the Rhine, with which it is connected by canals, and is the converging center of several railroads. The noteworthy buildings include the Church of Saint Salvator, the town hall, the public library, and a number of gymnasiums and *Realschulen*. The streets are straight and well improved with modern utilities, such as electric street railways, waterworks, sewerage and stone and asphalt pavements. It has manufactures of steel and brass wares, glue, tobacco, beet sugar, soap, furniture, chemicals, and machinery. In the vicinity are extensive coal mines and stone quarries. It has a large shipping trade in grain, coal, iron ore, and merchandise. Duisburg is an ancient town, but its larger growth is comparatively recent. Charlemagne fortified it and in the 13th century it became a member of the Hanseatic League. Subsequently it was made a free town, but was annexed to Prussia after the Napoleonic War. Population, 1905, 192,346.

**DULCIMER** (dūl'si-mēr), a musical instrument used in almost all countries. It dates from ancient times. In shape and construction it is similar to the dulcimer made many centuries ago, and as a whole the instrument has undergone fewer changes than any other musical device. It consists of a flat box with a sounding board crossed by bridges, to which wires are fastened and tuned by pegs at the sides. The operator performs upon it by striking the wires with small pieces of wood held in each hand, or with two hammers containing heads of cork. It differs from the psaltery in



the manner of striking the wires, while a pianoforte is in reality a dulcimer on a large scale.

**DULUTH** (du-lōōth), a city of Minnesota, county seat of Saint Louis County, at the west end of Lake Superior. It is on the Northern Pacific, the Great Northern, the Chicago and Northwestern, the Duluth, South Shore and Atlantic, the Duluth and Iron Range, and other railroads. Being situated at the western extremity of navigation on the Great Lakes,



AERIAL FERRY AT DULUTH, MINN.

opposite Superior, Wis., it is highly important as a wholesaling and distributing center. The harbor is nine miles long and two miles wide, and is protected by a narrow strip of land called Minnesota Point, which forms a natural breakwater and is cut by ship canals, through which large vessels pass. The largest of these canals, which is located near the city, is crossed by the celebrated aerial ferry. It is the only structure of the kind in America and has the advantage of leaving the canal clear, carrying pedestrians, vehicles, and street cars at regular intervals. The United States government has expended large sums in dredging and otherwise improving the harbor for heavy shipping.

The city occupies a fine site overlooking the lake. It stretches along the lake shore a distance of about twenty miles, and Superior Street, the principal thoroughfare, extends nearly parallel to the shore the entire distance. The ground rises rapidly from the margin of the water. The business section is near the lake, occupying a level and slightly elevated tract, while the finer residential sections are in the higher lands toward the west and northwest. It is one of the leading shipping points in the country. Among the industries are sawmills, grain elevators, machine shops, flouring mills, car works and blast furnaces. In the vicinity are quarries of sandstone and granite.

Duluth is generally well built and the public

utilities are modern and well managed. The public high school, one of the finest in the Northwest, was erected at a cost of \$300,000. Other noteworthy buildings include the Carnegie public library, the Federal building, the Masonic Temple, the Spalding and Saint Louis hotels, the State Normal school, the Board of Trade, the Lyceum theater, and many fine churches. Lincoln, Chester and Grand View are among the public parks. Daniel Gresolon (Sieur du Lhut), after whom it was named, visited the place in 1680, but it was not settled until in 1853. It became a town in 1867, and was chartered as a city in 1870. The growth of the city from 1880 to 1900 is one of the most remarkable in the United States, the population of the former year being 3,843, while in 1900 it was 52,969. Population, 1910, 78,466.

**DUMA**, or **Douma**, the lower branch of the legislative department of Russia, established by an imperial manifesto on Oct. 19, 1905, and frequently referred to as the National Assembly. It is composed of about 500 members, who are elected by the Zemstvos, and has joint legislative power with the Council of the Empire, but bills passed by both these branches are subject to veto by the emperor, and cannot be introduced the second time without the royal consent. Among the restrictions upon the дума are that it cannot take part in legislation regarding titles of nobility or entailed estates. Neither can it discuss the reports of the Minister of Finance, or consider charges of malfeasance against members of the council or officers of the government.

**DUMBARTON** (dūm-bār'tūn), a seaport and the capital of Dumbartonshire, Scotland, thirteen miles northwest of Glasgow. It is situated on the Leven River, near its entrance into the Clyde, and has transportation facilities by steamboats and railways. The castle of Dumbarton, located at the mouth of the Leven, stands on a basaltic rock which rises about 560 feet. This castle is maintained by the government under the treaty of union between England and Scotland, whose terms require that it and three other Scotch castles be kept in repair. Sir William Wallace, the Scotch hero, was for a time imprisoned in the castle. It was a residence of Mary, Queen of Scots, before she went to France. Dumbarton has extensive shipyards, iron foundries, cordage works, and machine shops, and is the center of considerable trade in



merchandise and produce. Population, 1907, 20,864.

**DUMFRIES** (dŭm-frēs'), a river port and the capital of Dumfrieshire, Scotland, 72 miles southwest of Edinburgh. It is situated on the Nith River, nine miles from its entrance into the Solway Firth, and has convenient railroad facilities. The chief buildings include the post office, an infirmary, the Crichton Institution, and a number of fine schools and churches. Among the manufactures are hosiery, baskets, clothing, leather, and boots and shoes. Dumfries is noted for its early history. In 1306 Robert the Bruce slew the Red Comyn in the Greyfriars' Monastery, which was built by Devorgilla, the mother of John Baliol. Robert Burns, the poet, is buried in the Saint Michael's churchyard. The Young Pretender made Dumfries his headquarters in 1745. Population, 1907, 20,150.

**DÜNA** (dü'nà), or **Southern Dwina**, an important river of western Russia, rises in the Valdai Hills, flows toward the southwest, and thence makes a bold curve toward the northwest and discharges into the Gulf of Riga. The entire course is about 650 miles, of which a large part is navigable, except four months of the year, when it is frozen. Canals connect it with the Black and Caspian seas, the Gulf of Finland, and other navigation centers. The course of the Düna is through a fertile and densely populated region and its importance in commerce is marked, having Jacobstadt, Riga, and Friedrichstadt on its banks.

**DÜNABURG** (dü'nà-böörk), or **Dvinsk**, a fortified city of Russia, in the government of Vitebsk, 110 miles southeast of Riga. It is situated on the Düna River and on the trunk railway from Warsaw to Saint Petersburg. The surrounding country is fertile. Among the manufactures are flour, matches, clothing, machinery, tobacco, and spirituous liquors. It has a large trade in produce and merchandise. Many of the streets are improved by paving with stone and asphalt. The French bombarded it in 1812. Population, 1906, 75,806.

**DUNDEE** (dŭn-dē'), the fourth city of Scotland, in Forfarshire, fifty miles northeast of Edinburgh. It is situated on the Firth of Tay, about ten miles from its entrance to the sea, and is the center of a large railroad and navigation commerce. The streets are regular in most of the city and are well paved and lighted, and many are traversed by electric street railway lines. It has a safe harbor and extensive dockyards. Among the manufactures are textile goods, clothing, confectionery, earthenware, and machinery. It is the seat of extensive warehouses, flouring mills, and machine shops. The

northern seal and whale fishery interests make it an important depot for operation, thus adding largely to its commercial importance. Among the noteworthy buildings are the Saint Paul's Episcopal Church, the post office, the county courthouse, the Kannaird hall, and the University College. In 1887 the large bridge, about two miles long, over the Tay, was blown down while a passenger train was passing over. The Firth is crossed farther up at present by a bridge 3,600 yards long. Dundee was besieged and sacked by the Duke of Montrose in 1645, and was stormed by General Monk about six years afterward. Its history in connection with Great Britain is quite interesting. Population, 1907, 165,748.

**DUNE** (dŭn), the name first given to the hills of sand along the coast which are blown together by the winds, but later applied to sandhills formed similarly in regions of sandy or arid soil. Dunes begin to form where the sand is blown against some obstruction, such as a log or boulder, and from this beginning low hills are built up gradually. They are common on the sandy Atlantic coast of North America from Cape Cod to Cape Canaveral, where they are frequently from ten to thirty feet high, and on the coasts of the Bahamas they have a height of more than a hundred feet. In France, in the department of Landes, the dunes cover a large area and encroach farther upon the land each year. Others are found among the cliffs of England, near the southern end of Lake Michigan, and in extensive areas of the Sahara.

**DUNEDIN** (dŭn-ē'dīn), a city of New Zealand, capital of the provincial district of Otago, on the east side of South Island. It is conveniently located at the head of Otago harbor, and has a large interior and domestic trade. A railway connects it with the principal cities of the island, and steamboats run regularly between it and Melbourne. It is the seat of Otago University, opened in 1871, and has street railways, waterworks, a public library, a fine post office, and several handsome government buildings. The streets are regularly platted and well paved with brick and stone. Among the manufactures are clothing, brick, pottery, utensils, and woolen goods. The first settlement on its site was made in 1848, but its prosperity dates from 1861, when extensive gold fields were discovered in the vicinity. Population, 1906, 56,020.

**DUNFERMLINE** (dŭn-fĕrm'līn), a city of Scotland, in the western part of Fifeshire, sixteen miles northwest of Edinburgh. It has railroad and electric railway facilities. The manufactures include cotton and linen goods, iron-



ware, pottery, clothing, and machinery. Lime beds and iron collieries are worked in the vicinity. It has a Carnegie public library, a fine high school, a public hall, and several county and corporation buildings. Dunfermline was a favorite residence of the early Scottish kings and is the birthplace of David II. and Charles I. Malcolm Canmore founded a Benedictine abbey here about 1075. The remains of Robert Bruce are beneath the pulpit of the Abbey Church. Population, 1906, 26,352.

**DUNKARDS** (dŭn'kĕrdz), a name derived from the German word *Tunkers*, meaning immersers, and by which a Protestant denomination is known. The society of Dunkards was founded at Schwartzenau, Germany, in 1708. It includes the Conservative, Old Order, and Progressive Baptists, and the German Seventh-Day Baptists. The entire Dunkard denomination comprises 1,095 churches, 2,885 ministers, and 118,875 members. It has the largest number of adherents in Ohio, Pennsylvania, Indiana, and the states in the Northwest. The publishing headquarters are at Elgin, Ill. Several colleges and seminaries are maintained. The bicentennial of the Progressive Baptists was held at Des Moines, Iowa, in 1908, when the society was renamed Church of the Brethren.

**DUNKIRK** (dŭn'kĕrk), a city and port of entry of Chautauqua County, New York, on Lake Erie, about 35 miles southwest of Buffalo. It is on the Erie, the New York Central, the Lake Shore and Michigan Southern, and other railroads. The noteworthy buildings include the public library, the high school, the Brooks Memorial Hospital, and the city hall. Many of the streets are paved and improved by grading and parkings. It was settled in 1809 and incorporated in 1837. Among the manufactures are flour, machinery, locomotives, clothing, lumber, utensils, and hardware. Population, 1905, 15,251; in 1910, 17,221.

**DUNKIRK**, or **Dunkerque**, a seaport in France, on the Strait of Dover, in the department of Le Nord. It is defended by forts and outworks, and surrounded by walls. The harbor is large and convenient. Among the manufactures are cordage, sugar, spirituous beverages, leather, soap, and machinery. Shipbuilding is an important industry. The railroad and electric car line connections are extensive. Among the public buildings are a library, the Church of Saint Eloi, the museum, and the town hall. Dunkirk owes its early growth to the church built by Saint Eloi in the 7th century. It has an interesting history in connection with that of France. The English under the Duke of York tried to capture it in

1793, but were defeated with much loss. Population, 1906, 38,287.

**DUNMORE** (dŭn-mŏr'), a borough of Lackawanna County, Pennsylvania, on the Erie and the Lackawanna railroads. Extensive anthracite coal and clay deposits are worked in the vicinity. It is the seat of the State Oral School. Among the industries are steel and iron mills, stone works, feed mills, and implement works. It has gas and electric lighting, electric street railways, and municipal waterworks. The place was settled in 1835 and incorporated in 1862. Population, 1900, 12,583.

**DÜPPEL** (dŭp'pĕl), a village of Germany, in the Prussian province of Schleswig-Holstein, sixteen miles northeast of Flensburg. It is located on the coast of the Little Belt, is strongly fortified, and has importance as a strategic point. In the war between Prussia and Denmark, in 1849, it was stormed and captured by the Germans. A second engagement took place at Düppel in 1864, when the Germans bombarded the Danish position and captured it after a siege of two months.

**DUQUESNE** (dŭ-kān'), a borough in Allegheny County, Pennsylvania, about ten miles southeast of Pittsburg, on the Monongahela River and on the Pennsylvania Railroad. The chief buildings include the high school and the Carnegie Library and Institute. It is an important manufacturing center and has a growing trade in coal and merchandise. The manufactures embrace ironware, machinery, earthenware, cigars, and utensils. It has modern municipal improvements, such as pavements and waterworks. Duquesne was settled in 1885 and incorporated in 1891. Population, 1910, 15,727.

**DURANGO** (dŭŏ-rān'gŏ), a city of Mexico, capital of the state of Durango, 475 miles northwest of the city of Mexico. The city is well built on an elevation 6,845 feet above sea level, has manufactures of cotton and woolen fabrics, leather, and machinery, and is the seat of a government mint and a cathedral. It has several fine school and church buildings. Mining, agriculture, and stock raising are carried on in the vicinity. It has railroad connections and a considerable trade. Population, 1906, 32,902.

**DURANGO**, county seat of La Plata County, Colorado, on the Las Animas River and on the Rio Grande Southern and the Denver and Rio Grande railroads. It is surrounded by a fertile country, which yields large quantities of agricultural products and contains extensive coal deposits. The noteworthy buildings include the high school and the county poorhouse. It has a considerable trade, and it is the seat of iron and steel works. Population, 1900, 3,317.



**DURBAN** (dûr-băn'), an important seaport of South Africa, the only port city of Natal, on the Bay of Natal. The bay has a lighthouse and is protected by fortifications. It has a public library, a museum, electric street railways, and a fine public park, and is the terminus of two railway lines. The domestic and export trade are important. It has manufactures of clothing, brick, utensils, and machinery. Durban was founded in 1823 by the Dutch. Population, 1906, 69,894.

**DURHAM** (dûr'ûm), county seat of Durham County, North Carolina, 26 miles northwest of Raleigh. It is on the Seaboard Air Line, the Southern, and the Norfolk and Western railroads. Among the chief buildings are the county courthouse, the public library, the Watts Hospital, and Trinity College. It is surrounded by an agricultural country and has a large trade in produce and merchandise. The manufactured products include tobacco, furniture, cotton and woolen goods, flour, ironware, machinery, and implements. Durham was settled in 1855 and incorporated in 1869. General Johnston surrendered with a Confederate army to General Sherman near the city in 1865. Population, 1900, 6,679.

**DURHAM**, a city of England, situated near the center of Durham County, on the Wear River. It occupies a site partly encircling a steep, rocky eminence, on the top of which are a castle and a cathedral. The ancient castle is now used by the university, which was founded in 1832 and incorporated by royal charter in 1837. Durham first became important in 995, when a church was located here to enshrine the tombs of Saint Cuthbert and others. The present cathedral was begun on the site of the old church in 1093, and constitutes one of the most characteristic specimens of Norman architecture. The main building has a length of 510 feet and the central tower is 214 feet high. The bishopric of Durham is celebrated for its efficient line of bishops, who exercised marked influence upon the religious aspect of Great Britain. Population, 1907, 15,382.

**DÜSSELDORF** (düs'sel-dörf), a city of Germany, in Rhenish Prussia, on the Rhine River, at the mouth of the Düssel. It has communication by lines of steamers, steam railroads, and electric railways, and is one of the leading commercial centers in the valley of the Rhine. Among its manufactures are carpets, tobacco, cotton and woolen goods, leather, ironware, chemicals, machinery, musical instruments, and objects of art. The cotton and iron industries are very extensive and merit special mention. It has a large export and jobbing trade.

Düsseldorf is noted as a center of art and education. The Academy of Art is one of the leading institutions of the kind in Europe. It was founded in 1767 and contains paintings by Rubens, Bellini, Dürer, Janssens and other famous artists. Among the noteworthy buildings are the palace of justice, the Church of Saint Lambert, the museum, and a number of gymnasiums. Among the public parks may be mentioned the Hofgarten, one of the finest in Europe, and within it are several fine monuments, including the War Memorial erected in 1892 to commemorate the campaigns against Austria and France. Düsseldorf was first mentioned in the 12th century. It was annexed with the Grand Duchy of Berg to Prussia in 1814. Population, 1905, 253,274.

**DUTCH**, the language and people of Holland, or the Netherlands. The name was originally applied to most of the Teutonic peoples, but beginning with the 17th century the people of Holland were designated as Dutch and all others of the Teutonic order as Germans.

**DUTCH EAST INDIES**, the territory of the East Indies under the control of the government of Holland. These possessions comprise Java and Madura; parts of Borneo, Sumatra, and New Guinea; the Riau-Lingga Archipelago, Banca, Billiton, Celebes, the Molucca Archipelago, and the Sunda Islands. The entire area is estimated at 736,500 square miles and the population at 35,095,500, of which about 75,000 are Europeans. As a whole it has remarkable fertility of soil and extensive productions of rice, coffee, sugar, tobacco, cotton, indigo, minerals, spices, and fruits. Many minerals abound, but the mines are not worked extensively. The government is administered by a governor general, who is appointed by the crown and assisted by a council of five members. Most of the islands are treated under separate titles, which see.

**DUTCH GUIANA** (gê-ä'nà), or Surinam, a possession of Holland in South America. See **Guiana**.

**DUTIES**, a term which signifies taxes, but in general use it is restricted to taxes levied upon imports and exports, and has much the same meaning as customs. *Ad valorem* duty is the duty levied upon imported merchandise at a given per cent. as invoiced by the importer. A *specific duty* is the duty chargeable on imported merchandise by quantity, weight, or number, without regard to value. The term *duty on water* is applied to the charges levied on water used in the irrigation of crops. See **Customs Duties; Tariff**.

**DVINA** (dvě-nà'), or Dwina. See **Dwina**.



**DWARF** (dwarf), a term used to designate any plant or animal that is much smaller in size than the average size of development. Individual dwarfs occur in all plant and animal life, though those of the human race have attracted the greatest share of attention and study. Charles I. of England had a dwarf, Jeffery Hudson (1619-1682), who was only eighteen inches high at the age of seven years, but afterward grew to three feet ten inches. Wybrand Lolkes, a dwarf born in the Netherlands in 1730, was 27 inches tall at the age of sixty years, weighing 56 pounds. These and other celebrated dwarfs were kept as pets in the courts of princes and families of nobles. Dwarfs are now shown at exhibitions. Among the most celebrated dwarfs of America was Charles S. Stratton, known as General Tom Thumb. In 1863 he married Lavinia Warren. He was 31 inches in height and his bride was about one inch taller. Together with their dwarf child and Commodore Nutt, they were exhibited extensively in America and Europe. A dwarf of New York known as General Mite was only 21 inches tall.

Many of the dwarfs are unusually strong for their size and exhibit considerable intelligence. Several races of dwarfs are mentioned in history and some still exist. Aristotle described a race of dwarfs who inhabited caves on the banks of the Nile. The Akkas, who inhabit Central Africa, are among the most noted of existing dwarf races. They were described by Stanley in 1881 as a brave people, though their average height does not exceed four feet ten inches. Several communities of dwarfs dwell in the Congo Free State, though they are more or less mixed with other tribes. The old Germanic legends mention numerous dwarf nations who had kings and a recognized form of government. It is quite probable that any of the stories met with as to their advancement in arts and sciences have been greatly exaggerated.

**DWARFING**, the process of training plants for ornamentation and useful purposes whereby their size is kept much below the normal. The process includes a special manner of planting, pruning of the roots, and pinching off of the stronger shoots. The art is practiced most extensively in China and Japan, where dwarfing is applied to ornamental trees and hedges. Besides pruning the stronger shoots, the limbs are bent and twisted in various ways and trained to develop into ornamental and beautiful forms. Some plants do not possess the characteristics which make them serviceable for dwarfing, even in fertile soil and under fa-

vorable climatic conditions. The osage orange, the acacia, and the arbor vitae are commonly dwarfed for hedges. Some fruits and the coffee tree yield larger returns when they are kept trimmed.

**DWINA** (dwē'nà), or **Dvina**, an important river of northern Russia. It is formed by the junction of the Jug and Sukhona, has a northwesterly course, and flows into the White Sea by four mouths. It has a length of about 435 miles from its mouth to the point at which it is formed, and about 750 miles to the source of the Sukhona. The Vytchegda is the largest tributary. The entire system drains an area of 140,000 square miles, affords valuable means of inland navigation, and is rich in valuable fish. Large vessels cannot enter from the sea owing to shoals at its mouth, and it is obstructed by ice for about 175 days in the year. At Archangel it is four miles wide. Canals connect it with the Neva and the Volga.

**DYAKS** (dī'aks), the name applied to the aborigines of Borneo, who chiefly inhabit the interior. They have made considerable advancement in agriculture and other arts. Their complexion is yellow, and in docility and industry they rank far above the Malays. In worship they are classed as pagans. Considerable advancement has been made in civilization, especially in the vicinity of Sarawak. The former practice of head hunting, an art in which they engaged to secure the heads of their enemies, has been abolished in all districts where Europeans have exercised influence. Most of the Dyaks are under the government of Holland.

**DYEING**, the art of fixing colors on linen, cotton, silk, wool, and other textile fabrics. Owing to a marked difference in which fibrous materials take color, it is necessary to pass the substances to be dyed through various preliminary operations. All matters preventing the dye from having free access, and the natural coloring that interferes with the production of the clear and bright tints, are removed. Bleaching is applied to linen and cotton fabrics before bringing them in contact with dyes, while silk is boiled to remove the fatty matter, and wool is scoured in soda, lye, diluted ammonia, or weak soap. The order in which substances have attraction for color is: wool, silk, cotton, flax, and hemp. Dyes are often applied to woolen goods before weaving, in which case they are called *wool-dyed*. If the coloring matter is applied after weaving, they are called *piece-dyed*. Some dyes will not adhere to the materials which are to be colored without an agent to fix them, that is, to cause a combina-



tion between the dyeing color and the stuff to be dyed. Such an agent is known as a *mordant*.

The dye materials used at present are derived from the mineral, vegetable, and animal kingdoms. The most common mineral dyes are known as arsenical greens, chrome yellow, cobalt blues, and Prussian blues. Vegetable dyes of different kinds are derived from *Rubia tinctoria*, munjeet, sandalwood, logwood, sapanwood, and Brazilwood. Animal dyes include those made from the cochineal insect and kindred species of insect life. In recent years aniline dyes derived from coal tar have been added to the list of coloring stuffs. Under various forms of treatment many organic substances yield coloring matter. Among them may be mentioned starch, lichens, wood, sawdust, cotton waste, mosses, soot, sugar, camwood, sumach, French berries, saffron, and turmeric.

**DYER'S BROOM**, or **Dyer's Weed**, a low and shrubby leguminous plant native to many parts of Europe. It has simple leaves and yellow flowers and is reputed to be the *Genêt*, a bush from which the Plantagenet family obtained its name. The tops are used in making a yellow dye, and it is said to possess medicinal properties useful in preventing hydrophobia. This plant has been naturalized in some parts of Canada and the United States.

**DYNAMICS** (dī-nām'iks), the science which treats of the action of forces. It is divided into statics and kinetics. *Statics* treats of forces that counterbalance each other, and which therefore produce no motion or change of motion; while *kinetics* treats of forces that do not counterbalance, and therefore cause motion or change of motion. The whole science is generally called *mechanics*, while dynamics is restricted to the branch commonly called kinetics. The three primary laws of force were first stated by Newton, and express the principal phenomena of mass motion. These are: 1. A body at rest will continue at rest, or a body in motion will continue in motion in a straight line with a uniform velocity, until acted on by some external force. 2. Any change in the direction or in the amount of motion is proportional to the force acting, and takes place in the direction in which the force acts. 3. Action and reaction are equal in amount and in opposite directions.

The first law is sometimes called the law of *inertia*, being a mere statement of the property of inertia. Matter at rest will continue at rest; or, if in motion, it must continue moving until it is acted on by some force, for the reason that it has no ability to start itself moving,

to stop moving, or to change the direction of its motion. The second law states the principle that the amount and character of motion produced by any force depends upon the elements of a force. An equal force, acting on two masses, one twice as large as the other, imparts to the smaller mass a motion twice as great as to the larger. From this we notice that the amount of motion of a mass or body depends upon the quantity of matter the body contains, as well as upon the intensity of force causing its motion. The amount of motion a body possesses is called its *momentum*, which is equal to the mass of the body multiplied by its velocity. The principle declared in the third law is well illustrated by the recoil or kick of a gun, when a ball is shot from it. The motion in the gun is equal to that of the ball and is opposite in direction, but the actual velocity imparted to the gun is comparatively small on account of its mass being much greater than that of the ball. Hydrostatics is included in dynamics, when a wide construction is applied to the term.

**DYNAMITE** (dī'nā-mīt), a powerful explosive compound invented by Alfred Nobel, a German chemist, in 1867. The name is from a Greek word meaning strength. It was first produced by combining nitroglycerin with a siliceous earth obtained at Oberlohe, in Hanover, and known in Germany as *Kieselguhr*. Nitroglycerin was discovered by an Italian in 1846, but was not brought into practical use until the invention of dynamite. The proportion of nitroglycerin mixed with kieselguhr is seventy-five per cent., the mixture being made to diminish the liability of the nitroglycerin exploding by shock, and not destroying its force as an explosive. This earthy matter is highly porous and friable, thus containing high absorbent power. The color of dynamite is reddish-brown and has much the appearance of raw sugar. Other substances are now used to form dynamite, many being superior to kieselguhr for some purposes, among them diatomite, sand, charcoal, and sawdust.

Dynamite is not impaired by age unless exposed to water. Small quantities may be burned without danger and give off a yellowish flame, but an explosion results if it is heated to a high temperature. As an explosive force it is several times more powerful than gunpowder, the explosion being effected by a fulminating cap. It is used extensively for blasting bowlders and may be employed under water, though about six per cent. of its power is lost when exploded in a submerged state. On account of its tendency to break rock into particles, it is not used for quarrying, gunpowder



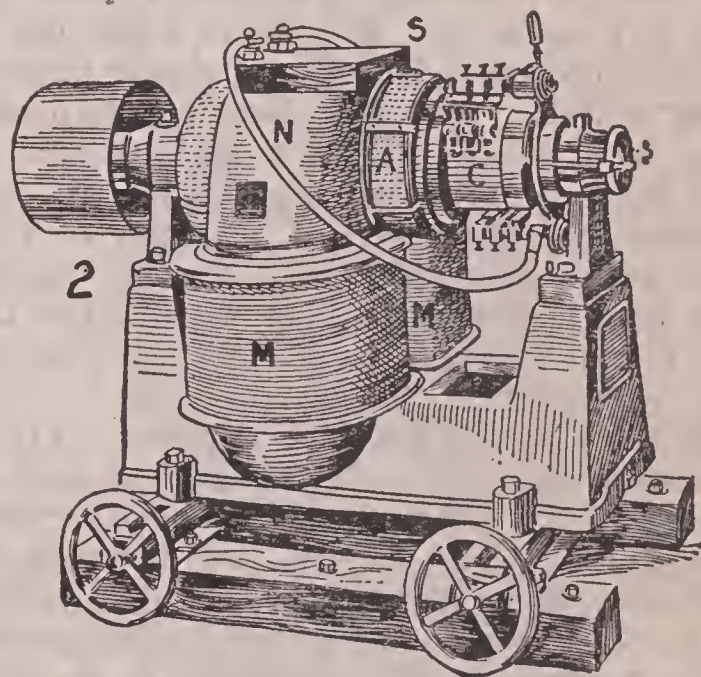
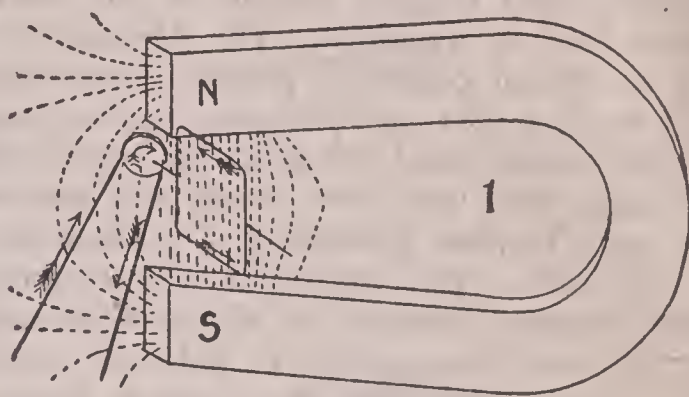
still serving for that purpose. *Gun cotton* is a mixture of nitroglycerin and cotton or wood cellulose, and has the appearance of soft gelatin. It is used for some forms of tunneling and blasting in preference to dynamite, on account of giving off less fumes and having no tendency to cause headache to operators.

Dynamite has gone into use for firing guns in warfare, a dynamite gun suitable for that purpose having been invented in 1883. The dynamite gun made under the direction of Lieutenant Zalinski consists of a mechanism in which a tube from forty to sixty feet in length is utilized. This tube is supported by a truss frame to guard against warping by its own weight, and the dynamite projectiles are thrown from the tube by means of compressed air. The compressed air is stored in a chamber beneath the gun carriage, its pressure being usually 4,000 pounds, though not more than 2,000 pounds of effective pressure is applied in throwing the projectile. Usually the air is introduced back of the projectile at an effective pressure of 2,000 pounds, and is increased as the projectile moves forward in the tube, this being done as a safeguard against sudden explosion. By means of this arrangement dynamite projectiles may be thrown a distance of three miles, the destruction being effected when they explode by reason of the sudden jar with which they crash against a fortification or some other object at which they are aimed. Another dynamite gun is the Maxim-Schupphaus, in which a special powder starts the projectile with a low pressure and increases the velocity by maintaining pressure throughout the entire length of the gun. This gun is among the latest that has attracted attention and has given marked satisfaction, though there are others that have been used successfully in throwing dynamite projectiles and aerial torpedoes. Guns of this character were first successfully employed in actual battle during the attack on Santiago by the American forces in the war with Spain, but since then have had an extended use elsewhere.

**DYNAMO ELECTRIC MACHINE**, a machine for generating electricity by mechanical action, or for transforming electrical energy into mechanical energy. This is the definition of a dynamo-electric machine, which may serve either as a *generator* or a *motor*, depending upon whether it is supplied with mechanical or electrical energy; hence, whether it is giving out electrical or mechanical energy.

In Fig. 1 are shown the essential parts of a simple dynamo. Here the two magnetic poles, N S, of opposite polarity, are placed near to

each other. Between the poles is a field of so-called lines of magnetic force, which are represented in the illustration by dotted lines. As the pulley C is revolved rapidly in the magnetic field, it cuts the lines of force and an electromotive force is induced in the conductor. However, the magnitude of the electro-motive force in the conductor depends entirely upon the rate at which the lines are cut. Since one end of the conductor is raised to a higher electric potential than the other, owing to this electro-motive force, there is a tendency for electricity



DYNAMO.

to flow along the conductor. If the ends of the conductor are connected exterior to the magnetic field so as to form a closed circuit, a current will flow through it as is indicated by the two arrows in the illustration.

In a dynamo, as shown in Fig. 2 of the illustration, is an *armature*, A, of soft iron, around which a large number of wires are wrapped, the armature being revolved rapidly between the poles N and S of the large magnets M and M. By these means a current of electricity is induced which is conducted along the axis of the armature and taken up by brushes of metal and conducted over wires to the lamps or motor intended to be operated.

The *commutator*, C, is fixed on the collar



of the axis on which the armature revolves, and by means of it the direction of the current is reversed. In some machines the commutator causes the currents to be continuous or to have the same direction. The power of the machine depends upon the number of magnetic poles, within which the armature is moving, and the speed of rotation.

The effect of a dynamo is practically the same as that of a magneto-electric machine, but they differ in construction in that the latter has a permanent steel magnet instead of the electro-magnets used in dynamos. The dynamo is superior in that it possesses greater compactness, due to the fact that electro-magnets are stronger than permanent steel magnets of equal bulk. Their extensive use dates from the improvements made in their construction by Gramme of Paris in 1870. His invention became known as the Gramme machine, by means of which a powerful continuous current of uniform strength was obtained. Among the greatest dynamos ever built are those of Deptford Central Station, in London, and at Niagara Falls, the latter being propelled through the motive power of water wheels. At the Columbian Exposition there were twelve dynamos that weighed 900 tons, had a capacity of 180,000 lights, and were operated by engines with an aggregate of 12,000 horse power. Since then other notable dynamos have been constructed, those used at the London, England, exposition in 1908 being particularly noteworthy.

**DYNAMOMETER** (dī-nā-mōm'ē-tēr), an instrument to ascertain the strength of men and animals, and to determine the power exerted by machines. Three classes of dynamometers are in use, including those designed to indicate the force of *thrust*, of *traction*, and of *rotation*. A thrust dynamometer is attached to the screw shaft of a steamship and measures the force of the screw in driving the vessel through the water. A simple traction dynamometer consists of a spring balance, in which the power exerted is indicated by an index upon a scale

of figures. It may be fastened to a wagon or a plow, and when the team of horses pulls the load it shows the force exerted. The force of a shaft is measured by a rotary dynamometer, indicating the force transmitted by the shaft to other machinery.

**DYNASTY** (dī'nās-tŷ), a succession of sovereigns in one line of family descent, or derived from the same ancestral stock, and who govern the same country. Among the particularly noteworthy dynasties are the Hohenzollern of Germany, the Hapsburg of Austria, the Stuarts of England, and the Castile of Spain.

**DYNE** (dīn), the absolute unit of force, employed in the metric system for measuring force. It is termed the unit of the centimeter-gram-second system (C. G. S.), and is equal to a force that, acting upon one gram of matter for one second, will give it a velocity of one centimeter per second. Since the dyne is a small unit, it is more convenient to use the *megadyne*, which is equal to one million dynes.

**DYSODILE** (dīs'ō-dīl), a mineral closely related to amber, found chiefly in limestone. It is of a yellowish or grayish color, and emits an odor similar to that of assafoetida when burning.

**DYTICIDAE** (dī-tīs'i-dē), a family of water beetles which embrace nearly a thousand species. The body is flattened and the hind legs are furnished with hairs to aid in swimming. They pass the winter in a dormant state by being concealed in thick tufts of herbage or in mud, and become active in early spring. The antennae are smooth. Their habits are active, both in swimming and in flying from one pond to another.

**DZIGGETAI** (dzīg'gē-tā), a wild ass found on the plateaus of Central Asia, which resembles the horse more than any other animal. The color is brown and a black stripe extends along the back. Naturalists regard this animal of the same family as the kiang and koulan. It is thought to be the "half ass" mentioned by Pliny and Herodotus.





## E

**E**, the fifth letter and the second vowel of the English alphabet. It is used more frequently than any other of the 26 letters. Its natural or long sound is the same as *i* in the German, Italian, and French languages, as in *me*, *mere*, and *here*. The short sound of *e* is represented in words like *men*, *hen*, and *met*, while its sound equivalent to *a* is exemplified in *there*. Several modifications are recognized when long and short *e* are followed by *r*, as in *here* and *her*; and the *u* or *dropped sound*, as in *camel*. In pronouncing it the mouth is opened to a medium extent, the tongue is expanded to touch the upper molars, and the voice is gently expurgated. It is generally silent as a final letter, but serves to lengthen the preceding syllable, as in *plume*, *cane*, *mane*, though in some cases it exercises no influence on the preceding vowel, as in *give* and *gone*. The final *e* was pronounced in most cases up to the end of the 14th century, as is the case in Chaucer's "Canterbury Tales."

In music it is the third note of the diatonic scale of C. *E*, as a key in music, has four sharps in its signature, F, C, G, and D sharp; but minor *E*, as a key, has but one sharp, F. The abbreviation *E.* signifies East.

**EAGLE** (*ē'g'l*), the name by which many birds of prey are known. They are classed in the genus *Aquila* and the family *Falconidae*, with which the eagles, falcons, and hawks are included. Eagles are regarded the most noble and courageous of the rapacious birds, and soar higher than any other birds of flight. The *golden eagle* has a dark, tawny-brown color, with a yellowish tinge on the back of the head and neck, and is a large and beautiful bird. It attains a length of about three feet and is able to seize any kind of poultry, rabbits, and small quadrupeds and carry them to its nest in the rocky ledges and cliffs of mountains. This species is a common bird of many

## EAGLE

regions of Eurasia and North America. The *sea eagle* is found near the coasts of lakes and seas and feeds largely on fish and marine life. It has a grayish-brown color, white tail, and pale-colored head. The *bald eagle* is found in



BALD EAGLE.

America and northern portions of Eurasia, and has been adopted as the symbol of the United States and some other countries. Its general diet is more extended than that of the *tree*



*eagle*, and carrion is even taken in time of need. The *serpent eagle* is found in Southern Asia and Northern Africa, and in structure and habits approaches the buzzard. Other species include the *imperial eagle*, the *eagle hawk*, and the *crested eagle*. These birds are fond of fish and commonly feed on the dead fishes found along the shore. They are frequently seen in pursuit of the osprey and other birds, requiring them to drop the fish they may have caught.

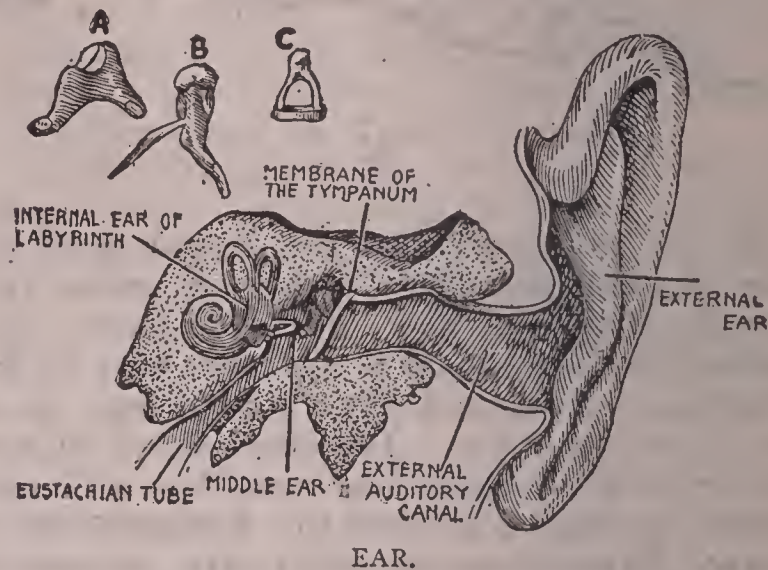
**EAGLE**, the bird most noted as a symbol of societies and nations. The Persians bore an eagle as a symbol upon a spear in battle as early as 401 B. C., and from them it passed as a war standard to the Egyptians. Among the Romans it was customary to use eagles of silver as a standard and rarely of gold, the custom being introduced among them in 104 B. C. The dynasty of Napoleon adopted the eagle as a symbol for France. A double-headed eagle was introduced as the emblem of Russia, and Charlemagne introduced it into Germany as a standard. The Russians have an association known as the White Eagle Order of Knighthood, and in the German Empire are Orders of the Black, Golden, and Red Eagles.

The Prussian Order of the Black Eagle was founded by the elector of Brandenburg in 1701, and is still maintained with a degree of marked respect. Its decoration consists of a Maltese cross surmounted by a royal crown. This cross is given for meritorious service by the emperor. The double-headed eagle is maintained as the standard of Austria. France long held the eagle in high esteem as a symbol, but it was abolished with the rise of the republic in 1870. The bald eagle is the emblem of the United States and is represented with outstretched wings, having the olive branch in one talon, a bunch of arrows in the other, and a shield upon its breast. Its head is surmounted by thirteen stars, while in its beak is a band bearing the inscription "E pluribus unum."

**EAGLE**, a gold coin current in the United States, equal in value to ten dollars. It was coined in 1795, weighing 270 grains and containing  $247\frac{1}{2}$  grains of pure gold. Later the government began to coin of the same fineness and of proportional value the double eagle, half eagle, and quarter eagle.

**EAR**, the organ of hearing. It is divided into three parts: the external ear or concha, the middle ear or tympanum, and the internal ear or labyrinth. The *external ear* consists of a passage to the middle ear, is about an inch in length and a quarter of an inch in diameter, and is formed partly of flesh and partly of bone. Around its opening is a lobe, called the

*auricle* or *pinna*, which serves to collect sound waves. Rudimentary muscles are connected with the external ear and are so well developed in some persons that they can move their ears as a rabbit or a horse does. The outer half of the passage is provided with a number of glands that secrete a kind of sticky wax, which prevents dust and insects from reaching the drum membrane. The gland secreting the wax grows



A, anvil; B, hammer; C, stirrup.

outward towards the surface like the nails and prevents it from accumulating. Carelessness in picking the ears often causes the wax to crowd against the drum membrane and results in deafness.

The *middle ear* is provided with a special mechanism for transmitting the air vibrations to the inner ear through two outer cavities. The tympanum or middle ear is connected by a small aperture with the inner ear. As to the size, the breadth of the middle ear is about a quarter of an inch and its length a half an inch. It is lined with mucous membrane and filled with air. The drum membrane is a thin leaf which closes the outer end like a drum, and a similar membrane closes the aperture to the inner ear. The cavity of the middle ear is increased by extending backward into a bony projection, which can be felt behind the outer ear, and is called the *mastoid process*. From this a tube, called the *eustachian*, about the size of a knitting needle, passes to and connects with the pharynx, and is opened by the act of swallowing. A chain of three small bones, known as the *ossicles*, constitutes the essential part of the middle ear. These are called the *malleus* or *hammer*, the *incus* or *anvil*, and the *stapes* or *stirrup*, and extend across the cavity from one membrane to another.

When sound waves strike the ear drum, they are thrown into vibrations, which are transmitted to the inner ear by a chain of bones.



The vibrations are increased by the tympanum and its extension into the mastoid cells, which act like the sounding box of a violin. The *internal ear* or *labyrinth* is the most delicate part. At its center it is about an eighth of an inch in diameter, this part being called the *vestibule*. A small spiral tunnel extends from the vestibule, which is called the *cochlea* from its resemblance to the inside of a snail's shell, and, besides it, there are three other tunnels called from their shape the *semicircular canals*. A clear liquid fills the labyrinth, which is lined with epithelial cells, and in them the nerves of hearing end. Cilia are numerous upon the surface of the epithelium, and among them are hard particles called the *ear sands*. When the sound waves reach the liquid, they produce waves that beat against the cilia, thus causing the sense of sound.

In order to produce a sound it is necessary that the waves in the liquid surrounding the nerves occur at least sixteen times a second. When they occur more than 38,000 times a second, no sound will be heard for the reason that they are too rapid for the nerves to take account of their action. The nerves of action may be excited by the air in the middle ear being too dense or too rare, by too much blood circulating in the middle ear, and by a blow upon the head or wax in the ear. Quinine and other drugs tend to produce abnormal excitement. In some cases an impression passes to the brain by the auditory nerve as though a real sound had excited the nerves. Other illusions are caused by an excitement of the pulse in an insane person. In dreams persons often get vivid impressions of sounds, and they are afterward recalled to memory and seem to be real.

Birds and quadrupeds have ears corresponding to those in man. No outer ear is found in turtles and frogs, but the drumhead forms a visible circle behind the eyes, just under the skin, and the middle ear contains a single bone. Snakes have no external or middle ear, but a bone extends from the inner ear to a kind of membrane immediately below the skin by which they are able to hear. The vibrations in fish are transmitted only through the skull, since they have no external or middle ear, and the labyrinth has no cochlea. Other animals have ears more or less modified, and those that have ears at all possess a modified form of the internal ear. See **Sound**.

**EARRING** (ēr'ring), an ornament suspended from the ear, the lower part of which is pierced for the purpose. Orientals have prized this mode of adorning the person from remote antiquity. Anciently earrings were worn by both

sexes in many countries of Asia and Africa, especially in Persia, Egypt, Babylon, and Carthage. The fashion was confined to women in Greece and Rome, where the people looked upon this ornament as one especially fitted for those of rank. In the time of Queen Elizabeth it became fashionable to wear earrings by both sexes, and the custom still prevails to a considerable extent among men in some countries and among certain classes of laborers, especially sailors. However, earrings are worn chiefly in Europe at present, where the custom is quite general, but in America these ornaments are not used as extensively as in the past. Earrings are made chiefly of silver and gold, with settings of precious stones. All of the more valuable antique earrings are finely ornamented and contain settings of pearls. Many ornaments classed as earrings are not properly rings, but are attached to the ear with a hook, the size and value varying greatly according to changes in the fashion.

**EARTH** (ērth), one of the eight planets which revolve around the sun and from it receive light and heat. It is farther from the sun than Mercury and Venus, and is larger than Mercury, Venus, or Mars. A satellite, called *Moon*, revolves around it at an average distance, measured from the center of the moon, of about 239,000 miles.

**FORM AND SIZE.** Among ancient peoples the belief was current that the earth is an extensive flat surface surrounded by water, though many writers of antiquity suggested that its form is spherical, and some held the view that it revolves around the sun. Its spherical form is now admitted by the scholars of all civilized countries, and numerous proofs are submitted to establish that fact. The form is that of an oblate sphere, much like an orange, slightly flattened at two opposite sides and somewhat enlarged midway between. A diameter imagined drawn through the shorter distance is called the *axis*, the two ends of which are its *poles*, and a line drawn around it midway between the poles is the *Equator*. The length of the axis is 7,899 miles, and its equatorial diameter is 7,925.6 miles, or about 26.6 miles greater than the former. The *circumference* is 24,899 miles, and the entire surface is equal to about 197,000,000 square miles.

**PROOFS OF ROTUNDITY.** Among the proofs that the world is round is the fact that men have circumnavigated it. Magellan was the first navigator to pave the way for this enterprise, in 1519. Though he was killed in the Philippine Islands two years later, the voyage was completed successfully by Sebastian del



Cano, one of his officers. Sir Francis Drake successfully completed a trip round the earth in 1580, and since then many others have done likewise. The rotundity is also proven by the shape of the *great circle of illumination*, the line separating the portion of the earth's surface which is in the shadow from the part which is lighted by the sun's rays. Besides these are the facts that the horizon has a circular shape, that the earth's shadow cast on the moon during an eclipse of the moon is circular, that the tops of ships are seen first when sailing towards us and last when passing away, that the horizon of vision becomes larger as we ascend in a balloon or to an eminence, and that new constellations of stars appear as we pass from the Equator to the poles. The actual measurement of the arc of a meridian has not only demonstrated the earth's rotundity, but has

the quantity of matter it contains, is found by careful calculation to be 5,639 times that of water. This means that the real earth weighs 5,639 times as much as a sphere of water equal in size to the earth. The measurement of the earth's density was attempted about a century ago by calculating it from the attraction of a mountain on two plumb lines, one being suspended on each side. Since plumb lines suspended in this manner are attracted to the mountain mass, they indicate lines that converge toward the center of the earth, and by them geologists are able to compare the weight of the earth with that of the mountain, the latter having been first carefully examined and its weight calculated in tons. The mountain first utilized in making this important research is Schihallion in Scotland. Other methods include the test made by Cavendish, in which the

attractive force of the earth was compared with that of two large balls over two other small balls by means of the torsion balance, that ascertained by the difference of oscillation of a pendulum when placed at the sea level, and when at the top of a mountain, and the pendulum experiments at the top and bottom of a deep mine for determining the difference of gravity. There are other methods, but these are the principal ones and are regarded of greatest worth.

CREATION. It is thought that the earth originally existed in



HEMISPHERES, SHOWING PARALLELS AND MERIDIANS.

enabled us to know approximately the amount of its oblateness.

**SURFACE LINES.** We imagine the earth to be encircled by a number of curved lines, for the purpose of being able to locate places on its surface and to represent certain localities on globes and maps. They are divided into *great* and *small* circles, the former dividing the earth into two equal parts or hemispheres, and the latter dividing it into unequal parts. The Equator is a great circle, and divides the earth into the Northern Hemisphere and the Southern Hemisphere. Meridian circles are great circles that pass through the poles, while parallels are small circles that pass round the earth parallel to the Equator. Latitude is measured north and south of the Equator along the meridians by the parallels, and longitude is measured on the parallels, by the meridians, east and west of a prime meridian. Both latitude and longitude are reckoned in degrees.

**DENSITY.** The density of the earth, that is,

a nebular or gaseous state, and that its elements and those of other heavenly bodies were generally distributed throughout space. By the expulsive force of heat, the attraction of gravity was overcome, and the different portions collected about nebulae that formed the centers of the various bodies. In this way the earth took on its present form, the action covering long periods of time, perhaps many millions of years, each period represented in Genesis as days. The mass gradually cooled by radiation, the outer surface and the polar regions cooling first and forming a crust; while the interior, cooling by conduction, still retains a high temperature. The spherical form attests its former fluidity, while the highly crystalline state of rocks formed early and the warm climate during the geological past give evidence of great central heat during remote ages. That the interior is still highly heated is evidenced by a rise of temperature equal to 1° Fahr. for every 55 feet of descent into the crust.



If this general rise in temperature continues, it reaches the boiling point at a depth of two miles, and at fifty miles below the surface the heat is sufficient to melt every solid.

INTERIOR. As to the condition of the interior, various views have been expressed, among them that the earth has a solid crust and a solid center, with a heated, pasty layer between; that the earth is solid throughout, but has a highly heated interior; and that the crust is solid, but the interior is a pasty mass in a highly heated condition. The last mentioned view is held most commonly and likely is correct, since the immense pressure at the center probably operates to raise greatly the melting point and tends to hold the mass in a pasty condition, even if the temperature is very high. The cooling effect of the heated interior causes the crust to contract or shrink, thereby crowding the materials into a smaller space, and exerting a marked influence on the crust. In some cases gases exert a marked pressure, rocks are melted, and frequently pressure is removed by certain portions of the earth's surface being elevated. In some cases water undoubtedly comes in contact with melted rocks by soaking down and is converted into steam. By this hypothesis it is possible to account largely for the phenomena of volcanic action, earthquakes, nonvolcanic igneous eruptions, and gradual elevations and subsidences of the crust.

MOTION. The earth has two motions, the *diurnal* and the *annual*. The diurnal motion is its daily motion from west to east around its own axis, which requires twenty-three hours, fifty-six minutes, four seconds—about twenty-four hours—and is the direct cause of our common day and night. By annual motion is meant the revolution of the earth around the sun, which is completed in about 365 days and six hours, and is one of the causes of our common year. The orbit is in the form of an ellipse, and has a total length of about 577,000,000 miles. Since the sun is at one focus of the ellipse, the earth is nearer the sun at some times in its revolution than at others. The earth is at perihelion about the 1st of January each year, when it is about 3,000,000 miles nearer the sun than at aphelion, six months later. Its distance from the sun at perihelion is 89,897,000 miles and at aphelion, 92,963,000. The average velocity at which the earth moves in its orbit through space is about nineteen miles per second, while the rotation on its axis causes any point on the Equator to move about 1,042 miles per hour. However, the velocity caused by its rotation diminishes toward the poles.

The earth's axis is inclined  $23\frac{1}{2}^{\circ}$  to the plane of the ecliptic and points nearly to Polaris, the north star. Owing to this it is always approximately parallel to any former position, and different portions of the surface receive the vertical rays of the sun. From this it is clear that new portions of the surface are turned toward the sun every day during the revolution, thus causing the change of seasons. The winter solstice occurs on December 21 and the summer solstice on June 21. On the former date the days are shortest north of the Equator, while on the latter date the reverse is true. The vernal equinox occurs on March 20 and the autumnal equinox on September 22, at which two periods in each year the days and nights are of equal length in all parts of the earth. At the poles the longest days and nights are each six months, being caused by the constant parallelism of the earth's axis in its revolution. The Arctic Circle bounds the north polar zone and the Antarctic the south polar zone, each being  $23\frac{1}{2}^{\circ}$  from the pole, that being the distance the sun shines beyond the pole during the respective solstices, and include respectively the North and South Frigid zones. The sun shines directly on every point twice in the year throughout a region extending  $23\frac{1}{2}^{\circ}$  both north and south of the Equator, which is called the Torrid Zone. The circle in the Northern Hemisphere which bounds this region is called the Tropic of Cancer and in the Southern Hemisphere the Tropic of Capricorn, both being called tropics. Between the polar circles and the tropics are respectively the North and South Temperate zones, each occupying  $43^{\circ}$ .

SURFACE PHENOMENA. About 150,060,000 square miles of the surface of the earth are water and 46,940,000 square miles are land. The water surface is divided into five great oceans and numerous bays, seas, gulfs, and channels. Lakes, rivers, and glaciers are classed as features of the land surface, though the waters of most of them flow into the oceans. Tides, currents, and waves are great phenomena of the oceans, while earthquakes, rains, and winds equally affect both the water and the land surfaces. The Eastern Hemisphere contains the greater portion of the land masses, including all of Europe, Asia, Africa, and Australia, while the Western Hemisphere includes America. The only great land masses south of the Equator are Australia and portions of South America and Africa. Besides the five continents, there are numerous detached masses called islands. These are known as continental, when near the continent; oceanic, when far out in the oceans; volcanic, when of volcanic origin; and coral,



when built largely by the coral polyps. The greatest depths of the ocean are equal to the heights of the loftiest mountains, about 29,000 feet, and usually are found near the greatest land elevations. Land masses have irregular coast lines and a surface variously designated as valleys, plains, deserts, plateaus, mountains, and depressions below the sea level. The three kingdoms studied in relation to the earth are those of the minerals, plants, and animals. According to the latest reports, the total population is 1,500,000,000. See **Atmosphere**.

**EARTH CURRENTS**, the natural electrical disturbances which appear to be allied closely to the magnetic storms. They are associated with the magnetism of the earth. Though not well understood, they are known to be dependent upon or affected by the occurrence of spots on the sun and by the appearance both of aurora borealis and aurora australis. Communication by long lines of telephone or telegraph, and especially submarine connections, is affected constantly by earth currents.

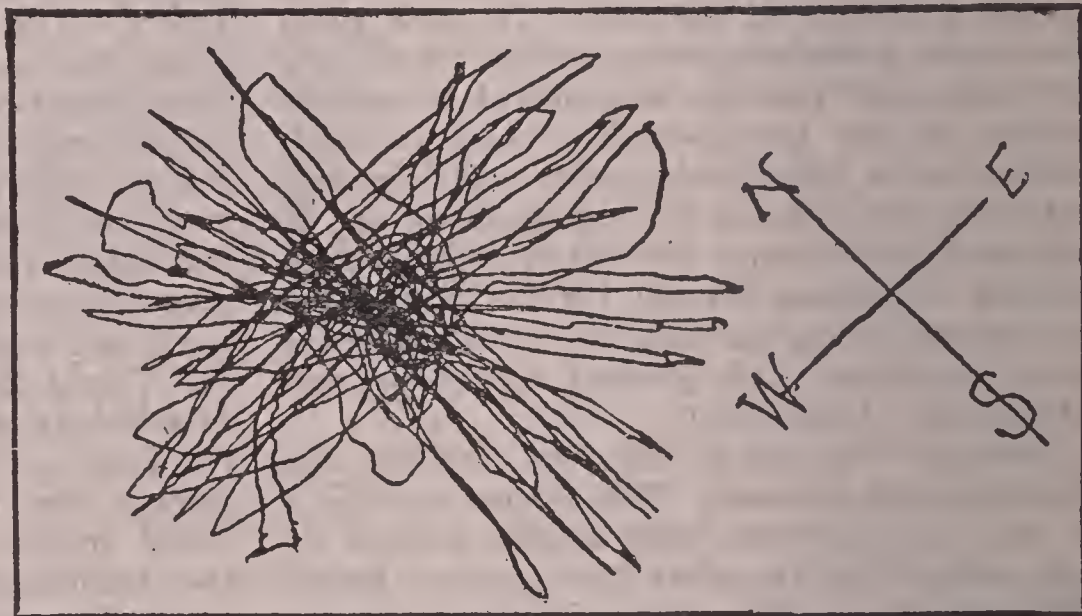
**EARTHENWARE**, any object made of clay and dried in the sun or baked in a kiln, though the term is sometimes restricted to the inferior grades of earthenware as distinguished from stoneware and porcelain. See **Pottery**.

**EARTHNUIT**, the name of the tubers of certain plants of the parsley family and a number of others, so called because they grow and mature in the ground. Pignut and earth chestnut are other names of plants of this kind. A species common to Sweden produces tubers which are valued for their nutriment and these form an important article of trade. Another species is common to Greece. Most of these tubers are about the size of a chestnut, have a brownish color and sweetish taste, and grow on slender roots from four to six inches below the surface. When used as an article of food, they are roasted or cooked in soups. Earthnuts are prized as feed for swine and are fed in some localities for fattening purposes.

**EARTHQUAKE**, a sudden undulation of a portion of the earth's surface produced by forces acting from beneath. Several theories have been advanced as to the probable cause of the disturbances, and, while any great concussion upon the surface of the earth may cause a diminutive earthquake, steam is clearly the most

favorable agent, as its sudden generation or condensation on a large scale is sufficiently powerful to produce extensive movements in the earth's crust. Water probably finds its way through fissures in the earth's crust to heated rocks, where it is suddenly converted into steam. Some earthquakes are caused by the falling in of the roof of enormous subterranean caves formed by the solvent action of water on deposits of rock salt, limestone, or gypsum; by various gases that result from internal heat; and by the general contraction of the earth's crust, resulting from the radiation or conduction of heat. Earthquakes are classified according to the character of the movements, which may be *vertical*, *circular*, or *wave-like*. The circular or twisting movements are rare, but they are the most destructive.

There is little doubt that the cause of earthquake and volcanic action is the same, though



Record of the earthquake at San Francisco, Cal., in 1906, as recorded by the seismograph.

the latter is governed materially by permanent channels through which the discharge is made. Certain premonitory symptoms usually herald the approach of a great earthquake, such as subterranean noises like cars running over a bridge. Suddenly the fatal moment arrives, some portion of the surface becomes the center of impulse, and waves are propagated in all directions through the solid materials of the earth's crust. If the center of impulse is below the sea, as it often is, the vibrations of the ground are accompanied by inundations of water. The earth frequently heaves and swells like a rolling sea, fissures being produced in all directions similar to those on a broken window-pane, various noises accompanying the vibrations. These disturbances may consist of a single shock, lasting a few seconds, or a series of such shocks continuing for days or weeks. The principal shock at San Francisco, in 1906,



had a duration of twenty-eight seconds. It was wavelike and the earth moved about two inches east and west and three inches north and south. Great changes in the surface of the earth have been made in a few seconds of time, as in the earthquake of Italy in 1908, and many towns and many thousands of lives have been lost. It is estimated that an earthquake occurs somewhere every day, though most of them are barely perceptible. They are more numerous in winter than in summer and at



MAP OF THE REGION DISTURBED BY THE EARTHQUAKE OF 1908.

night than during the day, for the reason that the cooling of the earth's crust is more rapid. They are more frequent when the attractive forces of the sun and moon act simultaneously, which occurs during full and new moons.

Some of the most destructive earthquakes on record are: 742 A. D., Asia, 500 towns destroyed; 1531, Lisbon, Portugal, 1,500 houses and 30,000 persons destroyed; 1693, Sicily, 54 towns, 300 villages and more than 100,000 lives lost; 1731, Pekin, China, 100,000 persons killed; 1754, Cairo, Egypt, 400,000 lives lost; 1755, Lisbon, Portugal, 50,000 persons killed. The most severe earthquakes ever known in the United States occurred at Charleston, S. C., in 1886, and at San Francisco, Cal., and its immediate vicinity on April 18, 1906. At the time of the latter a large part of San Francisco, many buildings of the Leland Stanford Junior University, and much property in adjacent towns were destroyed. In the same year, on August 16, a destructive earthquake visited Valparaiso and other cities of Chile.

The most destructive earthquake of recent times visited Calabria and Sicily in December, 1908, when Messina and Reggio were almost totally destroyed. Suddenly and without warning, at 5:20 o'clock in the morning, the earth began to tremble. At Messina, after the city crumbled into ruin, a wave of water 35 feet high engulfed the streets at the water front. As the wave receded its surface was black with human corpses and the wreckage of houses. At Reggio a chasm eighty feet wide opened and belched out scalding water. The disturbance extended from the vicinity of Naples to some distance south of Catania, but it was centered largely in the Strait of Messina, between Messina and Reggio, whose shores were greatly changed by the upheavals and subsidences. The loss of human life is estimated at about 200,000.

**EARTHS**, in chemistry, a class of substances consisting of a metal combined with oxygen, erroneously regarded elementary by alchemists and early chemists. They are insoluble, inodorous, and tasteless, and constitute the larger part of the soil and gravel. Lavoisier classed them as compounds and they are so recognized in modern chemistry. The list includes baryta, lime, strontia, and magnesia, which are classed as alkaline earths, since they are less soluble in water than true alkalis. Thoria, zirconia, alumina, didymia, glucina, erbia, ceria, yttria, and lanthana are true earths.

**EARTH SHINE**, the faint light seen on the part of the moon not illuminated by the sun, but which is cast upon her by the earth. Sometimes the outlines of the full moon are made visible by the reflection, which occurs on clear nights at the time the moon is very old or very new.

**EARTHWORM**, or *Angleworm*, the common name of many species of worms found widely distributed in the tropical and temperate



EARTHWORM.

regions. They are called earthworms because they burrow in the earth, but are known in some sections as angleworms or fishworms, since they are used as bait in angling. After a hard rain they are seen on the surface, when they are said to have *rained down*, but their coming out of the ground is due to the fact that they crawl about in attempting to get away from the water. The body is formed of many narrow rings in contact with each other, and is covered with rows of bristles pointing back-



ward. It has no tentacles, eyes, ears, or teeth. The upper lip is extended, forming a kind of proboscis. Those commonly seen in the Temperate zones are three or four inches long, though some, when fully extended, are nearly a foot in length. They swallow the decaying parts of animals and vegetables and take with them into the ground a quantity of soil, which is subsequently ejected in small heaps called *worm casts*. It is estimated that on an acre ten tons of earth is thus improved and enriched every year. The passages they burrow in passing through the soil loosen and stir it, making room for roots to grow more easily, and for the elements of the air to destroy the poisonous alkalis. Charles Darwin expressed the view that vegetable soil in its present aspect and distribution was produced largely by earthworms. Besides their usefulness in the improvement of the soil, they are important as food for birds, fishes, and insects.

**EAR TRUMPET**, an instrument used by those who have defective hearing or are partially deaf. Many forms of this contrivance are in general use, but they agree in having a trumpet-shaped tube to collect and condense the sound waves, and thus intensify the impression upon the ear. The ear trumpet is held by the hand in the direction where the sound originates, while the other end of the tube is placed in the cavity of the ear. It is not necessary to have an expensive adjustment of the parts, since sound is readily reflected along conical tubes, whether they are straight or coiled. Small ear trumpets, called cornets, are attached to the ear by a spring, hence are concealed by the hair of the wearer, but these can be used to an advantage only where the hearing is very slightly impaired.

**EARWIG** (ēr'wīg), a genus of insects allied to the cockroach and classed with the runners. They have six feet well formed for running; two pairs of wings, an upper short pair and a lower gauzelike pair; a mouth formed for mastication; and a somewhat flattened body. The abdomen has strong pinchers and the head is provided with delicate antennae. The earwig is so named from the erroneous belief that it creeps into the ears of sleepers. Several species are widely distributed in Europe. In North America these insects are found only on the Pacific Coast and in the central and southern parts of the continent. Several small centipedes which frequent houses in the United States are known as earwigs.

**EASEMENT**, in law, the right which one person has in the real estate of another, not inconsistent with the general property of the

owner, such as a right of way over it or a right to lay pipes below the surface. It is distinguished from a mere license, since an easement is a permanent right. An easement is called a *dominant right*, while the land burdened is termed the *servient estate*. It is acquired either by *grant* or by *prescription*. The former is usually by a formal written deed, but an oral grant is sufficient when the possession passes



Earwigs, showing larvae and perfect insects.

to the grantee. An easement by prescription, or implication, is acquired through continued use, when the natural presumption arises that a grant was made when possession was obtained of the land. An owner of property who does not wish to have an easement created without his actual consent should not permit the use of his property for a long period of time without a written agreement or notice to the contrary, else such a right may be created by prescription.

**EAST AURORA** (ā-rō'rā), a village of New York, in Erie County, seventeen miles southeast of Buffalo, on the Western New York and Pennsylvania Railroad. It is surrounded by a fertile farming country, and contains the residences of many Buffalo business men. Among the facilities are electric lights, public waterworks, and a number of fine school buildings. Aurora is noted as the seat of the Roycrofts, a printshop which produces fine editions of standard and current books and hand-made furniture. Population, 1900, 2,366.

**EASTBOURNE** (ēst'būrn), a seaside resort of England, in Sussexshire, on the coast between Brighton and Hastings. It has railroad facilities, electric lights, finely paved streets,



and a commodious town hall. Along the shore is a fine drive two miles long. It has gained rapidly in population on account of its healthful situation and popularity as a coast resort. The town was incorporated in 1883. Population, 1907, 44,630.

**EAST CAPE**, the most easterly cape of Asia, extending into Bering Strait, nearly opposite Cape Prince of Wales, the most westerly point of North America. It is a rocky promontory and is almost cut off from the mainland by shallow lakes and swamps. The village of Uedle is situated on the northeastern side, containing a population of 300. The name Cape East is also applied to the southeastern extremity of New Guinea; the eastern headlands of North Island, New Zealand; and the easternmost point of the island of Madagascar.

**EASTER** (ēs'tēr), the festival kept in commemoration of the resurrection of Christ. It was observed by the early Christians as a continuation of the feast of the passover and generally lasted eight days, from Palm Sunday to Easter Sunday inclusive. It was a time of joy. The austerities of Lent were over; alms were given to the poor and needy; sports, dances, and farcical exhibitions were indulged; and stories and legends were recited by the clergy to stir the hearts of the hearers to laughter. On Easter day the people saluted each other with a kiss and the exclamation, "He is risen;" to this the reply was, "He is risen, indeed." A long controversy took place between the Eastern and Western churches as to the proper time for celebrating Easter, but in 325 it was fixed by the Council of Nice on the first Sunday after the full moon occurring upon or next after March 21. Easter, the feast of eggs, is considered emblematical of the resurrection and of a future life.

**EASTERN QUESTION**, the problem which relates to Turkey in Europe and the occupation of the Balkan Peninsula. It has been a complicated issue of international politics for many years, but its modern phase dates from 1856, when the Congress of Paris made definite declarations upon the questions involved in the Crimean War. The war between Russia and Turkey in 1877 opened the problem anew, after which the Congress of Berlin refused to permit the former country to receive the full benefits arising from the new status created by the conflict. It was likewise influenced by the annexation of Eastern Rumelia to Bulgaria in 1885, the war between Greece and Turkey in 1897, and the establishment of autonomy in Crete. The question was again opened in 1908, when Bulgaria declared its independence and

Austria-Hungary proclaimed the annexation of Bosnia and Herzegovina. It is not probable that the issues will be finally adjusted until the territory of Turkey in Europe becomes absorbed by the nations of Europe, when the status existing at the time of the ancient Byzantine Empire will be restored in a measure and the Turks will be confined beyond the Hellespont.

**EASTERN RUMELIA**. See Rumelia.

**EASTHAMPTON** (ēst-hämp'tūn), a town of Massachusetts, in Hampshire County, four miles southwest of Northampton. It is on the Boston and Maine and the New York, New Haven and Hartford railroads, and has a growing trade in merchandise and produce. The manufactures include yarn, rubber goods, cotton textiles, buttons, and machinery. It is the seat of Williston Seminary, a preparatory school for boys, and has a fine public library. Waterworks, electric lights, and several fine schools are among the public improvements. The settlement of Easthampton dates from 1665, and it was organized as a town in 1809. Population, 1905, 6,808.

**EAST HARTFORD** a town of Connecticut, in Hartford County, a short distance east of Hartford, on the New York, New Haven and Hartford Railroad. It has railroad shops and manufactures of paper, tobacco, clothing, and machinery. The noteworthy buildings include a town library, the Raymond Library, and the high school. It has public waterworks and electric lighting. The first settlement on its site was made about 1645. Population, 1910, 8,138.

**EAST INDIA COMPANIES**, the term used to designate companies organized in the 17th and 18th centuries for the planting of colonies and the promotion of trade. They were organized under the governments of Holland, Great Britain, Sweden, and Denmark, and were given a monopoly of foreign and colonial trade within certain districts. The company operating in a specified region was granted exclusive control in the matter of government and was permitted to organize armed forces, equip natives, and build defenses for the general good. Some of the companies paid an annual tax to the home government and in return received aid and protection. After a time difficulties arose regarding territorial claims, which resulted in several wars between some countries of Europe. The first English company was granted a charter by Queen Elizabeth in 1600 for the purpose of securing East Indian trade. It was chartered as "The Governor and Company of London Merchants Trading with the East Indies." It became the most powerful



body in its time, represented a large capital, and was controlled by a court of proprietors, who were large shareholders in the company. Parliament appointed a government board of control in 1784, and in 1858 made India a crown province, when the company ceased active existence, though for several years afterward it maintained an organization for the purpose of closing up its business.

In 1602 the Dutch company was organized and vied with the British until 1795 for the supremacy of the East Indian seas. The Danish company was founded in 1618 and had a varied existence until 1729, when its property interests were transferred to the state. In 1664 the first French company was founded. It continued operations until 1769, when its business interests were merged into the government. The Swedish company organized for the Indian trade in 1741, and reorganized on a government basis in 1806. Both the Danish and French made their chief seat of operations on the Coromandel Coast, while the Dutch operated in Sumatra, Java, and adjacent islands, and their possessions in the Dutch East Indies date from the operation of their company. The British company settled largely in India proper, at Calcutta, in Bombay, Bengal, and Madras.

**EAST INDIES** (ĭn'dĭz), the name applied to the region which includes the two great peninsulas of Southern Asia and the islands located from the delta of the Indus to the northern extremity of the Philippines. The appellation is made usually to distinguish these islands from the West Indies, and quite frequently includes all the islands southeast of Asia, except the Philippines and New Guinea.

**EAST LIVERPOOL** (ĭv'ĕr-pōol), a city of Ohio, in Columbiana County, on the Ohio River. It is on the Cleveland and Pittsburg Railroad and is surrounded by a fertile country. The noteworthy buildings include the public library, the high school, the city hall, and several fine churches. Many of the streets are substantially paved, lighted by gas and electricity, and traversed by electric street railways. The manufactures embrace furniture, cigars, machinery, ironware, and farming implements. It has large pottery interests and extensive machine shops. The place was settled in 1795 and incorporated in 1834. Population, 1900, 16,485.

**EASTON** (ĕst'ŭn), a city of Pennsylvania, county seat of Northampton County, 52 miles north of Philadelphia. It is at the junction of the Delaware and Lehigh rivers and on the Pennsylvania, the Lackawanna, the Central of New Jersey, and other railroads. Extensive slate quarries and coal and iron fields are

worked in the vicinity. Bridges connect it with South Easton and with Philipsburg in New Jersey. The noteworthy buildings include the public library, the county courthouse, and the high school. It is the seat of Lafayette College, a Presbyterian institution established in 1832.

Easton is an industrial center and a shipping point for coal and produce. The manufactures include machinery, wire, clothing, hardware, cordage, musical instruments, and food products. It has street railways, gas and electric lighting, waterworks, and pavements of stone and macadam. The place was laid out in 1750 and incorporated in 1789. Important treaties with the Iroquois were made here in 1756 and 1761. Population, 1900, 25,238; in 1910, 28,523.

**EAST ORANGE**, a city adjacent to Newark, N. J., twelve miles west of New York City, on the Lackawanna and the Erie railroads. Many business men of New York have handsome villas and make it their residence. The chief buildings include the public library, the town hall, and many schools and churches. It has electric lighting, well-paved streets, systems of sewerage and waterworks, and electric railways. It was a part of Orange until 1863 and was incorporated as a city in 1890. Population, 1905, 25,175; in 1910, 34,371.

**EASTPORT**, a city and port of entry in Maine, in Washington County, the easternmost settlement of the United States. It is located on Moose Island, in Passamaquoddy Bay, and has a deep harbor. The chief industries are fishing, shipbuilding, and sardine canning. Among the principal buildings are the public library, a customhouse, and several schools. The first settlement was made at Eastport in 1782, but it was claimed by England and captured in 1814. The British governed it under martial law until June 30, 1818. Population, 1900, 5,311.

**EAST PROVIDENCE**, a town of Rhode Island, in Providence County, across the Seekonk River from the city of Providence, on the New York, New Haven and Hartford Railroad. It is important as a manufacturing and commercial center. The chief manufactures include chemicals, fencing wire, handkerchiefs, clothing, and machinery. It was formerly a part of the town of Rehoboth together with Seekonk, Mass., but was set off from the former when the boundary line between Rhode Island and Massachusetts was definitely fixed. It was incorporated in 1862. Population, 1905, 13,750; in 1910, 15,808.

**EAST RIVER**, the name applied to the strait between Long Island Sound and New York Bay. It is twenty miles long and separates the



boroughs of Brooklyn and Queens on the southeast from those of the Bronx and Manhattan on the west and north. Blackwell's, Riker's, and Randall's are among the islands within the strait. It is spanned by the Brooklyn, the Williamsburg, and other great bridges. At the center of its course the Hellgate rock formerly obstructed the passage, but it has been removed by blasting. The strait is not properly a river. The misnomer probably arose from the powerful action of the tides, which resemble the current of a river.

**EAST SAINT LOUIS**, a city of Saint Clair County, Illinois, on the Mississippi River, opposite Saint Louis, Mo., with which it is connected by the famous Eads's Bridge. About twenty railroads enter the city, including the Illinois Central, the Wabash, the Baltimore and Ohio, the Chicago and Alton, and other lines. Among the noteworthy buildings are the public library, the city hall, the Howe Literary Institute, a Roman Catholic academy, and the public high school. Among the industries are rolling mills, car shops, gas works, foundries, nail factories, breweries, machine shops, flouring mills, and glass works. It has one of the largest stockyards in the United States and has extensive interests in beef and pork packing. The streets are well paved, drained, and lighted. It was incorporated as a town in 1861 and as a city in 1865. A tornado swept over the city in 1896, killing about 500 people and destroying property valued at \$10,000,000. Population, 1910, 58,547.

**EAU CLAIRE** (ō klār'), a city of Wisconsin, county seat of Eau Claire County, on the Chippewa River, at the mouth of the Eau Claire River. It has the advantage of steamboat navigation on the Chippewa, and is on the Wisconsin Central, the Chicago and Northwestern, and the Chicago, Milwaukee and Saint Paul railroads. The site of the city is divided into three parts by the two rivers, which are crossed by several bridges. It is the center of an extensive market in lumber and produce. The chief buildings include the county courthouse, the high school, the public library, and the Federal building. It is the seat of several institutions, including the Sacred Heart Hospital. Among the manufactures are flour, machinery, paper, hardware, lumber, and woolen goods. Gas and electric lighting, pavements, sewerage, and waterworks are among the improvements. An abundance of water power for manufacturing is obtained from both rivers. Population, 1905, 18,737.

**EBONY** (ěb'ŭn-ĭ), a hard, heavy wood, usually dark, susceptible of a high polish, and used in many kinds of ornamental cabinet work. In

various species of trees the heartwood becomes black and is the ebony of commerce. The Ceylon ebony is, perhaps, the best known, although the West India or Jamaica ebony of the bean family, a greenish-brown product, and the green ebony of the spurge family are of importance commercially. On account of jet black ebony being free from veins, it is considered the best. The different species are variously used for toys, mosaics, veneering, and inlaid work.

**ÉCARTÉ** (ā-kār-tā'), a game of cards which is popular in France, played ordinarily by two persons, but *pool écarté* may be played by three or more. In the latter the third player and others in the game act as advisers, remaining close at hand and advising one of the players, and, when one player loses a game, his place is taken by the adviser. The object is for the player to get all the tricks, but it is necessary for him to follow suit, if possible, and at other times he may trump. The game is interesting and is governed by elaborate rules.

**ECBATANA** (ěk-bāt'a-nā), an ancient capital of Media, founded about 728 B. C. It was inclosed by seven concentric walls, the innermost of which was gilded and the next was plated with silver, while the others were painted in order orange, blue, scarlet, black, and white, respectively. They rose in graduation toward the center, hence could all be seen at once by a spectator occupying an advantageous point. On a conical hill stood the beautiful temple of the sun. The city was about thirty miles in circumference during its prosperity. It was captured by Cyrus in 549 B. C. and later by Darius, who found there the edict of Cyrus the Great concerning the rebuilding of the temple of Jerusalem. Alexander the Great conquered it while on his famous Asiatic expedition. On account of its beautiful surroundings and mild climate it was made the summer residence of first the Median, second the Persian, and lastly the Parthian monarchs. It was pillaged by the Seleucidae and later by Antiochus the Great, and fell into utter decay, so that its exact site can no longer be fixed with certainty, though historians generally agree that the present Hamadan, containing the supposed tombs of Mordecai and Esther, occupies its ancient site.

**ECCENTRIC** (ěk-sěn'trĭk), a contrivance in mechanics for securing reciprocating rectilinear motion from a revolving shaft. It consists of a disc fixed on the axis or center of a wheel, which does not pass through the center of the other disc. Not being in the center, the result of its revolution is the same as a crank. It is used chiefly in machinery where a subsidiary motion of small power is required, as in operat-



ing the slide valves of steam engines and in working the force pumps of steam boilers.

**ECCLESIA** (ĕk-klĕ'zĭ-à), a popular assembly of the people, especially of Athens, to discuss public affairs. According to the laws of Solon these assemblages were held four times every 35 days, unless special meetings were called, when messengers were sent to summon the people from the country. Every citizen twenty years of age could vote and was required to attend under penalty of a fine. The poorer classes were paid a small sum for attendance. The meeting usually began by prayer to the gods, after which the business was introduced. Any regularly convened assembly came to be called *ecclesia*, and the name was afterward applied to the Church by the New Testament writers.

**ECCLESIASTES**, one of the canonical books of the Old Testament, commonly called the *Preacher* in the English versions. In the Hebrew it is called *Koheleth*, meaning the gatherer of the people. It is generally ascribed to the authorship of Solomon, but modern criticism places it at a much later date. The vanity of earthly good and the certainty of judgment are the two leading ideas of the Preacher. Some writers have imputed an epicurean meaning to several passages, but others regard them as mere ironical expressions.

**ECCLESIASTICUS** (ĕk-klĕ-zĭ-às'tĭ-kŭs), a book of the Apocrypha, commonly called the *Wisdom of Jesus the Son of Sirach*. The Jews and Protestants accept it as an apocryphal writing, but the Roman and Greek churches class it as canonical. It is recommended to be read for edification by the Articles of the Anglican Church. This book appears to have been written in Hebrew at Jerusalem about 250 B. C. It contains rules rather than principles for living, admonishes man to honor the law, and approves of the righteous life for the happiness that it brings.

**ECHIDNA** (ĕ-kĭd'nà), a genus of toothless mammals native to Australia. These animals have a long, slender muzzle, toothless jaws, long, thick fur intermingled with sharp spines, and feet provided with powerful claws. When frightened or in danger, they curl up like the hedgehog to protect the under parts, which have no spines. They are closely allied to the duck-bill and, like it, propagate by eggs. The food consists chiefly of ants and other insects, for which they burrow in the earth. The body is from a foot to eighteen inches long and somewhat broad and depressed, and the movement is quite rapid, considering the shortness of the legs. They lie dormant during the seasons of drought and come out most frequently at night.

Their flesh is prized as food by the Papuans and other natives.

**ECHINODERMATA** (ĕ-kĭ-nô-dĕr'mà-tà), one of the grand divisions into which the animal kingdom is divided. It constitutes an independent assemblage of organisms, formerly classed as radiates with the Coelenterates, and ranks as the third from the lowest of the divisions of the animal kingdom. The five parts of their body radiate from a central axis, hence the former classification, and their external skeleton is calcareous, which is leathery in some species and in others is covered with spines. The alimentary canal is distinct from the body cavity and is protected by the skeleton, and the nervous system is radiate. Reproduction is by eggs. The young are greatly different from the adult, especially in that they are bilaterally symmetrical, instead of having the radiate structure.

Some species of the Echinodermata effect locomotion by a peculiar water vascular system, by which the water is carried to a system of locomotor tube feet, or *ambulacra*, these being thrust outward and forward to produce movement. In some of the larvae movement is effected by long arms, which are stiffened by slender rods of carbonate of lime. These arms are absorbed at the time metamorphosis takes place. The sense of touch is well developed, but only traces of pigment eyes and of the blood system are found in some of the species, while in others they appear to be entirely absent. All the species, of which there are about 3,000 now living, are marine and are distributed through all seasons. Seven divisions have been made of the echinodermata, depending upon the form of the body. They include the sea cucumbers, sea urchins, brittle stars, starfishes, cystoids, and pentremites. See **Starfish**; **Urchin**.

**ECHO** (ĕk'ô), in Greek mythology, one of the Oreades or mountain nymphs, daughter of the earth and air. It is related that Echo fell in love with Narcissus, who was deaf to her entreaties. In her grief she wasted away until nothing remained but her bones and her voice. Later she was avenged by Nemesis, who inspired Narcissus with a love for himself. Many poets have used the story as a basis for exquisite productions.

**ECHO**, a Greek word meaning sound, signifying the repetition of a sound wave, in the air, reflected from some obstacle. When the reflecting surface is at right angles, the sound waves are returned to the person or object causing them, but, if oblique, the echo is sent in another direction and may be perceived in some other locality than the one from which the



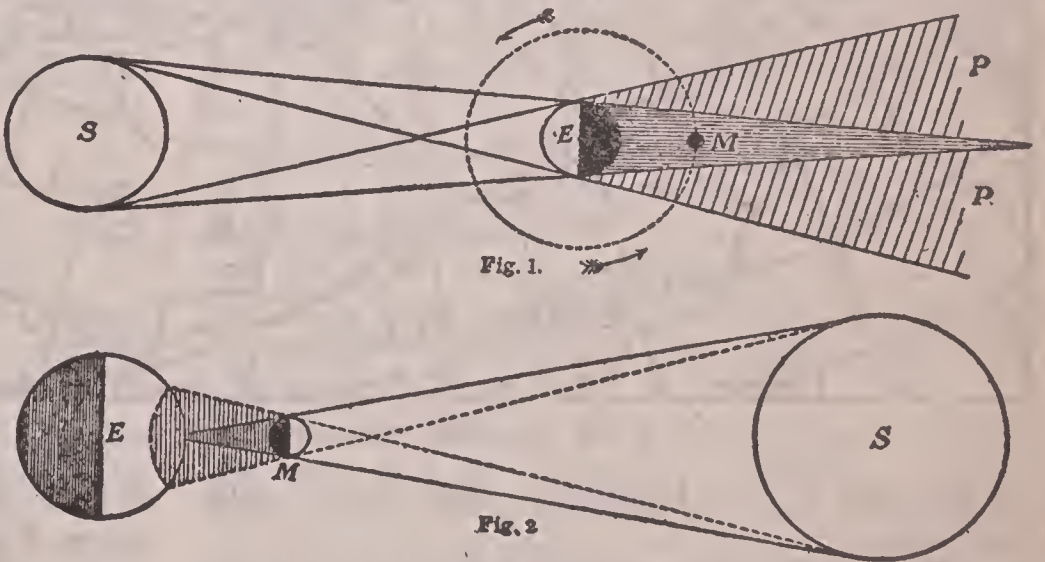
waves were induced. No absolute law can be laid down for the exact distance the reflecting object must be from the speaker. Sound at 60° Fahr. has a velocity of 1,120 feet per second. If in ordinary speech five syllables are uttered in a second, then the speaker, standing in front of a reflecting surface 112 feet distant, can hear the last syllable. The other syllables are reflected, but reach the speaker just as he begins the next syllable, hence he does not hear them as distinct sounds. A sharp, quick sound may be heard 56 feet distant. In a properly constructed hall the voice of the speaker is strengthened in effect by the waves reflected by the walls and ceiling. If the walls are too close or too far the sound is confusing. Natural echoes are produced by woods, hills, rocks, and mountains, and many localities have become famous on account of them. Some echoes are repeated a number of times. It is said that the report of a pistol is repeated sixty times by an echo in the Simonetta Palace, near Milan, Italy. Lake Killarney, in Ireland, is noted for its echo, which belongs to this class.

**ECLECTICS**, a class of philosophers who selected or chose from others what they considered the best parts of all the recognized systems. As a school of philosophy eclecticism necessarily had its rise after other systems had been established, since it chose what was regarded the best and harmonized it into a new system. Since both Plato and Aristotle drew from the philosophies of those who preceded them, they may be regarded as eclectics in a certain sense. However, those belonging more particularly to this class include Plutarch, Plotinus, and Epictetus. Victor Cousin, the French writer on the history of philosophy, is the most eminent modern eclectic.

**ECLECTIC SCHOOL OF MEDICINE**, the school of medicine which relies upon treating patients as thought advisable by the physician rather than to follow closely the instruction of schools. It is an American system and is known also as the New School of Medicine, though it may more properly be said to be the modern representative of a system of healing that dates from the year 200 B. C. It must not be assumed that the eclectic practitioner is an absolute individual, but rather that he relies upon individual judgment while at the same time he keeps in mind what has been learned in medicine and the art of healing by experiments. Wooster Beach founded an eclectic college in New York City in 1826, and it may be said

that the modern eclectic school of medicine dates from the early part of the 19th century. He published a number of text-books which are still looked upon as standard, and founded colleges in a number of states. In 1870 the National Eclectic Medical Association was incorporated in New York and since then other associations of the same kind have been organized, all of which have for their aim the improvement in the art of healing. While the medicines generally employed in the treatment of diseases are used by this school, in theory it does not favor the employment of mineral substances and is an advocate of using native plants that possess medicinal properties. This position in relation to plants has been the means of obtaining much information regarding American plants useful in the treatment of diseases. In 1908 there were about 875 students in attendance at 24 eclectic medical colleges in the United States.

**ECLIPSE** (ĕ-klĭps'), an obscuration, partial or total, of a heavenly body by its entering the shadow of another body, as when the moon enters the shadow of the earth, or a satellite that of a planet. An eclipse may occur by the partial or total disappearance of the sun as the effect of the passage of the moon between it and an observer. Stars, planets, and the satel-



ECLIPSES.

S, sun; E, earth; M, moon; P P, penumbra.

lites of planets may be eclipsed, but the principal eclipses are those of the sun and moon. An eclipse of the sun begins by an obscuration of the western side of the disc and ends on the eastern, while an eclipse of the moon begins on the eastern and ends on the western side.

**SOLAR.** When the sun and moon are in conjunction at the time of new moon, the moon is necessarily between the earth and the sun, the three bodies being in a straight line, as shown in Fig. 2. This causes an eclipse of the sun. If the moon's orbit were in the same plane as



the ecliptic, an eclipse of the sun would occur at every new moon; but, since the orbit is inclined, an obscuration can occur only at or near a node. As a consequence of the diameter of the moon being comparatively small, the cone of the shadow cannot enshroud to exceed 180 miles in breadth of the earth's surface. Within this region occurs a *total eclipse*, and for a certain distance beyond only a portion of the sun's disc is obscured, where the eclipse is said to be *partial*. When the eclipse takes place at the time the moon is farthest from the earth, its disc does not cover the disc of the sun, thus leaving a ring exposed to the vision of the observer. This is known as an *annular eclipse*. The longest duration possible of a total eclipse

tions in Labrador unsatisfactory, but good results were obtained in Spain and Northern Africa. The Lick Observatory sent a party to Egypt, where a number of fine views were taken with photographic telescopes. In that region the shadow bands were nearly parallel and moved as fast as a walking man. During the eclipse little variation was shown by terrestrial magnetic elements.

LUNAR. Eclipses of the moon are caused by the moon passing through the earth's shadow, as shown in Fig. 1. They can only occur at full moon. The moon does not disappear completely even in a total eclipse, because of the refraction of the solar rays in traversing the lower strata of the earth's atmosphere. Since



PATH OF THE TOTAL ECLIPSE, AUG. 30, 1905.

of the sun in any locality is only about eight minutes.

An unusually interesting total eclipse of the sun occurred Aug. 30, 1905. In the accompanying illustrations are shown the path of the eclipse and the result of observations taken on board the *Lucania*, a vessel belonging to the Cunard Company, while at sea during a westward passage. At sunrise the path of the total eclipse came in contact with the earth near Lake Winnipeg, passed north of Newfoundland into the Atlantic, reached Spain at noon, passed over Northern Africa, and ended in Arabia. The maximum velocity was 2,000 miles per hour; average 1,000 miles; width of path of total eclipse, 160 miles; duration of totality,  $2\frac{1}{2}$  to  $3\frac{3}{4}$  minutes. Cloudy weather made observa-

a *penumbra* surrounds the shadow of the earth, it sometimes occurs that the moon does not reach the true shadow, passing only partly within the *penumbra*. There never can be an annular eclipse of the moon, for the reason that the earth's shadow exceeds in diameter the moon's disc. Total eclipses of the moon are rarer

events than those of the sun, yet are seen more frequently, for the reason that they are visible over the entire unilluminated hemisphere of the earth, and also because of the long duration of the eclipse, which may last several hours.

Total solar eclipses at any given point on the earth's surface are exceedingly rare; prior to 1715 none had been visible at Paris, France, for five and a half centuries. In ancient times the people were very much frightened during an eclipse, and thought them presages of dire events. All manner of frantic efforts were made to drive them away. At one time the laws of Rome made it punishable blasphemy to talk publicly of their being due to natural causes. See **Sun; Moon.**

**ECLIPTIC** (ĕ-kliĕp'tic), the apparent yearly



path of the sun around the celestial sphere. It was so called by the Greeks for the reason that they observed that eclipses of the sun and moon can occur only when these bodies are near this circle. The earth's axis is not perpendicular to the plane in which the sun appears to move, but is inclined  $23\frac{1}{2}^{\circ}$ . If the stars could be observed in the daytime, the sun would be seen to be moving slowly among them toward the east, just as the moon does at night; this path is the *ecliptic*. Now, if the earth's Equator is imagined to be extended as a great circle into the heavens immediately above its true position, it is known as the *celestial equator* and cuts the ecliptic at the equinoxes. The position of the sun on March 21 and Sept. 21 is on the Equator or equinoctial points. Then, there are two periods in the year when the sun has reached its greatest distance from the Equator—June 21 and Dec. 21. These four points are distant from each other by a quadrant of a circle, or  $90^{\circ}$ . Each quadrant is divided into three arcs, or  $30^{\circ}$ , from which are reckoned twelve signs of  $30^{\circ}$ , called *signs of the zodiac*, being named from constellations through which the ecliptic passes. The equinoctial points are not fixed, but recede westward about fifty seconds in a year, while the angle at which the ecliptic stands to the Equator is diminishing also about fifty seconds in a century. The decrease, however, has a limit, and there is a point beyond which it can never pass. It requires 8,000 years to change a degree, and this can never sensibly affect the seasons.

**ECLOGUES** (ĕk'lŏgz), a class of pastoral poems, so named from the *Eclogues* of Virgil. The poems of this class relate the loves and adventures of shepherds and shepherdesses. Spenser's "Shepherd's Calender" is a good example of an English eclogue. Pope made this class of literature popular in the 18th century.

**ECONOMICS** (ĕ-kŏ-nŏm'iks). See **Political Economy**.

**ÉCOLE DES BEAUX ARTS** (ă-kŏl' dă bŏ zăr'), the national school of fine arts in Paris, France, founded as an academic school by Mazarin in 1648. The present name was not given to it until 1815, and a system of workshops were added to the main institution in 1863. It is situated in the Villa Medici, on the Pincian Hill, and takes rank as one of the most important schools of fine arts in the world. Both men and women between the ages of fifteen and thirty have free access to the courses, which include drawing, sculpture, painting, engraving, architecture, modeling, and gem cutting. Foreign students are not subject to the age regulation and not eligible to the *Prix de Rome*, which

was established in 1666. Students may remain as long or short a time as they desire, but the regular course is from eight to ten years. About 40 teachers give instruction, twelve in the workshops and 28 in the École proper, and the students number approximately 1,350.

**ECUADOR** (ĕk-wă-dŏr'), a republic of South America, located mostly south of the Equator. It extends from  $5^{\circ}$  south latitude to  $1^{\circ} 45'$  north latitude. Its northern and eastern boundary is formed mainly by Colombia; southern, by Peru; and western, by the Pacific Ocean. The boundary between it and Peru and Colombia has been in dispute for many years, hence the area cannot be stated with accuracy, but is usually given at 118,500 square miles.

**DESCRIPTION.** The surface is divided naturally into the extensive plains in the east, the elevated mountain regions through the center, and a narrow coast region lying between the latter and the ocean. Many of the mountains are active volcanoes, and the ranges are traversed by longitudinal valleys and plateaus. Two chief mountain ranges, both containing snow-clad summits, traverse the country in a direction from north to south, though the western of these has the more highly elevated peaks. It contains the highest summit in Ecuador, Chimborazo, elevation 20,500 feet, but its peaks as a whole are generally lower than those of the eastern range. The loftiest mountains of the latter are Antisana, Cayambé and Cotopaxi, the last mentioned being 19,612 feet. The sea coast is quite uniform, being indented only by the Gulf of Guayaquil. Many of the plateaus take the form of valleys among the mountains and their soil is generally fertile. In the eastern part of the country, east of the Andes, is an extensive fertile plain belonging to the Amazon basin.

A larger part of the country slopes toward the east, and the drainage is chiefly by tributaries of the Marañon, as the upper course of the Amazon is called. These tributaries include the Napo, the Putumayo, and the Japura, and some of these streams furnish transportation facilities with the Amazon. The rivers of the western slope are short and flow rapidly. They include principally the Mir and the Esmeraldas. Ecuador has numerous lakes, but all of them are small.

The climate is tropical, but is greatly modified by differences in altitude. Excessive heat and moisture render the eastern and western plains unhealthy, but some parts of the elevated interior are delightful, especially the valleys of the Andes that have an altitude of about 8,000 feet. The regions that have an elevation of



more than 9,000 feet have a cold and rigorous climate, but habitations are met with at much greater heights in many of the mountains. It may be said that the dry and the rainy seasons form two divisions of the year, the former from June to November and the latter from December till May. In the deep river valleys the thermometer seldom registers below 80°, while the elevated summits are covered with snow perpetually. The rainfall is abundant in all parts of the country, hence fine grasses and thick forests are abundant. Tropical vegetation thrives in regions elevated less than 6,000 feet, and above that it becomes more rigid. Among the wild animals are the tapir, alpaca, jaguar, monkey, vicuña, and many birds of prey and plumage.

**AGRICULTURE.** Farming is the chief industry and cacao is the principal product. It is cultivated extensively in the provinces of Oro, Manabi, and Guayas. Coffee takes second rank and is grown chiefly in the lowlands. Sugar cane is cultivated quite extensively. Indian corn, rice, tobacco, wheat, barley, and oats are grown profitably. The forests yield chinchona bark, sarsaparilla, vegetable ivory, and rubber, and the trees yielding these products are grown with considerable care. Alfalfa is cultivated for hay. All the domestic animals common to North America thrive, but sheep and cattle receive the larger share of attention.

**MINING.** Many minerals are found in the mountains, including coal, iron, zinc, and the precious metals, but very little has been done to develop the mineral resources. Gold is the chief mineral product, and copper and petroleum are obtained, though in comparatively small quantities. The lack of development may be attributed both to the lethargy of the people and a general lack of transportation facilities.

**MANUFACTURES AND COMMERCE.** The manufacturing interests are developed but slightly, the most important products including flour, lumber, leather, cotton goods, clothing, and sugar. Coarse fabrics and straw braid used in making hats and other straw articles are produced in considerable quantities. Fruits and fish are canned to some extent for transportation. The exports usually exceed the imports. Foreign trade is chiefly with France, Germany, Great Britain, and the United States in the order named.

Most of the interior trade is carried by pack animals, owing to the fact that the highways are not improved and become almost impassable in the rainy season. A good highway is maintained most of the way from Quito to Guayaquil, the chief port. Not more than 265 miles of

railways were in operation in 1900, the principal line extending from Guayaquil inland, but a line from Quito to Guayaquil, about 300 miles in length, was completed in 1905. In 1908 the total lines in operation had a length of about 500 miles. Most of the telegraph and railway lines were built by foreign capital.

**INHABITANTS.** The population is composed largely of a mixture of Negroes, Indians, Spanish Creoles, and Whites. The white inhabitants are in possession of most of the land and manage the business enterprises, while the colored races engage in agriculture and hunting. It may be said that the Indians consist chiefly of two classes, of which the descendants of the Incas are the most numerous and most highly developed in civilized arts. Spanish is the official and spoken language, and Roman Catholic is the state religion, though other faiths are tolerated. Education has made little advancement among the common people, but a number of elementary and secondary schools are maintained. The national university is located at Quito. Quito, the capital, is the largest city and Guayaquil, on the Gulf of Guayaquil, is the chief seaport. Other cities include Cuenca, Riobamba, Latacunga, and Ambato. Population, 1906, 1,450,000.

**GOVERNMENT.** Ecuador is divided into sixteen provinces. The constitution vests the executive authority in the president and a ministry, and the president is elected for a term of four years. The congress consists of two houses, the senate and the house of representatives, the members of which are elected by direct vote, in the former for four years and the latter for three years. All male citizens who have attained to the age of 21 years and are able to read and write are granted the right of suffrage. The Indians were practically in a condition of slavery and were not represented until 1896, when they were admitted to citizenship under certain restrictions. A supreme court of six judges constitutes the highest judiciary. The standing army consists of only 3,500 men and the navy is not materially strong, being made up of a few torpedo boats and transports.

**HISTORY.** The early inhabitants of Ecuador were advanced in many of the arts of civilization, and they had many writings and records that were destroyed when their dominion was overthrown. At the time Pizarro conquered Peru for the Spaniards, Ecuador formed part of the great empire of the Incas. From 1564 until 1718 it existed as an independent presidency under Spain, and in the latter year became a part of the state of New Granada. A



revolution in connection with adjoining countries against Spain secured its independence in 1822, when the Spaniards were defeated in the Battle of Pichincha, and in 1831 it was organized as a separate republic. The present constitution dates from 1906, and since then the country has enjoyed an era of reasonable progress.

**EDDA** (ěd'dá), the name by which two ancient Icelandic works in literature are known. The term means "great-grandmother," and is a fitting appellation of this work, being an interesting forerunner of Scandinavian literature. The "Poetic Edda" was compiled in the 13th century and contains mythical poems, while the "Prose Edda" was written partly about 1230 and was discovered in 1628. The poems of the former praise the deeds of Scandinavian gods and heroes, while the latter treats of northern myths, exemplifies Scaldic poetry, and comments on the achievements of Haco of Norway, who died in 1263.

**EDDYSTONE LIGHTHOUSE** (ěd'di-stōn), a celebrated lighthouse of England, situated in the English Channel, on a group of rocks called Eddystone. Owing to tides covering the rocks daily, it became necessary to guard against shipwrecks at this point of danger. The first lighthouse was completed in 1700, but was destroyed by storm in 1703, and the second was burned in 1755. The third was a massive structure of limestone, with a granite inclosure at the foundation, and of sufficient height to cast a light thirteen miles. Owing to erosions at the foundation rocks by the action of sea waves, a new one was completed in 1882. This structure is the highest yet built at this place. It is equipped with the newer modern appliances and casts a light nearly eighteen miles.

**EDEN** (ě'den), the locality in which the first human family had its residence. In the eastern part of it was a garden, which was watered by a river and from thence the stream parted into four channels, though we have been unable to locate its exact place. Both the early Hebrew and Aryan writers believed that the human race first inhabited the mountains of Central Asia and that Eden was located in that part of the continent. At present it is generally assigned to Babylon and Armenia, with the preponderance of argument in favor of the former. The New Version of the Bible speaks of it as the Garden of Eden, and Milton calls it Paradise in his "Paradise Lost."

**EDENTATA** (ě-děn-tā'tà), or **Toothless Animals**, an order of mammalia established by Cuvier. The ant-eaters and pangolins are the

only edentata that are absolutely destitute of teeth; but, with the single exception of the armadillo, which has one, none of the order have any incisor teeth, and the back teeth are very imperfect, being destitute of enamel and distinct roots. The sloths belong to one tribe of this order and alone subsist on vegetable food. The armadillos, pangolins, and ant-eaters subsist on insects or on animal substances in a decaying state. No fossil forms of the ant-eaters and sloths have been found, but the edentata is represented by the extinct *Megatherium* and other mammals of gigantic size.

**EDGEHILL**, the locality of the first important battle of the Civil War in England. It was fought on Oct. 25, 1642, when King Charles had decided upon attacking London, but was met by 10,000 troops of Roundheads under command of the Earl of Essex. The army of the king numbered about 12,000, taking a stand on Edgehill, and their command rested largely with Prince Rupert. This commander led the right wing of the Royalists and made a gallant charge upon the left wing of the Roundheads, pursuing them for several miles. The Roundheads inflicted a severe loss upon the royal infantry and succeeded in driving the opponents back. Though the Royalists suffered the heavier losses, the battle terminated as an indecisive struggle.

**EDICT OF NANTES.** See **Nantes**.

**EDINBURGH** (ěd'n-bŭr-ŏ), the second city and the capital of Scotland, in the county of Midlothian, 46 miles east of Glasgow. It is located on a series of ridges and is surrounded on all sides by mountains, except the north, where the ground slopes gradually toward the Firth of Forth. The site of the ancient city was on the central ridge running from west to east, which is terminated on the north by a high, rocky cliff now containing the Castle, and on the east by Holyrood House. Castle Hill and Arthur's Seat, the latter 822 feet high, and several other lofty elevations overlook the city. Prince's Street, a fine promenade, divides the city into the two parts known as the Old Town and the New Town. Between the two parts are charming recreation grounds and the National Gallery and the Royal Institution. Cowgate Street and High Street intersect the Old Town and are the principal thoroughfares. Portobello, on the Firth of Forth, is included in the city.

Edinburgh is the seat of the supreme courts of Scotland and has several fine government buildings. Among the noteworthy structures are Saint Giles's Church, a beautiful edifice in the Gothic style; Victoria Hall; Tron Church;



the Bank of Scotland; the Advocates' Library, with 490,000 volumes; the Signet Library, with 70,000 volumes; and a fine public library built by Andrew Carnegie. The Palace of Holyrood, which dates from the 12th century, had its origin in the abbey founded by David I. In the crown room of the Castle, located on Castle Hill, are the crown regalia, known as the *Honours of Scotland*. This building was the scene of many events in the life of Mary, Queen of Scots, and here her son James was born.

The city is noted for its progressive position in the management of public utilities, such as the systems of waterworks, sewerage, and gas and electric lighting. It is well connected by railroads and electric car and telephone lines, and has beautiful parks, boulevards, and paved streets. Among its leading manufactures are beverages, machinery, soap, clothing, paper, fabrics, and earthenware. The public school system is well established. It is supplemented by numerous high schools, academies, and the famous University of Edinburgh (q. v.).

Edinburgh is mentioned as having been the capital of the King of Northumbria early in the 7th century, and was named from King Edwin, a powerful monarch, who absorbed the Lothians and added them to his dominion. Robert Bruce made the city a borough and caused the establishment of a port on the Firth, now called Leith. It became the capital of Scotland in the 15th century, the first wall for its defense being built in 1450. After the defeat at Flodden in 1513, the walls were enlarged to include Cowgate. The English burned the city in 1544, and Queen Mary made it the seat of her short reign in 1561. When Scotland became united with England in 1707, the city was materially affected by the removal of the Scottish nobility, but in 1745 the Pretender made it his seat of action for a brief period. Population, 1907, 345,747.

**EDINBURGH UNIVERSITY**, a noted institution of higher learning in Edinburgh, Scotland. It was founded in 1592 under a charter granted by James VI., though it did not attain its higher sphere of influence until the early part of the 18th century. Originally it had only four regents, besides the principal professor. At present it has a faculty of 125 and maintains four extensive departments, including medicine, law, arts, and divinity, each conferring appropriate degrees on graduation. The government is vested in a body known as the senate, and the officers consist of a chancellor, rector, and principal. It is provided that the acts of the senate are subject to review by a univer-

sity court, the members of which are appointed partly by the town court and partly by the university authorities. The present building of the university was begun in 1789. In its library are 2,500 manuscripts and 220,000 printed volumes, though this is supplemented by several large department libraries. In connection with it are numerous learned societies and museums devoted to natural history, general history, and anatomy. A number of fellowships and scholarships are granted annually. The number attending the different departments aggregates about 3,150. Some of the most eminent English teachers have been professors in this institution, and among its graduates are such prominent men as Scott, Carlyle, Goldsmith, and Darwin.

**EDINBURGH REVIEW**, a periodical established at Edinburgh, Scotland, by Sydney Smith in 1802. In this enterprise he was aided by Francis Jeffrey, Henry Brougham, Francis Horner, and a number of others. This publication was the first of the critical periodicals to be established in the 19th century. It exercised a wide influence in favor of the Whig party, but was relatively more important as a review of and factor in literature. Macaulay and a number of other eminent writers contributed to this periodical.

**EDMONTON** (ě'dmŭn-tŭn), a city of Canada, capital of the province of Alberta, 800 miles northwest of Winnipeg. It is located on the Saskatchewan River and on the Canadian Pacific, the Canadian Northern, and the Grand Trunk railways, and is surrounded by a fertile farming and grazing country. Coal, gold, silver, and platinum are mined in the vicinity. The principal buildings include those of the government, the public library, the city hall, the high school, and a number of substantial churches. The public utilities, including electric lights, waterworks, sewerage, and a gas plant, are well established. It is the center of a vast region which is easily reached by railways, hence is a growing market and has a large retail and wholesale trade in produce and merchandise. Population, 1906, 11,167.

**EDOM** (ě'dŭm), meaning *red*, the name given to Esau on account of the red pottage secured by him from his brother Jacob. The name was also given to the country settled by Esau, having been previously known as Mount Seir. It was about 100 miles long and twenty miles wide and was situated between the Dead Sea and the Gulf of Akabah, an inlet from the Red Sea. Bozrah, now Buseirah, situated in the extreme northern part, was its chief city and the capital. During the reigns of David and



Solomon, Edom was under subjection to the Israelites. Later the Edomites ravaged the southern borders of Palestine, and were denounced with considerable vehemence by some of the prophets of Israel. After the destruction of Jerusalem, in 70 A. D., the name of Edom or Idumæa disappeared from geography.

**EDUCATION** (ĕd-ŭ-kā'shŭn), a word derived from the Latin *educare*, meaning to lead forth. In a philosophical sense education is the natural inheritance of every individual, since he is impressed and developed for good or evil by all with which he comes in contact, everything he sees, feels, hears, and does influencing action and forming tendencies. According to this view, education begins with parental influence and terminates only when life ceases. The more common application of the term involves the efforts premeditated by parents and teachers to induce exercise of the powers of the learned in such a way as to become the most possible in physical strength, intellectual power, and moral goodness. To accomplish this high ideal, those instructing need to know the laws under which human development makes the most efficient progress; they must understand the possibilities of the student, and also be capable to administer precepts and examples to good purpose, in the process encouraging what is good to the individual and discouraging the tendencies that may result in harm.

**FUNDAMENTALS.** In a rational system of education it is necessary to enrich the life of every member of society with the fundamental elements and basic principles that underlie true development. This should be done for the universal good, and to the fullest extent of the personal capacity of each individual. In addition to the general culture that ought to be secured to all, there should be more or less technical training to fit for the calling in life by which the learner desires or is likely to support himself. Such an education necessitates a well-organized system of elementary schools at which all may be trained, secondary schools for a smaller number, and colleges and universities for those expecting to assume higher responsibilities or enter the learned professions.

However, education is not creative in its nature. Its aim is to attain the fullest development and highest right activity of the faculties of the body, mind, and soul. To accomplish this it is necessary to cultivate by right activity all the pliant, plastic innate powers by means of a continuous culture well adapted to individual needs. The culture must aim at harmonious training of all the faculties, having for its object the development of existing possibilities

into realities. It must take account of every need in order that the highest possible form of learning, development, and efficiency may result.

**THREEFOLD AIM.** The true aim in education is threefold and deals with the physical, intellectual, and moral. *Physical culture* should train the body that it may be strong, healthy, vigorous, graceful, skillful, and responsively active to the will. *Intellectual training* should engage the mind with and develop the love for knowledge, qualify for the independent acquisition of knowledge, and prepare for regular practice in the use of knowledge. *Moral culture* should strengthen the conscience and will by the formation of habit in carrying out pure feeling and good thought, to secure ready obedience to law as the embodiment of right, induce a consciousness of individual power and responsibility, and implant self-faith as the result of faith in a divine Providence.

**EDUCATIONAL SYSTEMS.** The systems of schools for the general dissemination of education have been and still are greatly diversified in courses of study, and the scope of education itself has shown marked differences in all ages and civilizations. All the countries that take some rank in educational arts maintain at least a portion of the general system that should be fostered in all highly civilized states. A complete system of the schools involves the establishment of many institutions with diversified courses of study, each aiming to cover its portion of a general system, and articulating in a well-connected way with others.

Among the schools recognized by the leading nations are: 1. *Kindergartens*, schools in which the young are trained to develop right activity of the body, though some attention is usually given to elementary growth in intellect. In communities not recognizing this class of schools essential in the process of education, the elementary work is done largely in the homes by mothers or private teachers. 2. *Common schools*, institutions designed for teaching the rudimentary branches, with courses of study so graded as to prepare the pupil for the various higher institutions. 3. *Schools of agriculture*, comprising courses in gardening, botany, horticulture, geology, vegetable chemistry, zoölogy, pomology, and surveying. 4. *Industrial schools*, including the teaching of industrial labors and work and the arts of trade. 5. *Schools of fine art*, those designed for educating artists in the various fine arts, such as sculpture, painting, music, poetry, and architecture in its character as art. 6. *Schools of technology*, institutions designed to teach civil, electrical, and military



engineering, geology and mining engineering, photography, engraving, building, navigation, telegraphy, and astronomy. 7. *High schools*, institutions having courses of study covering higher branches of learning than the common schools, and designed to prepare pupils for institutions in which they may secure such training as will best fit them for their vocation in life, among them those named below. 8. *Schools of business*, in which students are trained in all classes of business, such as banking, commerce, manufacturing, and office work. 9. *Law schools*, institutions for the education of lawyers. 10. *Normal schools*, the institutions established exclusively for the education of teachers. 11. *Schools of medicine*, those containing courses and facilities for the education of surgeons and doctors of medicine. 12. *Colleges*, institutions where the highest branches of knowledge and science are to be taught, and having courses designed to prepare a corps of men devoted exclusively to culture and science. 13. *Universities*, the highest institutions of learning, in which the most extended courses of study are offered to men and women who aspire to the more learned attainments in the arts and sciences, and to fit them for the greatest activity and highest good in the professions of law, medicine, ministry, and teaching, and for philosophical work. In each class the highest development of the moral faculty is to be made an objective point, which is the case in all the schools of the most progressive nations. The higher lines of education, above the basic, have been designated as moral, political, aesthetic, philosophical, and religious.

**HISTORY.** The history of education is concerned, more or less, with every epoch from which any record has passed down to us. Few studies are of deeper interest than the one that traces the systems under which man's influence upon nature was enlarged through the successive centuries, and by means of which he attained his present high development. Whether man in the beginning occupied a higher or lower status than at present has been a subject of controversy from remote times, though, so far as profane history is concerned, it is evident that he has been enabled to attain greater power and influence through the impulse of educational arts. Sacred history represents the first parents created in the image of God, and accords them efficiency to reason and converse with each other. Cain was not only a tiller of the soil, but is represented as a builder of a city which he named Enoch, after his firstborn son. In the seventh generation from Adam, and while that patriarch still lived, it is re-

corded that Tubal-Cain "was an instructor of every artificer in brass and iron," and that his half-brother, Jubal, "was the father of all such as handle the harp and the organ."

While it is impossible to determine the exact status of antediluvian education, it is evident that in the twilight ages man advanced materially in civilized arts. The invention of the organ and the harp, and the skill of artificers in brass and iron, imply that many others and related discoveries and inventions had been made. However, advancement in education dates from and is measured largely by the art of writing, this art being considered the prime meridian from which to measure. Committing thought to writing made it possible to pass funds of knowledge from generation to generation with much better results than by story and tradition. Besides, all succeeding generations were enabled to ponder the achievements of preceding ages, as well as profit by the failures and successes of the generation that preceded them. The writings were not necessarily made up of such characters as are used exclusively by the Caucasians at present, but included various forms of hieroglyphics and symbolical characters on monuments, stones, and architectural structures.

*Oriental Nations.* Among the early civilizations and antiquities the Chaldean, Babylonian, and Assyrian take high rank, and much knowledge of their skill and progress has come to us through various sources by means of monumental writings and architectural ruins, most of which are given us by the Greek historian, Herodotus, and the German, Max Müller. The rise of the Chaldean civilization dates from Nimrod, about 2300 B. C., when Babylonia was founded. These ancient peoples erected great cities, collected vast libraries, founded schools, and disseminated knowledge and learning for many centuries. Passing from their settlement on the Tigris and Euphrates to Egypt, we find a high state of civilization and a wide range of culture that had their beginning more than 4,000 years ago. In their city of Alexandria was a great university, which taught a system of geometry perfected by Euclid, and in accord with which and other productions the Egyptian intellect towered and expanded, attaining a foothold almost as durable as their gigantic pyramids and the time-enduring sphinx. Their system of education, like that of India, was largely characterized by the baneful influence of castes, resulting in classes who towered as educational giants on the one hand, and descended to the status of intellectual pigmies on the other.



In scrutinizing human history it is remarkable that practically every portion of value in education comes generally from the Caucasian race, the Mongolian being the only other race that presents any original theories and primitive acquirements of material knowledge. The educational system of China dates from Confucius, who lived about 500 years before Christ, and ever since his teachings have had a marked influence upon the Chinese and some effect among the Japanese, though Brahmanism and Buddhism have had more or less influence upon the education of both peoples. China still adheres closely to the educational theories and practices of the ancients, neglecting the education of women, but grading promotion in state affairs entirely upon educational merit, while Japan is breaking away from the old with remarkable rapidity and inaugurating schools and courses of study maintained in the systems of modern states. The latter people are distinguished by greater energy and independence of character than the Chinese, and are willing to inaugurate the newer and better, even if many traditional and time-tested institutions must be set aside.

*Ancient Classical Nations.* From Western Asia and Northern Africa education moved westward to Greece, and eventually from Greece to Rome. According to the writings of Homer, it is certain that the early education of Greece was patriarchal. Later four divisions arose, of which the Dorians and Ionians are the most noteworthy. The seat of influence of the former was at Sparta, and their higher education was largely the outgrowth of the codified laws of Lycurgus, though the teaching of Pythagoras influenced the whole of Greece by its strictness and aristocratic tendencies. Solon codified the laws of the Ionians. Their center of influence was at Athens. Socrates, Plato, and Aristotle are the great teachers of Greece, and rank highest in power and influence.

Numa Pompilius founded Roman education, though Greek culture was introduced in its entirety about 250 B. C. The great orator, Cicero, gave perfection to Roman rhetoric, while Seneca and Quintilian rank as the greatest educational writers. Greek education aimed to develop especially the beautiful and good. The Greeks as well as the Romans maintained a highly educated priesthood, though education was extended to all save the slaves and extremely poor. The young were trained early in life. Physical and intellectual strength were objective in all, while their religious culture consisted of the worship of representative gods, such as we read of in mythology. These were sacredly represented in statuary, temples were

built to their honor, and the young were admonished to do them reverence.

*Early Christian Era.* The influence exercised by the teachings of Christ is the most marked and contains the essential and basic principles of education. They oppose all external distinction among men, recognize the equality of women, and make capability the only limit of man's development. By their precepts man is taught to become perfect, and live, grow, be active, avoid stagnation, and seek progress and expansion. Its injunctions require activity, according to the talents possessed. Those who have the greater capabilities are presumed to accomplish the most and serve the higher and more useful purposes in society. Upon these principles of teaching every true system of modern education is based. They sustained the severest criticisms of the Middle Ages, were embraced by the early educators of modern times, and permeate the writings of the great master teachers.

*Education in Europe.* The Reformation (q. v.) is the beginning of the great epoch of modern education in Europe. Promoted by Luther, Melancthon, and Wycliffe, it taught the doctrine of justification by faith alone and the necessity of reading the Bible. This caused the Scriptures to be translated into the modern tongues and gave rise to schools which taught the people to read and write. Ultimately it made possible the great universities, such as those at Oxford, Cambridge, Edinburgh, Berlin, Paris, and Vienna. Among the teachers and writers who influenced educational thought in Europe are Bacon, Comenius, Locke, Francke, Rousseau, Kant, Fichte, Richter, Hegel, Rosenkranz, Herbart, Beneke, Pestalozzi, Froebel, and Spencer. Germany has been rightly named the *land of pedagogy*, and the influence of its great teachers has been felt in every civilized country. Its institutions have long had the highest reputation on account of their excellence for training teachers and inducing education, from the kindergarten system to the colleges and universities.

The education of modern Europe is largely statal, attendance is free and compulsory, and the courses of study cover, not only branches of classic learning, but disseminate knowledge and skill in the arts of industry. The primary schools have been given over entirely to women teachers, while grammar grades, higher instruction, and supervision are limited almost exclusively to men. Institutions and associations of teachers are maintained and exercise influences similar to those in America, while periodicals and books devoted to pedagogy are read extensively. The newer statistics place Sweden



in the highest rank among the nations of the world on account of its common school education, illiteracy there being limited to the lowest per cent. It is impossible to speak of all the many excellent qualities of European schools in this article, and it may be sufficient to say that all the progressive nations of Europe, and, for that matter, of the world, are giving closer attention to the building of schools and the education of the young for the state and for life than in any other period of history.

*Education in America.* Education has been a profound study in America, though the United States and Canada represent its greatest development and most marked influence. The representative form of government makes it necessary to educate universally, else our civil institutions must fail. The dangers of universal suffrage can be overcome only by universal education. In recognition of this fact legislation along educational lines was early directed to the building of schools and the founding of colleges. Massachusetts led the way in 1632 by requiring all children to be taught to read and write. Later, when the United States was established as an independent government, Congress set aside lands to aid schools, and in the newer states and territories sections sixteen and thirty-six of each township were reserved for that purpose. Normal training schools for teachers are maintained in nearly all the states by public taxation, at which admission is free, and through whose influence a strong profession of teaching is developing. The Commissioner of Education is an important officer of the Federal government, whose influence for good by means of treatises, lectures, and published reports is widening constantly in the entire nation.

The states maintain either State commissioners or superintendents of public instruction, while county superintendents and, in some states, commissioners, have local supervision. Teachers are called to convene in conventions and institutes by proper authorities, and are certificated to teach either by local officials, county superintendents, or State boards of examiners. In most of the states school attendance is nominally compulsory and in all it is free of tuition. Some states maintain free schools devoted to the industries and higher learning, though many of such institutions are aided by the Federal government. Public schools are open and alike free to both sexes, but in a number of Southern States separate schools are maintained for the education of Negro children. Besides the public schools and higher institutions, there are many denominational and pri-

ate schools, colleges, and universities. Collectively they represent an immense capital and wield a marked influence for good. In states which have compulsory laws, attendance at private schools, which have courses similar to the public institutions, is considered to be in compliance with law. Among the most prominent educators that have exercised a large influence in shaping educational theories we may name Kant, Richter, Hegel, Asa Gray, Herbert Spencer, Herbart, Rousseau, Froebel, Pestalozzi, Horace Mann, Aristotle, Socrates, Plato, Fichte, Rosenkranz, Haeckel, Max Müller, Locke, and Jonathan Edwards, all of whom are treated in special articles. To this list may be added the following American educators of recent date: G. Stanley Hall, W. T. Harris, David Starr Jordan, William R. Harper, Herman Eduard von Holst, Andrew Dickson White, George Payn Quackenbos, Joseph Baldwin, C. W. Eliot, Francis Wayland, W. M. Beardshear, Samuel Eliot, etc.

**EDUCATION, Commissioner of,** the title of the chief officer of education in some states and countries. The term is applied interchangeably with that of superintendent, though in some states and provinces it is recognized as the exclusive title. It is the duty of a commissioner of education to supervise the general management of schools and public institutions, and to publish recommendations and biennial reports upon the methods of teaching and the management of educational system. In Canada various names are used in speaking of officials who have charge of educational work, such as minister of education, in Toronto; superintendent of education, in Nova Scotia; and commissioner of education, in Saskatchewan.

The Commissioner of Education of the United States is the chief officer of the national Bureau of Education. He is appointed by the President with the consent of the Senate. The duties are to collect educational statistics, diffuse information regarding the organization and management of schools and school systems, to promote the cause of education, and to present annually to Congress a report embodying the result of his investigations and labors. The office was established in 1867 with Henry Barnard as the first commissioner.

**EDUCATION, Compulsory,** the term applied to the system of education in which attendance is required by the state for some fixed period. Nations have long recognized the importance of training youth for citizenship, hence attendance upon some schools has been compulsory, though in most cases the parent may select the particular school at which the child



is to attend, that is, the parent may choose to enroll the pupil in a public school or in a private institution where work of the same kind is done in certain branches. The law varies in fixing the compulsory period, usually beginning with the ages of five to seven years and extending to the ages of fourteen to sixteen years. In a majority of countries the compulsory period is eight years.

Since the state requires all of its citizens to pay taxes toward the support of the schools, it is held reasonable that the citizen should expect all children to get the advantages of an education. Since the safety of society is dependent upon morality and intelligence, it is quite essential to the state that no one should grow up without receiving proper training for the responsibilities of citizenship. Compulsory attendance laws were in force among the ancient, especially in Sparta and Athens, where training in military affairs and other branches was required. Germany has had a compulsory attendance law for many years, and similar laws are on the statute books of Great Britain, Sweden, Denmark, Switzerland, and France. In the United States and Canada they are enacted by the State or Province, since these countries do not retain supervision over the public schools, but instead delegated this part of the government to the individual states and provinces. Truant officers are provided for by the laws, and such officers are usually appointed by the local boards of education. It is their duty to see that the attendance law is enforced, and parents are subject to a fine where the child is not in attendance in compliance with the law, though they cannot be punished without due trial. The employment of very young children in mines and factories has made it quite necessary that these laws be enforced.

**EDUCATIONAL ASSOCIATION**, a society of teachers and educators to study methods and promote educational work. Many forms of societies of this kind are maintained. Local organizations are usually made up of the teachers and educators in a particular city or in a county, and these are tributary to the educational association of the State or Province. Societies organized within a city or county usually meet several times each year, while those of a State or Province hold meetings annually, and in these the work is assigned to different departments, such as that of elementary schools, high schools, and institutions of higher learning. In many states teachers are required to attend the meetings, and are paid for their attendance the same as if they were teaching in the schools.

The National Educational Association of the United States was incorporated in the District of Columbia in 1896, when it succeeded the National Teachers' Association, which was organized at Philadelphia, Pa., in 1857. This association meets annually in different parts of the country, and at these meetings prominent educators read papers or lecture upon topics of interest to teachers in the management of schools or the supervision of school systems. A complete report of the proceedings, including the principal papers and lectures, are published for the benefit of the members. This association has had a marked influence upon public instruction, especially by its celebrated report of the Committee of Ten in regard to secondary schools. It consists of seventeen departments and the National Council, the latter being a board which exercises general advisory power. The largest meeting of the association was held at Boston, Mass., in 1903, when 34,983 members were registered.

**EEL**, the name of a class of serpent-shaped fishes found in nearly all rivers and seas of the warmer zones. About fifty species have been described, differing somewhat in form, but all are covered by a soft, thick, slimy skin, some having minute cycloid scales. The gill orifices are very small and are situated far back, by reason of which they can remain out of water a long time. Some species frequent the land by night in search of food. Eels prefer to live in the mud, and in cold weather bury themselves in the muddy bottom or migrate to warm and sluggish waters. They are very sensitive to cold and not found in latitudes beyond 64° 30' north or south of the Equator. They are particularly abundant near the deltas and estuaries of rivers, where the adults spawn, and in the spring immense numbers of young eels pass up streams and canals, overcoming many obstacles in their progress. They are excellent and nutritious food. The *electric eel* found in the marshy waters of the llanos in South America attains the length of four or five feet and discharges a perceptible current of electricity when it is touched.

**EGG**, the cell or ovum and its accompanying products which are extruded from the ovary of females of various animals, containing the germ, origin, or first principle of life. It consists essentially of a single cell of protoplasm, in which rests the potentiality of life of an individual corresponding to the parent stock, but rarely two or more such cells are contained in the egg, when the life product is a deformity or results in more than one offspring. Repro-



duction in all animals is by eggs, except in the Protozoa, but in some animals the egg is incubated within the body and the new life is brought forth in a more or less immature state. Young produced in this way are said to be *born*, while those developed from eggs outside of the body are said to result from hatching or incubating.

In general the term *egg* is used only in connection with animals that do not produce their young alive, in other words, the oviparous animals. The most common oviparous animals include birds, reptiles, fishes, insects, and worms. Eggs usually contain, besides the germ, substances which serve for nourishment of the new life. In animals below the birds, the egg has only three parts, the germ, the germinal vesicle, and the yolk. In the egg of birds, besides these, are a calcareous shell, a tough skin, and a considerable amount of white or albumen. When the young animal is developing, it is nourished first by the albumen and then by the yolk, both of which are consumed before it comes out of the shell.

The eggs of birds and fowls are usually oval, but a few are nearly round. In one end of the egg, between the skin and the albumen, is an air cavity which is thought to facilitate the breathing in the early stages of the new life. The outer covering of the eggs of reptiles and lizards consists of a parchmentlike membrane, while in cartilaginous fishes, such as sharks and rays, the egg is inclosed in a four-sided horny case, with tendrils projecting by which it is moored to floating seaweeds. These, after the escape of the young fish, are washed upon the shores, where they are familiarly known as *mermaid's purses*. Eggs of animals now extinct have been found in Madagascar three feet in circumference, but the ostrich lays the largest egg of any animal now living.

The eggs of birds and fowls are hatched by being kept at a temperature of about 104° Fahr. for a period of from two to four weeks. Crocodiles, alligators, and turtles bury their eggs in the sand, where they are incubated by the heat of the sun or by the warmth of decaying vegetation. Eggs of the turtle are in repute as an article of food and luxury, and those of gulls, guillemots, and wild ducks are much sought by the inhabitants of the Orkney and Shetland islands, as well as Iceland and other northern regions. On the coast of Labrador an extensive business has developed by the eggers, who collect the eggs of sea birds and carry them to the markets of Canada and the United States. Tremendous precipices are braved by men, whom their companions let down

by means of ropes to gather the eggs from ledges.

Birds differ greatly in the number of eggs which they lay for a *set* or *clutch*, but in this respect the individuals of the same species are quite uniform. The larger birds of prey and many waterfowl lay only one egg in the year, while others, as the hen, produce a large number. Field and woodland birds, as the robin and crow, usually lay from five to seven, while the titmouse ordinarily deposits about ten. In some instances the color is quite similar to that of the nests, but it includes white, brown, greenish, and variously spotted species. The egg of the hen is the most important as a commercial product. It consists of 73.7 parts water, 13.4 parts protein, and 10.5 parts fat. Other eggs sold on the market are those of the duck, turkey, goose, and guinea. Besides being valuable as food, eggs are used for purifying liquids and the albumen is useful in preparing photographic paper. See **Evolution; Nest; Poultry.**

**EGGPLANT** (ĕg'plănt), a plant of the nightshade family, so named because the fruit resembles an egg in shape. It is native to the tropics, but may be grown in the northern portion of the United States and the southern part of Canada, when planted in a hotbed. About a dozen species are cultivated for the fruit, which is cooked in a variety of ways as a table vegetable. The species that yield a purple colored fruit is the best for general use, such as the New York purple and the black Pekin. The plant grows to a height of about two feet, has prickly leaves, and flowers of a violet color. The fruit varies from the size of a hen's egg to specimens from six to eight inches in diameter, depending upon the season and the richness of the soil.

**EGOISM** (ĕ'gō-iz'm), the doctrine of a class of philosophers, according to which a person can be certain of nothing but his own existence, and that of the operations and ideas of his own mind. As affecting mental sensations, egoists involuntarily regard the body as ego, that is, the being itself; but, so far as cognition is concerned, the body is regarded objective, or non-ego. Egoism, in an ethical sense, is now used as an antonym to altruism (q. v.).

**EGRET** (ĕ'grĕt), the name of several species of heron, especially those that have a well-developed crest during the breeding season, and whose back is adorned with long, loose flowing plumes. The American egret is about 37 inches long, measured from the tip of the beak to the end of the tail, and the extent of the wings is 55 inches. The snowy egret, native to the



region bordering on the Gulf of Mexico, is a beautiful bird. It is hunted for the sake of the plumes during the breeding season, hence is becoming rapidly exterminated. The reddish egret is remarkable in that some birds of the



SNOWY EGRET. LITTLE EGRET.

same species are nearly white while others have a bluish-slate color, and it appears that the differences in color are not dependent upon sex, age, or season. Several species are native to Europe and Asia, including the European and the white heron.

**EGYPT** (ē'jīpt), a country of Africa, situated between the Red Sea and the Libyan Desert, and extending from the Mediterranean Sea to the Nubian Desert. It is bounded on the north by the Mediterranean Sea, on the east by Syria and the Red Sea, on the south by a line drawn from the Red Sea to a point about 200 miles west of Wadi Halfa, and on the west by a line drawn from about 200 miles west of Wadi Halfa to the southeastern point of Tripoli, and thence north to the Mediterranean. The southern boundary coincides nearly with the latitude of 22° north. It includes the eastern third of the Libyan Desert. The extent from east to west is about 500 miles and the length north and south is 670 miles. The area of Egypt proper is 394,240 square miles.

**DESCRIPTION.** Most of the surface consists of a sandy desert, the cultivated portion being confined to the country more or less affected by the annual inundations of the Nile and the coast plains along the Mediterranean. This fertile

region includes only about 10,000 square miles, and contains almost the entire population of the country. The Nile flows through it from south to north, though it has no tributaries within Egypt, owing to the arid condition of the country. West of the Nile are the barren wastes of the Libyan Desert, much of which is elevated only a few hundred feet above the sea, while many small localities are below it and derive their water by infiltration from the Nile. In the eastern part is a region of mountains, extending from Assuan and Berenice in the south to Cairo and Suez in the north. The mountains cover a district about 150 miles wide and are highest near the Red Sea, where their summits approximate 7,000 feet. The country south of Assuan is made up largely of sand plains and desert hills, which form the northern part of the Nubian Desert.

The course of the Nile through Egypt is about 800 miles. A short distance south of Assuan is the First Cataract, the only one in Egypt, where a great dam is maintained to regulate the supply of water for irrigating purposes. The annual overflow of the Nile has a tendency to fertilize the soil and render it exceedingly productive. Usually the overflow begins the middle of July and is occasioned by excessive falls of rain in the mountains and lake region near the Equator. The irrigated land begins to dry in October and the crops are sown in November, maturing in March, when they are harvested. Southwest of Cairo is a fertile tract, the depressed valley of Fayum, and near its northern extremity is the lake of Birket-el-Kerun. Many of the localities adjacent to the Nile and some of its banks are characterized by masses of rock and broken cliffs. Extensive forests are entirely unknown in the upper valley, but small clusters of trees are found in some localities.

The atmosphere is dry and the sky is clear most of the year. At Cairo the rainfall is less than two inches per year, while at Alexandria, on the coast, it is about eight inches. Near the sea the temperature rarely reaches the freezing point, but the thermometer sometimes registers 114°. In April and May a large part of the country is visited by the khamsin winds, which cause a rapid rise of the temperature and fill the air with dust and sand. The sycamore is the prevailing tree and is rivaled only by the date palm. Many species of trees have been introduced and are cultivated in the regions where moisture is sufficient. The lotus and the durra, the almost extinct papyrus, are Egyptian plants. Fish are abundant in the Nile and off the coasts, and birds and insects are numerous.



The fox, jackal, wild ass, leopard, lion, and striped hyena are among the wild animals.

**AGRICULTURE.** About two-thirds of the people are engaged in agricultural pursuits. Three crops are grown annually in the districts that are well irrigated, this being possible on account of the large amount of organic matter deposited by the waters of the Nile. Clover, wheat, barley, and vegetables grow best from

attention is given to the rearing of sheep, cattle, and camels. Swine are raised by the Copts, and horses and mules are quite common in the cities.

**MINING.** Egypt is not rich in mineral wealth, though it is possible that deposits exist which have not been discovered. Gold mines were worked anciently in the rugged mountains of eastern Egypt and some of them have been rediscovered. Salt is obtained in the salt marshes of the Nile Delta and considerable saltpeter is manufactured. Vast deposits of limestone, granite, and sandstone were worked in ancient times, but comparatively little is done in this line at present. The material used in the construction of the great pyramids and many temples was obtained from the granite deposits near Syene, where the supply is inexhaustible.

**TRANSPORTATION AND COMMERCE.** Alexandria is the chief seat of foreign commerce, being favored by its location on the Mediterranean and a number of important railways. A large trade is carried on at Cairo and other points on the Nile and the Suez Canal. Inland trade is chiefly by caravans, by railways, and by transportation on the Nile, which is navigable the entire distance in Egypt. Many of the highways have been improved and are being maintained by local taxes. The country has 2,500 miles of railways, most of which are owned by the government. The Cape-to-Cairo Railroad is the most important line and will furnish transportation facilities to Cape Town. Telephones are utilized in the cities and many rural districts, and all of the principal trade centers have telegraph communications. Great Britain has the largest share of foreign trade, and next in order are Turkey, France, Germany, Austria, Italy, and the United States.

The weaving of fez and linen is an ancient industry, but modern customs in dress have caused it to decline. Sugar is manufactured quite extensively by the employment of foreign capital, and Egypt is an exporter of that product. Other manufactures include cotton and woolen goods, cigarettes, clothing, utensils and machinery of different kinds. Cotton, cotton seed, meat, hides, and fruit are the chief exports, while coal, wood, textiles, and metal products are imported.

**GOVERNMENT.** The government is a form of monarchy, tributary to Turkey, and the chief executive is the Khedive or Governor General. He is assisted by six ministers in the administration of government, those of justice, interior, finance, war, foreign affairs, and public works and public instruction. France formerly



December to March; sugar cane, rice, cotton, millet, and fruit thrive from April to July. The Nile Delta is the richest region and produces most abundantly. Among the tropical fruits are the orange, lemon, and fig, and the grape, pomegranate, apple, plum, and quince thrive in nearly all parts where moisture is sufficient. Raw silk is produced to some extent and tobacco can be grown profitably, but its cultivation is not permitted. The live stock industry is on a profitable basis, and especial



exercised the greatest influence politically, but since the rebellion of Arabi Pasha the predominant influence has passed to England and the public defenses are under the control of that country. Local conditions are such that internal improvements have been going forward and trade relations have been enlarged materially within the last two years. The legislative power is vested jointly in the legislative council and the general assembly. Local government is administered by six governorships and fourteen provinces.

**INHABITANTS.** Native Egyptians comprise the greater part of the inhabitants, but a majority of these are known as fellahs, who comprise the lower class. The people in the smaller towns are wholly Egyptians, while the larger cities contain many foreigners. Among the foreign inhabitants are the Arabs, Greeks, Italians, British, French, Germans, and Persians. Nearly all of the Mohammedans are of the Sunnite faith, constituting about 92 per cent. of the entire population. Next in order of number are the Christians, chiefly Copts, and Jews. Cairo, the capital, is located on the Nile in lower Egypt. Alexandria is on the Mediterranean and Port Said is the chief town on the Suez Canal. Other cities include Rosetta, Damietta, Suez, Tanta, Assiut, Gizeh, and Mansourah. The total population of Egypt is 10,134,405, which includes 112,810 foreigners.

**LANGUAGE AND LITERATURE.** Comparatively little is known in regard to the origin of the language spoken by the ancient Egyptians. It showed some affinity to the Semitic languages, but as a whole was quite distinct in its general construction. The history of the language is divided usually into four periods, including those in which prevailed the four systems of writing known as the hieroglyphic, hieratic, demotic, and Coptic. It is not known when the *hieroglyphic* system of writing originated, but there is an abundance of evidence that it prevailed extensively as early as 3000 B. C. The *hieratic* writings are those of the priests or sacerdotal class, while the *demotic*, a popular form of hieratic writing, came into literary use about the 7th century B. C. Greek letters were used frequently to write demotic words and later Semitic forms came to be added, thus giving rise to the *Coptic* language, the latest form of the Egyptian. At present it is employed only in the liturgy of the Coptic Church, and in its stead the Arabic is now in common use.

Though the Egyptian language underwent marked changes, there is a notable similarity in the literature of the different periods. In the epoch of history included in the reign of

the Rameses inventive genius was especially encouraged, particularly such talent as led to the production of novels and works of amusement. However, by far the most important writings are of a historical character, especially in the time of the Ptolemies, when the lore of the East was energized by western scholars, particularly by the Greeks. The works in religion are numerous, especially in the Coptic period, when church rituals, homilies, and other Christian literature were introduced.

Among the Egyptian writings is an interesting work entitled "Book of the Dead," a copy of which was found in a tomb of a queen of the 11th dynasty, which is thought to date from about 3000 B. C. It contains an account of the adventures of the soul after death, and gives directions by which it is possible to reach the hall of Osiris. The writings on astrology, moral philosophy, agriculture, medicine, physics, economics, ethics, mathematics, and poetry are numerous. A work on geometry, entitled "The



ANCIENT STATUE.

Principle of Arriving at the Knowledge of Quantities," dates from about 1100 B. C. Euclid, the Greek mathematician, who flourished at Alexandria about 300 B. C., gave impetus to mathematical research and wrote his "Elements of Geometry," a work still recognized as authoritative. "The Romance of Setna," written about the 3d century B. C., and "The Tale of Two Brothers," probably written about the time of the exodus, are two works in story form. Many writings are in the form of epistolary letters and epic poetry. In the "Epic of Pentaur" are described the events connected with the war conducted by Rameses II. against the Kheta.

**HISTORY.** No country contains greater wonders of remote antiquity than Egypt. The Sphinx and pyramids are remarkable for their great size and wonderful endurance through the centuries. When Napoleon and his legions reached the vicinity of these relics, he was led to exclaim, "Soldiers, forty centuries look down upon you." The catacombs and labyrinth of Upper Egypt are likewise remarkable curiosities. The labyrinth is partly under ground, cut out of marble, and originally consisted of twelve palaces and 3,000 chambers. Anciently the



Egyptians possessed a wonderful civilization, and built vast palaces, monuments, and canals. They were superior as scholars and statesmen. On many of the ancient ruins are forms of hieroglyphic writings from which we have learned much of their system of mathematics, astronomy, architecture, and religion, and of their utensils, machinery, costumes, and implements of war. Their commerce was among the most extensive of the ancient world, and their civil institutions ranked with the best. Modern Egypt is but the shadow, the ruins, of a once powerful civilization.

Egypt has a history extending back, according to different writers, to the year 3892 B. C., though some writers of profane history place its beginning about the year 5004 B. C. The priest Manetho arranged and published, in 250 B. C., a list of thirty Egyptian dynasties, and this record is still considered the best extant. In the reign of the fourth dynasty the great pyramids were built, the largest by the three kings, Cheops, Chephren, and Mykerinos—according to Lepsius, the German philologist and Egyptologist, within about the period of 2800-2700 B. C. The Pharaohs ruled the country until the Egyptians were conquered in 520 B. C. by Cambyses, King of Persia. It is thought Ramesses II. was the Pharaoh who oppressed the Israelites, and that the exodus occurred in the time of his successor, Merneptah. The country was subject to Persia until Darius was vanquished by Alexander the Great, which occurred in 322 B. C.

After Alexander's time Egypt passed to the Ptolemies, becoming under them and Greek influence one of the most progressive kingdoms. The Ptolemies controlled it nearly 300 years, after which it was made a Roman province and was held by them about 650 years. In 337 A. D. it became a part of the Eastern Empire, but the Romans were finally expelled by the Saracens under Caliph Omar in 640 A. D. The last dynasty of the Saracens was overthrown by the Mamelukes in 1250, who held the supreme power more than two centuries, but they were subjugated by the Turks in 1517 under Selim I., the Ottoman Sultan.

Napoleon I. conquered Egypt for France in 1798, though his army was driven out by the British and the country returned to Turkish rule in 1801. Mohammed Ali became pasha in 1805, after completely vanquishing the Mameluke chiefs, and introduced the elements of European civilization. He was succeeded by Said Pasha, during whose reign the French engineer, M. de Lesseps, commenced the Suez Canal, which was opened in 1869. Within re-

cent years both the French and the English have sought to enlarge their influence in Egypt. The latter under General Kitchener defeated the dervishes in the Battle of Omdurman in 1898, while Fashoda was occupied by the French, on account of which complications arose between the two nations, but all differences were settled by arbitration on Jan. 9, 1899. The terms of the treaty place a portion of the Egyptian Sudan district under the English and a portion under the French authority. In 1907 the country had a financial crisis, but it was overcome the following year, and since then the industrial conditions have improved greatly.

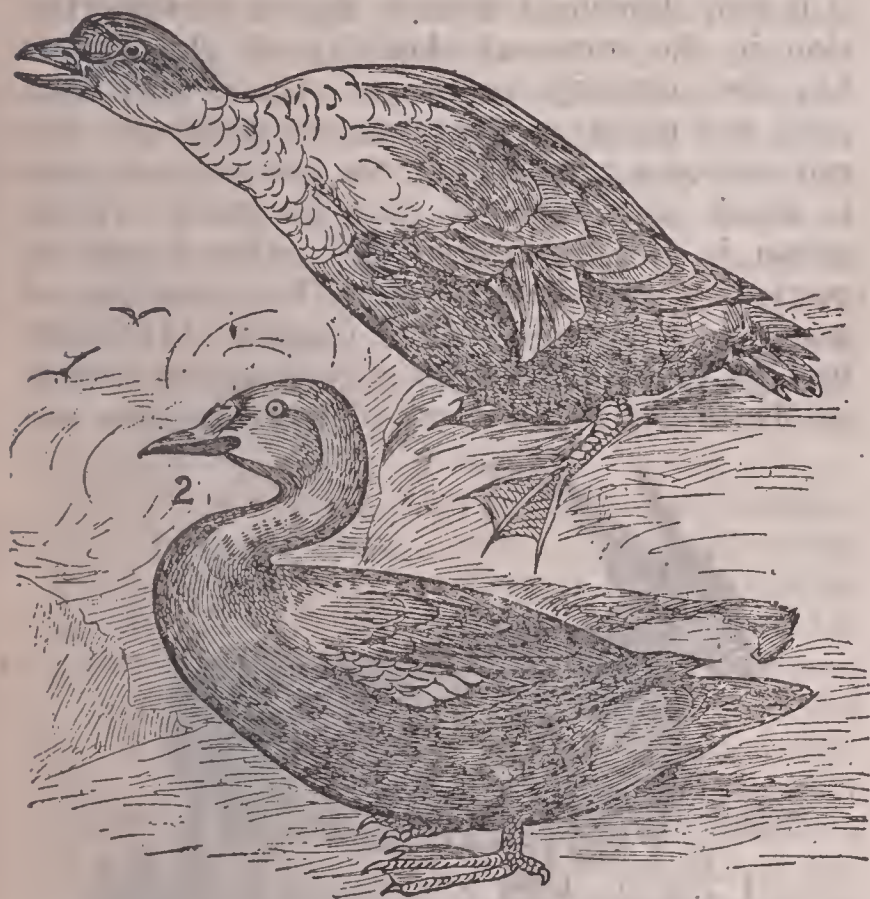
**EGYPTOLOGY** (ē-jīp-tōl'ō-jy), the study of Egyptian antiquities. The object of this branch of learning is to investigate the early life, language, customs, and achievements of the people of ancient Egypt. The study was induced largely by the discovery of the famous Rosetta stone by M. Boussard, a captain of Napoleon's army, in 1799. This stone contains a proclamation written in hieroglyphics, and is the key by which many of the inscriptions on Egyptian monuments may be deciphered ultimately. In 1883 a society was formed to explore the ancient temples and tombs, its object being to make historical investigations for the purpose of endeavoring to ascertain the history of the sojourn and exodus of the Israelites. The society has been able to enrich many of the museums of Europe and America with valuable specimens, and several works have been published in which descriptions and maps are given of many important ruins and relics found in the valley of the Nile between Assuan and Cairo.

**EHRENBREITSTEIN** (ā-rēn-brīt'stīn), a town and important fortress of Rhenish Prussia, Germany, situated opposite the confluence of the Moselle with the Rhine, and connected with Coblenz by a railroad viaduct and a pontoon bridge. It is built on a precipitous rock 387 feet above the river and is inaccessible from three sides. The fortifications were begun in the latter part of the 17th century, but were destroyed by the French. They were rebuilt in 1816-26 at a cost of \$6,000,000. The fortress has ample accommodation for 14,000 men and capacity for storing provisions sufficient to maintain an army of 60,000 for a year. The town is unimportant and has a population of 6,500.

**EIDER DUCK** (ī'dēr), a species of duck which is nearly twice the size of the common duck. It inhabits the rocky shores and islands of America and Europe. The male is black and white spotted, while the female has reddish-drab colors mixed with black, and white bands



on the wings. This species of aquatic birds subsists on insects, shellfish, small fish, and tender shoots of plants. The eggs are gathered by eggers for the market, while the down from the breast of the female is the well-known eider down of commerce. This down is used by the female to line its nest and cover the eggs. It is useful for its superior warmth and elas-



KING EIDER; 2, EIDER DUCK.

ticity in making beds and coverlets. In the districts of Iceland and Norway, where these birds abound in great numbers, they are guarded as valuable property. The *king eider* is an allied species, resembles the eider duck, and inhabits the same regions.

**EIGHT-HOUR DAY**, the term applied to what has been proposed as the ideal working day by trade and labor unions. It was first made an issue in England in 1833, and trade unions advocated it with more or less vigor in public meetings subsequent to that time. In 1869 a congress of tradesmen held at Birmingham passed a resolution which demanded the adoption of the eight-hour day in Great Britain. The issue was taken up by the National Labor Union of the United States in 1866, and it became the theme of much discussion in all sections of the country, especially after the strikes of 1872. It was put into effect by the national government at the navy yard in 1869, and it is now the working day in all departments of the government. Nearly all the states have recognized it, either in part or all

of the branches of work, and it is the common working day in all the mines and many other industrial enterprises. The socialists of Europe have made it an issue and secured its adoption more or less completely in a number of countries, but it is more completely in force in Germany than in the other nations of Europe. New Zealand and Australia have made notable progress in legalizing the eight-hour day. The movement to adopt it has large elements of strength in Canada, where it has been in vogue in most of the mining and a number of other industries.

**EISENACH** (ī'sen-äk), a city of Saxe-Weimar, Germany, situated on the northwestern limit of the Thuringian Forest. It is celebrated on account of the castle of Wartburg, which was built in 1067 on an elevation 600 feet above the site of the city. Luther occupied the castle as an asylum for ten months, in 1521-22, in accordance with the wishes of the elector of Saxony, remaining there for nearly a year after May, 1521. Visitors are still shown the chapel in which Luther preached, the chamber he occupied, and the point struck by the inkstand thrown at the head of the Evil One. The city has well-paved streets, statues of Luther and Sebastian Bach, and a palace erected in 1742. Among the churches are those dedicated to Saint Nicholas and Saint George. The manufactures include woolen, cotton, and linen goods, carpets, machinery, leather, soap, and meerschäum pipe bowls. It has electric street railways, municipal waterworks, and stone and asphalt paving. Population, 1905, 35,153.

**EISLEBEN** (īs'lā-ben), a city of Prussian Saxony, Germany, about 25 miles northwest of Merseburg. It is celebrated as the place where Luther was born and where he died. The city contains numerous memorials of Luther, a fine bronze statue erected to his honor in 1883, and the house in which he was born, the latter having been consumed partly by fire, though it is still preserved with studious care. The noteworthy buildings include the Church of Saint Andrew, in which are many memorials of Luther and Melancthon. Eisleben has railway and electric railway facilities and considerable trade. Copper is mined in the vicinity. It has belonged to Prussia since 1815. Population, 1905, 25,121.

**EKATERINBURG** (yè-kä-tyě-rën-böörk'), a fortified city of Russia, in the province of Perm, 180 miles southeast of Perm. It is located on the Isset River, near the eastern slope of the Ural Mountains, and is surrounded by a productive mining region. The trade is chiefly in iron, cattle, tallow, and cereals. A branch



connects it with Cheliabinsk, on the Trans-Siberian Railway, giving it good transportation facilities. It has a public museum of mineralogy, a government mint, a chemical laboratory, and a number of schools and churches. The public utilities include electric lights, waterworks, and electric railways. Peter the Great founded the city in 1722 and it was named after Catherine I., Empress of Russia. Population, 1906, 62,503.

**EKATERINODAR** (yê-kâ-tyě-rê-na-dâr'), a city of Russia, capital of the Kuban territory, 950 miles south of Moscow. It is located on the Kuban River, about 100 miles from its mouth, and is surrounded by a low and swampy region. The streets are regularly platted, but are not well improved by draining and sewerage. The chief buildings include a cathedral, a museum of natural history, and several government buildings. It has a considerable trade in cattle and cereals and is the seat of annual fairs. Cossacks founded the city in 1794 and named it in honor of Catherine II. Population, 1906, 68,704.

**ELAM** (ê'lâm), an ancient country of Asia, known by the Greeks as Susiana and Cissia. It comprised the great plain east of the lower Tigris and included the Zagros and Pushti mountains. The country formed a part of the ancient Persian Empire. Susa or Shushan was its chief city. It appears from the cuneiform inscriptions that Babylon and Assyria were conquered by a king of Elam about 230 B. C., but the Babylonians subsequently captured Susa. In 694 the Elamites overran Assyria and humiliated Sennacherib, and many of the Assyrians were carried away in captivity. Elam was conquered and Susa was razed to the ground in 642 B. C., when many of their valuable books and images were carried away to Nineveh.

**ELAND** (ê'lând), a species of antelope found in South Africa. Livingstone speaks of it as the most magnificent of all antelopes. It more nearly resembles cattle than other species of antelopes, having a broader muzzle, heavier limbs, and a greater bulkiness of form than the common antelope. The height at the shoulders is about five feet and the weight is from 700 to 900 pounds. The horns are two feet long, extending backward and outward, and the face has a gentle and ovine expression. Large herds formerly frequented the fertile hills and low plains, but European settlements have diminished very materially their numbers. They are hunted for their flesh and hide, both being highly esteemed in the market.

**ELASTICITY** (ê-lâs-tic'î-tÿ), that property of matter by which it resists change of shape,

and returns to its original form when the distorting force is withdrawn. If a body completely recovers its original volume the instant the stress is removed, its elasticity is perfect. Air and all gases as well as water and all liquids are perfectly elastic. Solids do not act this way, and their elasticity of shape is not perfect. For example, glass might be expected to be perfect, but experience proves that it is not, showing a notable degree of imperfection in the torsional elasticity of glass fibers. On the contrary, in copper, brass, soft iron, steel, and platinum, providing the distortion does not exceed a certain limit, the elasticity of shape is much more perfect than in glass. If the strain is too great, the body either breaks or receives a permanent bend. The elasticity of water was proved by John Canton (1718-1772) in 1762. Elasticity in gases is measured usually by the height of a column of mercury they sus-



ELAND.

tain. The term *compressibility* is used frequently in connection with elasticity of volume, and *rigidity* is employed in reference to the change of shape.

**ELBA** (êl'bâ), an island belonging to Italy, situated in the Mediterranean, six miles from the mainland, and separated from it by the Strait of Piombino. It is eighteen miles long and varies from three to eleven miles in breadth. It is traversed by a mountain range, the highest elevation being 3,500 feet above the sea level. The coast is rugged and precipitous, the mountains are bare, and the valleys and lowlands produce fruit, wheat, Indian corn, vegetables, and watermelons. Domestic animals common to the continent abound. Iron of an excellent quality, associated with granite and marble, forms a mountain two miles in circumference and 500 feet high. The island is famous in history for having been Napoleon's



place of exile from May 4, 1814, till Feb. 26, 1815. Porto Ferrajo is the capital. Population, 1906, 24,515.

**ELBE** (ě'l'bě), an important river of Europe, rises in the Riesengebirge of northern Bohemia, near the frontier of Prussian Silesia. It is navigable for seagoing vessels from its mouth to Hamburg, about 85 miles, and for smaller vessels a distance of 525 miles. The total length is 725 miles. An extensive system of canals connects it with numerous points of commercial interest. Among its principal tributaries are the Havel, Mulde, Moldau, Saale, and Eger. The general course through Germany is northwest and the mouth is at Cuxhaven, where its waters flow into the North Sea. Its extensive estuary is obstructed by numerous shoals and islands. It ranks as an important waterway and is rich in valuable fish. Since July 1, 1870, the navigation has been free to commerce from Melnik, Bohemia, to Hamburg.

**ELBERFELD** (ě'l-běr-fělt'), a city in Rhenish Prussia, Germany, about fifteen miles east of Düsseldorf, on the Wupper, a small tributary of the Rhine. It ranks as one of the leading commercial centers of the empire, owing to its extensive trade and manufactures, and has communication by electric and steam railway lines. Among the noteworthy buildings are the courthouse, the city hall, the public library, and the normal school. It has a fine public park and many monuments dedicated to prominent men. The manufactures include clothing, machinery, paper, ironware, and cotton, woolen, and silk goods. Large exportations of ribbons, tape, buttons, laces, carpets, and musical instruments are made. Among its numerous dyeworks are the celebrated Turkey red, which has given the city a reputation in the markets of the world. The city is a center of much wealth and has many modern improvements. Population, 1905, 162,853.

**ELBING** (ě'l'bīng), a seaport city of West Prussia, Germany, on the Elbing River, near its confluence with the Frisches Haff. It is connected with the Nogat by a canal, has good railroad facilities, and is the focus of several interurban railways. Among its noted buildings are the city hall, the gymnasium, and the public library of 35,000 volumes. The manufactures consist chiefly of cotton, linen, and woolen goods, soap, leather, clothing, beverages, and machinery. It is the seat of the Schichau ship-building works. Elbing dates from the 13th century and was long an important member of the Hanseatic League. It has belonged to Prussia since 1772. Population, 1905, 55,627.

**ELBURZ** (ě'l'bō̄rz), a mountain range of

northern Persia, trending parallel to the southern coast of the Caspian Sea. The average height of the peaks is from 5,000 to 8,000 feet, while the culminating peak, Mount Demavend, is 18,600 feet. Mount Demavend is a famous volcano. A short distance southwest of it is Teheran, the capital of Persia.

**EL CANEY** (ě'l kă'nă-ě), **Battle of**, an engagement of the Spanish-American War, which occurred on July 1, 1898. The Spaniards had a force of 520 men at the town of El Caney, about four miles from Santiago de Cuba, and were commanded by Gen. Vara del Rey. General Lawton with 4,500 Americans made the attack and met with desperate resistance, but the Spaniards were defeated. The Americans lost 423 men and the Spaniards lost about 400, including 100 prisoners.

**ELDER** (ě'l'dēr), a large shrub or tree found in both hemispheres, including several species. Most species have pinnate leaves and a small creamy-white flower, which clusters in terminal cymes, usually appearing in June. The berries are nearly black and are used to make a kind of wine. They are considered wholesome food, especially in the form of pies and jellies. The wood of the tree is yellowish, takes a fine polish, and is used in making mathematical instruments. Young shoots of the elder have a very large pith, which, when pushed out with a rod, leaves a hollow cylinder and in this form are used by boys in making popguns. The pith, being very light, is employed for various electrical experiments.

**EL DORADO** (ě'l dô-ră'dô), meaning the golden or gilded land, a term used by the Spanish conquerors of America to describe a country which they imagined to exist. Their vivid imaginations were stimulated largely by the successes in Mexico and stories told them by natives. Among the incidents of interest is the one connected with the vain attempt of Ponce de Leon to find a spring in the new world that would confer perpetual youth upon all who partook of its waters. Another is the story of fabulous riches reported by Orellana, a Spanish officer of Pizarro, after sailing down the Amazon in 1540. These stories inspired many Spaniards to enter upon voyages, and thereby stimulated the discoveries and settlements of many regions. Sir Walter Raleigh imitated the Spaniards by twice visiting Guiana in search of fabulous riches. El Dorado is the poetic name applied to a country which Orellana pretended he had discovered between the Orinoco and Amazon rivers. To this region he attached accounts of immense quantities of precious metals that he claimed to have discovered, and vividly de-



scribed a city called Manoa, which he represented as the capital of that country.

**ELDORADO**, a city of Kansas, county seat of Butler County, 135 miles southwest of Topeka, on the Santa Fé and the Missouri Pacific railroads. It is situated on the Walnut River and is surrounded by a fertile farming and dairying country. The industries include flour mills, carriage works, limestone quarries, and machine shops. It has electric lights, a number of fine schools, and several county buildings. The first settlement on its site was made in 1858 and it was incorporated in 1870. Population, 1904, 3,665.

**ELECAMPANE** (ĕl-ĕ-kām-pān'), a plant closely allied to the aster, native to Europe, and naturalized in various parts of North America. It attains a height of three or four feet, has root leaves about two feet long, and bears large yellow flowers. The root has an agreeable aromatic odor when dried, somewhat like that of camphor, and is used in medicine as a tonic and stimulant, especially in chronic diseases of the lungs. Several species are cultivated in gardens for their orange-colored flowers.

**ELECTION** (ĕ-lĕk'shŭn), the act or proceeding of selecting a person or persons for office, especially if done at a meeting in which the voting is by ballot. In the United States, Congress has power to fix the time for electing all Federal officers, except the President and Vice President. These two officers are chosen under a direct provision of the Constitution, by virtue of which the different states appoint electors under laws enacted by the legislatures of the several states. All general elections are governed by the laws of the states and electors are admitted to vote by State authority, subject to certain constitutional restrictions. In most of the states the right of suffrage is extended to any male citizen of the age of 21 years who has been a resident of the State, county, and election precinct for the period required by law, except those under sentence of imprisonment in the penitentiary and idiots. In certain states paupers are excluded. The right of suffrage has been extended in some states to women in school elections and elections to create bonded indebtedness, while in several the full right of suffrage has been accorded to them. Registration laws requiring voters to register their names and addresses a limited time before election day are in force in many states, but in some they apply only to the elections held in cities of a limited class.

The right to vote comes from the State, the power to abridge or extend voting privileges being vested in the Legislature. Naturalization

as a citizen of the United States can take place only under Federal law. The right to vote at all elections has been extended to aliens who have declared their intention to become citizens in nearly half of the states, and they thus enjoy equal voting privileges with citizens of the nation. However, citizens of the United States are the only individuals who may vote in some of the states. The Federal naturalization laws provide that an alien may be naturalized only after five years' residence; this applies alike to all the nation. A limited educational qualification, such as ability to read and write, is required in a number of states, while a property qualification is provided for only in Rhode Island. The 15th amendment to the Constitution, adopted March 30, 1870, extends full suffrage to Negroes. The Australian ballot system, a favorite system of voting, has been adopted in a more or less modified form in most of the states.

In Canada the constitution provides that the government shall be similar in principle to that of the United Kingdom. The members of the House of Commons, who are the highest officers chosen directly by the people, are elected for five years, unless that body is sooner dissolved. They are dependent for their election upon the constituencies in the provinces, by which the franchises are controlled. The voting is by ballot, but the qualifications for voting at the elections vary in the several provinces.

**ELECTIVE COURSES** (ĕ-lĕk'tiv), the term applied in American schools and colleges to the courses of study that may be chosen by undergraduate students. Formerly all students were required to pursue certain courses of study, but this plan has been supplanted in most of the institutions of higher learning. At present only a few institutions adhere absolutely to a required curriculum, and students are accorded the privilege of directing their studies along special lines or in accord with their inclination. However, the courses are divided into groups so each student must select certain studies from each group under the advice of members of the faculty. This arrangement avoids the danger of students selecting work that may be classed as one-sided, or regarded as unsuitable for the symmetrical development of the mental faculties. Harvard University, one of the older institutions, was a leader in the movement toward establishing elective studies and elective courses. At present nearly all of the State universities are conducted on this plan, while most of the institutions where it has not been fully adopted are giving at least some choice to students in the selection of particular studies.



**ELECTOR** (ĕ-lĕk'tĕr), or **Prince Elector**, the title of those princes who had the privilege of electing the Emperor of Germany. This title was established in 1256, when there were seven electors, those of Saxony, Cologne, Bohemia, Mentz, Treves, Brandenburg, and the Palatine. Later the electoral dignity was transferred from Palatine to Bavaria, but it was restored to the former in 1648, hence there were eight electors. In 1692 the number was increased to ten, but the office became obsolete on the dissolution of the Holy Roman Empire, in 1806. The term *elector* is applied to each of the persons chosen to elect the President of the United States. See **Electoral College**.

**ELECTORAL COLLEGE** (ĕ-lĕk'tĕr-əl), the body of men chosen by the people of the several states to elect the President and Vice President. The college is constituted of the entire body of electors chosen by the different states. Each State is entitled to select a number of electors equal to the whole number of members sent to both houses of Congress. Any person holding the office of Senator, Representative, or other position of trust or profit under the United States cannot serve as an elector. The first Tuesday after the first Monday in November is the day fixed by law of Congress for choosing electors. The electors of each State meet in the respective State capitals on the second Monday in January next after they are chosen for the purpose of casting their ballots for President and Vice President.

No discussion of the merits of the candidates takes place, the electors voting for the particular persons previously placed in nomination by conventions called for that purpose. This is a perversion of the intention of the authors of the Constitution, since they were originally intended to cast their votes according to their own judgment. In casting the ballots, electors are required to vote for candidates, one of whom, at least, shall not be an inhabitant of the same State with themselves. Lists of persons voted for at each capital are made, signed, and certified by the electors and transmitted to the seat of government of the United States, each list being directed to the President of the Senate. By law of Congress three certificates of all the votes given are carefully prepared, of which one is delivered in person to the president of the Senate at the seat of government, a second is sent to him by mail, and a third is delivered to the judge of the district court in the district in which the electors assemble.

At a joint meeting of both houses of Congress held on the second Wednesday of February following the reception of the certificates, the re-

ports are opened by the president of the Senate and canvassed in the presence of both houses. The persons having the greatest number of votes for President and Vice President are declared elected, but, if no candidate has a majority, the members of the House of Representatives choose the President by ballot from the three who received the greatest number of votes in the electoral college, each State being entitled to one vote, while the Senate chooses the Vice President in a similar manner. John Q. Adams was elected President by the House of Representatives in 1828, and R. M. Johnson was chosen Vice President by the Senate in 1837.

**ELECTORAL COMMISSION**, a commission appointed by an act of Congress, Jan. 29, 1877, to investigate certain alleged frauds regarding the electoral votes of Oregon, Florida, Louisiana, and South Carolina in the presidential election of 1876. The appointment of a commission in relation to the election has been deemed unconstitutional by a number of able jurists. Tilden and Hayes were the respective Democratic and Republican candidates for President. The commission consisted of five representatives, five senators, and five associate judges of the Supreme Court. It was constituted of the following: George F. Edmunds, Oliver P. Morton, Frederick T. Frelinghuysen, Thomas F. Bayard, Allen G. Thurman, Henry B. Payne, Eppa Hunton, Josiah G. Abbott, James A. Garfield, George F. Hoar, Nathan Clifford, William Strong, Samuel F. Miller, Stephen J. Field, and Joseph P. Bradley. Much political spirit was shown in the sessions of the commission. On February 27 the Presidency was given to Hayes by a strict party vote of eight to seven, and on March 2, 1877, the commission adjourned. The House voted to reject, the Senate to accept the findings of the commission, but on a concurrent session of both houses it was finally approved.

**ELECTRIC BATTERY**. See **Galvanic Battery**.

**ELECTRIC CLOCK**. See **Clock**.

**ELECTRIC FISH** (ĕ-lĕk'trĭk), the popular name of a fish that has the power of giving sensible shocks of electricity when touched with the hand. About fifty species of marine animals have this power. A fresh-water eel of South America is the most powerful of these animals in this respect. The body is from five to eight feet long, blackish in color, and about the same thickness throughout. Little is known in regard to its generation of electricity, but it is certain that this force is used in killing fish for food. The electric organs are intimately connected with the nervous system. The torpedo, a mem-



ber of the ray family, is an electric fish found off the Atlantic coast of North America. A catfish common to the Nile, known as the raash, is about four feet long, and gives an electric shock about equal to that of a Leyden jar.

**ELECTRIC GENERATOR.** See **Dynamo.**

**ELECTRIC HEATING,** a system of artificial heating by converting electricity into heat. The essential principle of an electric heater is that the temperature of a conductor which offers great resistance is raised by passing through it a current of electricity. Such a heater is made by constructing coils or circuits of some refractory metal, which are surrounded by air or some insulating material, and the heat is thrown off by means of a metallic box or radiator. When a current is passed through such a device, it heats the coils by meeting resistance, and the heat is carried off by the radiator. Another system is to pass the current through broad strips or plates of metal, which are covered by an enamel, the latter serving to carry off the heat generated, while the current passes through the metal.

By electric heating it is possible to obtain an efficiency of 80 to 87 per cent. It is used extensively in obtaining heat for housekeeping purposes, such as boiling and baking. An ordinary cooking stove in which solid fuel is used yields but two per cent. of the heat generated, since 12 per cent. is lost in obtaining the fire, 16 per cent. radiates into the room, and 70 per cent. passes out through the chimney. Electric heating is used extensively in bath rooms, street railway cars, and in many waiting rooms. It is employed largely in welding iron and steel, and many other metals which require a high temperature to unite firmly, having the advantage that no flux is required and that the surfaces do not oxidize.

**ELECTRICITY** (ē-lĕk-trĭs'ĭ-tĭ), the science which treats of an invisible agent producing various manifestations of energy, which is generally rendered active by some molecular disturbance, such as rupture, friction, or chemical action. The name was derived from the Greek word *elektron*, meaning amber, from the circumstance that the Greeks were acquainted with the fact that amber, when rubbed, attracts light particles, such as leaves, straw, or small pieces of wood.

**DEFINITIONS.** The general science of electricity embraces a consideration of *statical* and *dynamical* electricity, or electric force in a state of rest and electric force in motion. The former is often termed *frictional* electricity, since it is usually produced by friction, but also results from greatly increasing the intensity of

dynamical electricity. The latter is developed by magnetism, heat, chemical action, and other forms of energy, and exhibits its power in the form of currents. Electricity resulting from chemical action on metals is termed *voltaiic*, or *galvanic*, electricity. The phenomenon of statical or frictional electricity on a simple scale may be observed by rubbing a piece of glass with dry silk, and then placing the glass near small pieces of paper or pith, which will at once be attracted to it. Similar experiments may be made with amber, rosin, gum shellac, and sealing wax.

Formerly all substances that can be electrified easily were called *electrics* and all others were termed *nonelectrics*. When the subject of *conduction* of electricity came to be investigated, it was found that the substances formerly termed electrics are *nonconductors*, and the nonelectrics are *conductors* of electricity. Since all bodies can be electrified under proper circumstances, the terms electrics and nonelectrics were abandoned as incorrect, and the terms conductors and nonconductors were adopted, this classification depending on the ability to conduct electric currents, though there are no perfect nonconductors, with the possible exception of dry gases. The term *insulator* is applied to a substance that has small conductive power, and the word *resistance* is used to express the opposition which the conducting substances forming the circuit offer to the passage of electricity. A good conductor is said to have low resistance, and a good insulator to have high resistance. The following is a partial list of substances having low and high resistance, with the best conductors and the best nonconductors named first;

CONDUCTORS.	NONCONDUCTORS.
All metals.	Shellac.
Charcoal.	Amber.
Plumbago.	Resins.
Concentrated acids.	Sulphur.
Dilute acids.	Wax.
Saline solutions.	Jet.
Spring water.	Glass.
Rain water.	Mica.
Snow.	Diamond.
Vegetables.	Ebonite.

Electricity is produced for general purposes by a conductor being rubbed on a nonconductor, as in an ordinary electrical machine having appliances to cause glass to rub against an amalgam. Two opposite kinds of electricity are manifested by substances electrified, known as *positive* and *negative*, the positive accumulating in one of the substances and the negative in the other. The presence of the same kind of electricity in different bodies causes them to repel each other, while those being charged with



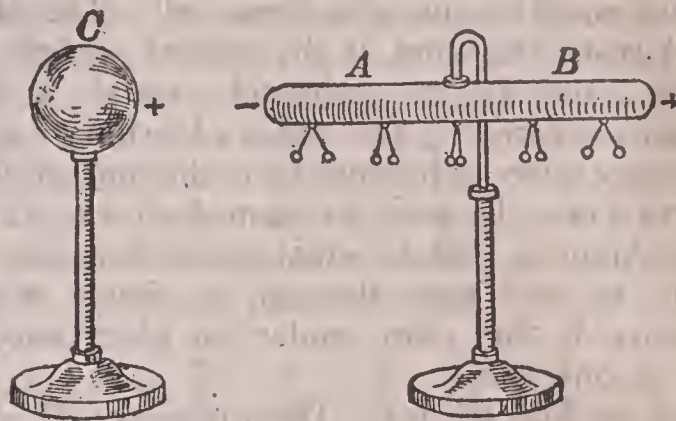
opposite kinds attract each other. It was long thought that electricity is a fluid, but scientists now regard it a condition of strain among the molecules of a body, a form of molecular motion, capable of being communicated like a fluid. However, nothing is known of its nature, and we are able only to understand the laws in accordance with which its phenomena are manifested. When a body is excited electrically, it is said to be *charged*. If the charge of two bodies is equal and opposite, it is neutralized by putting them in contact. When a body is charged positively, it is said to be at high potential; if charged negatively, at low potential, and when discharged, at zero potential.

**THE ELECTROSCOPE.** The electroscope is an instrument used to indicate the presence of electricity, and to identify electrical charges as positive or negative. A simple electroscope consists of a pith ball hung by a fine silk fiber from a glass support. It detects the charge by moving toward or away from the charged body, as in D and E. To illustrate: If the ball be charged from ebonite, it is negative. Now bring the ball near to a body whose charge is unknown. If it be attracted as in E, the charge is negative; but, if it be repelled as in D, the charge is positive.

**ELECTRIFICATION.** Electrical induction is the induced electrification of a body when brought near to an electrified body. The electrification is always of opposite kind to that of the inducing body on the side nearest the latter, and of the same kind on the farthest side. This may be illustrated by bringing an insulated conductor,

near the middle are practically neutral. All the electric charge on an insulated conductor lies on the outside of the conductor. However, this is true only of an electric charge. When the electricity is in steady motion, as an electric current, the current passes through the whole substance of a conductor.

When electrification passes from a higher to a lower potential, along a conductor, it is called

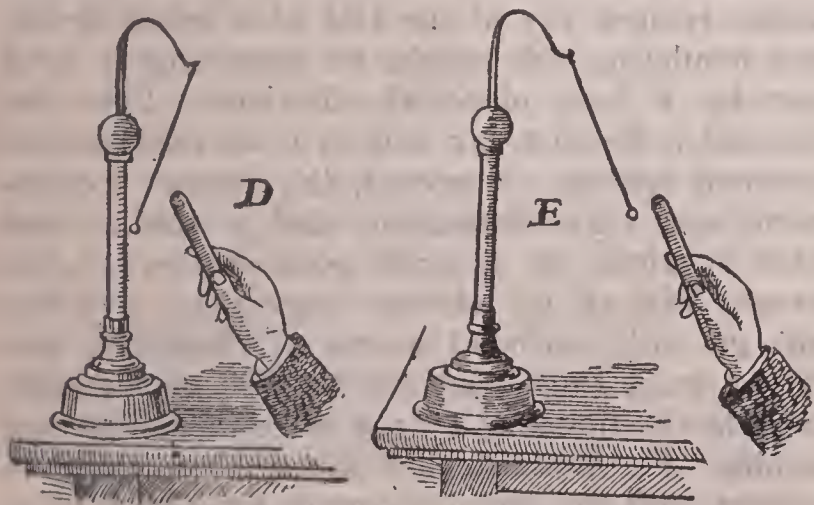


ELECTROSTATIC INDUCTION.

an *electric current*. This occurs when any other form of energy is converted into electric energy, and two bodies, charged to different potentials, are joined together by wire. In such a case there is a sudden and complete change to equal potentials by a momentary current through the wire, and a continuous current may be maintained by applying the electrification to the two bodies as fast as it is transferred; or, in other words, there must be a constant difference in potentials. In a voltaic battery the difference of potential is maintained by an expenditure of chemical energy; in a thermo battery, by an outlay of heat energy; and in a dynamo, at the expense of mechanical energy. The force produced by changing any other form of energy to electric energy is called *electromotive force*, and the means producing it is termed the *electric source*.

While light has a velocity of 186,000 miles per second, electricity has an estimated velocity of 230,000 miles per second. However, its velocity is not definite, since it depends largely upon the source and the condition of the conductor. Practical experience has demonstrated that its velocity is greater along lines suspended on poles in the air than those laid in subterranean passages. Since the former method combines speed with economy in construction, it is commonly employed, except in cities, where a multiplication of wires is objectionable.

**ELECTRICAL QUANTITIES.** George Simon Ohm, a German physicist, was the discoverer of the law in accordance with which electricity flows, or passes, through a circuit, which is commonly known as Ohm's Law. This law, briefly stated,



SIMPLE ELECTROSCOPE.

as the cylinder AB shown in the figure, near a positively charged ball, C, fixed on a glass support, when the cylinder will acquire a negative charge at the end nearest the ball, and a positive charge at the opposite end. The pith balls attached to the cylinder will show by their movement that the ends of the cylinder are excited most highly electrically, while the parts



implies that the current passing through any circuit is directly proportional to the electromotive force acting on the circuit, and inversely proportional to the resistance of the circuit. In computing electrical quantities certain units are employed, which are called the *volt*, *ohm*, and *ampere*. The volt is the unit of electromotive force, and was so named from Alessandro Volta (1745-1827), an Italian physicist. It is about equal to the blue-stone cell. The ohm, named from Dr. Ohm, is the unit of electric resistance, and is approximately equal to the resistance offered by two miles of ordinary copper trolley wire. The ampere is the unit of electric current. It was so named from Andre Marie Ampère, and is equal to such a rate of current as will pass through a circuit whose resistance is one ohm, under an electromotive force of one volt.

**USES OF ELECTRICITY.** The discovery of electric phenomena and the invention of instruments and machinery to practically apply electric forces in the arts, sciences, and industries have caused a remarkable revolution in all lines of economic enterprise. Having a prolific heating effect, electricity has entered as a heating agency into homes, offices, and railway cars. It is utilized to a large extent in electric welding. For lighting it possesses greater utility than any other form of energy, and its power to propel and move machinery exceeds the dreams of ancient philosophers. The electric spark serves in overcoming the danger formerly experienced in firing explosives, while it speeds symbols and words to all parts of the world, through the medium of the telephone and the telegraph, with the rapidity of lightning. The X-ray (q. v.) has added much of value to physical research and the practice of medicine. Among the latest electrical developments is a process for sending portraits and drawings by means of an electric current over a copper wire. This invention, called the *electrograph*, promises to be of vast value to newspaper publishers and in the detective service.

Past experience has demonstrated that water power is the most economical agent to generate electric currents, though coal, coke, gas, and mineral oil are in extensive use to produce steam for propelling electrical machinery. In many regions, as, for instance, at Niagara Falls, vast machinery is propelled by water power, and the electricity is conveyed by wire to factories at long distances. It is noteworthy that storage batteries at the places of consumption have proven highly profitable in manufacturing centers. While the use of electricity has greatly revolutionized many lines of industry and no-

ticeably modified the arts, it is not improbable that the greatest discoveries and the most useful applications of this force are yet to be made. Certainly, it offers a vast field for study and experiments.

**HISTORICAL.** As early as the 6th century B. C. the Greek philosopher Thales, one of the seven wise men, wrote of the attractive force of amber when rubbed with silk, and expressed the view that amber possesses a soul. Aside from this phenomenon, nothing was known of electricity until the 16th century, when, William Gilbert (1540-1603), physician to Queen Elizabeth, made some valuable experiments and published a work entitled "On the Magnet." Otto von Guericke, a German physician, the inventor of the air pump (q. v.), invented the first electrical machine about 1675. In this machine a ball of sulphur, so arranged that it turned on an axis, was electrified by friction with the hand, receiving negative electricity, while the positive flowed through the person to the earth. The Dutch writer Musschenbroek invented the Leyden jar and first exhibited it at Leyden, Holland. This invention made it possible to gather a greater quantity of electricity than ever had been produced before his time. He was not only able to discharge gunpowder by means of the current, but adapted a metallic conductor in transmitting electricity, and successfully demonstrated that the discharge along two miles of wire was practically instantaneous.

Benjamin Franklin in 1752 proved the identity of lightning and frictional electricity by means of a kite, which he elevated during a thunderstorm, tying a key at the end of a hemp string, and insulating the whole by fastening it to a post by a long piece of silk lace. Later he charged a Leyden jar and in both experiments obtained sparks. However, the former experiment was very dangerous, and a similar test later resulted in several experimenters being struck lifeless by electric currents. *Friction* was the only artificial source of electricity employed until Luigi Galvani in 1790 accidentally brought the limbs of a frog in contact with two metals. He noticed that when they came in contact with the metal a convulsion occurred as if they were in pain, and concluded that the effect was produced by what he termed animal electricity. It was his view that this electricity was different from that caused by friction, and that he had discovered the agent by which the will controls the muscles. Alessandra Volta (q. v.) rejected the idea of animal electricity, and developed the discovery of Galvani until he produced the *galvanic* or *voltaic battery*.

Hans Christian Oersted (1777-1851), of Co-



penhagen, Denmark, made discoveries in 1820 by which electricity and magnetism began to be studied as allied branches, instead of distinct studies. Andre Marie Ampère (q. v.), a French physicist, discovered that two parallel wires conveying an electric current in the same direction attract each other, but repel each other when in opposite directions. With this discovery the whole subject of electro-magnetism became generalized, and scientists turned their attention to the invention of the electric telegraph and hundreds of other modern devices. Among the inventors who made discoveries of vast value in the field of electricity are S. F. B. Morse, Thomas A. Edison, George Simon Ohm, A. G. Bell, Nikola Tesla, Michael Faraday, W. C. Röntgen, William Marconi, and Ernst Werner Siemens, all of whom are treated in special articles. See **Dynamo**; **Electrolysis**; **Galvanism**; **X-Rays**.

**ELECTRICITY, Medical Use of**, the employment of electricity in the treatment of diseases. In medical practice three forms are in general use; that is, the galvanic, static, and faradic. *Galvanic electricity* is obtained from a galvanic battery (q. v.), and is used extensively in treating many diseases of the nervous system. It produces a contraction of the muscle upon which it acts, and its application is accompanied by a sensation of heat and a buzzing sound. *Static electricity* is produced by a machine in which glass plates are revolved rapidly against chamois rubbers, and is seen in a succession of sparks that pass into the body of the patient, who is seated on a chair in which the feet are of glass. It has a great electro-motive force and is employed in medicine as a treatment of functional weakness, since it encourages respiration, secretion, circulation, and nutrition. *Faradic electricity* is obtained from a faradic battery, invented by Faraday (q. v.) in 1845, in which the current is made and broken with extreme frequency and rapidity. The current is applied by means of electrodes to the human body. It is used in treating paralysis of the muscles, hysteria, gout, and rheumatism. Another form of electrical machines is used in cauterizing and removing diseased or foreign tissues. Surgeons employ for this purpose an instrument in which the electrodes are joined by fine wire, the current raising the latter to a white heat. See **X-Rays**.

**ELECTRIC LIGHT**, the light obtained by conducting a current of electricity through a resisting medium, as a gas or a carbon wire. Many devices are employed for utilizing the luminous effects of electricity for lighting and in electrolysis. The chief systems for lighting

may be grouped as the arc and incandescent, both of which are in common use. In each of these a conductor conveys the current from a battery or dynamo D, and a brilliant light is obtained at any point where the current is broken. The so-called arc light is produced by connecting the two ends of the wire with two pointed sticks or pencils of carbon, and, when the carbon pencils are separated about one-tenth of an inch, the current passing from the positive to the negative pole, a light rivaling sunlight in whiteness results. The brilliant arc of light, called the voltaic arc, continues as long as the pencils are adjusted the proper distance from each other, which is provided for by a self-feeding mechanical contrivance. An intense heat is generated in an arc light, which is suffi-

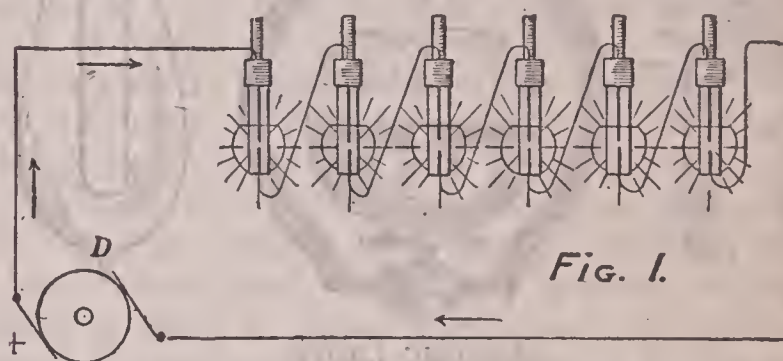


Fig. 1.

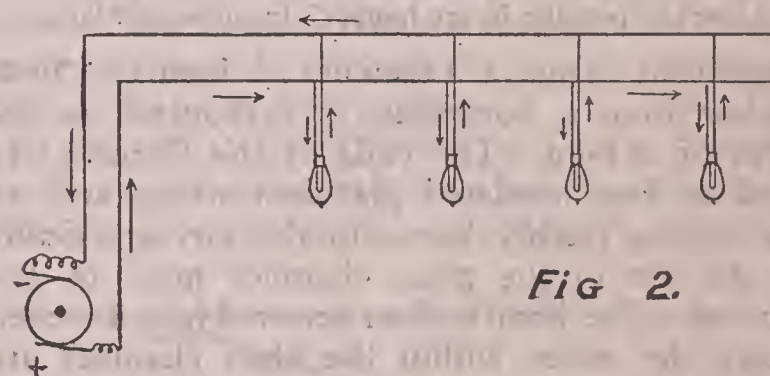


Fig. 2.

## ELECTRIC LIGHT.

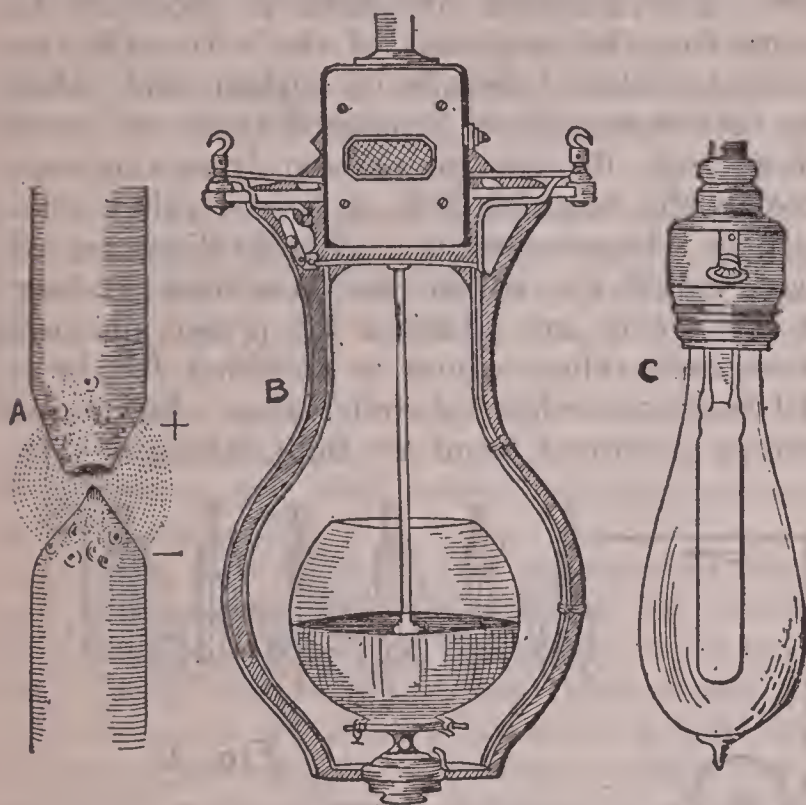
Fig. 1, arc lights; Fig. 2, incandescent lights.

cient to fuse quartz and magnesium and melt platinum. Both carbons decrease in size, though the positive decreases more rapidly than the negative, and the latter remains pointed. The intense heat tends to volatilize the carbon, causing small particles of the positive carbon to be carried in the form of an arc or bow and to become condensed in the form of graphite. Arc lights give a light too brilliant for small rooms, but are favored greatly for large buildings and for street lights. The dynamo must yield a current of constant strength, but of varying potential, according to the number of lamps. In some systems of lighting as many as fifty or even seventy-five lamps are lighted by one machine, each lamp ranging in intensity from 500 to 2,000 candle power.

The incandescent lamp is obtained by rendering incandescent a thread or filament of car-



bon by passing through it a current of electricity. While there are various modes of obtaining the carbon filament, the common way is to press a carbonaceous paste in a die plate, and then finish by carbonizing. In the Edison in-



ELECTRIC LIGHT.

A, carbon pencils; B, arc lamp; C, incandescent lamp.

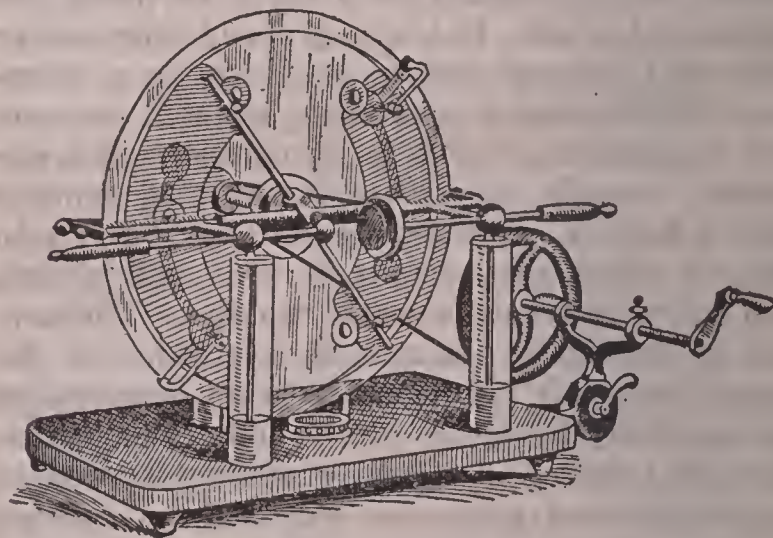
candescent lamp a filament of bamboo, little thicker than a horsehair, is carbonized in the form of a loop. The ends of the filament are fixed to two insulated platinum wires, and, as the carbon readily burns in the air, practically all the air in the glass chamber must be exhausted. The lamp is then screwed into a socket, where the wires within the glass chamber are brought in contact with two insulated brass plates, in which the wire of the circuit terminates. Usually a large number of incandescent lamps are connected with the same wire, and all take current from one of the line wires, returning it to the other wire of the circuit as shown in the illustration. However, all the lamps in a given system require the same current as every other. A turn-off enables one to close or open the circuit, thus lighting or extinguishing any one or all the lamps. A sixteen candle power incandescent lamp requires a current of about a half an ampere at 110 volts, or 55 watts.

Improvements of vast value in electric lighting were made in 1907, when the flaming arc lamp came into use. In this lamp the carbon is impregnated or cured with metallic salts, whose luminous vapors give increased light. Other newer forms include the helion, the tungsten, and the metallized carbon lamps, but, while they have a greater candle power efficiency,

they are more costly and more fragile than the ordinary carbon lamp. Other improvements include those made in the mercury vapor lamp, which has been made highly serviceable in photography and other arts in which a brilliant white light is essential. Glass has been displaced to some extent in making the tube, from which the air is exhausted, and an intense light results when an electric current is passed from one electrode to the other through the vapor of mercury.

The electric currents ordinarily employed produce no marked mechanical effect, as those from a battery of Leyden jars, or a flash of lightning (q. v.), in which the results are destructive, especially if the path is formed of poor conducting material. Electric light, like solar light, acts chemically on chloride of silver in the photographic process. It is an important means of chemical analysis. When a current of electricity passes between two terminals or electrodes, through a compound liquid or electrolyte, it has the effect of decomposing the molecules of the electrolyte into constituent parts called ions or radicals. Decomposition occurring in this manner is called electrolysis.

**ELECTRIC MACHINE**, the name generally applied to any mechanism employed to convert mechanical energy into electric current. There is a very wide difference in construction and capacity of the machines in common use for producing powerful electrical effects. Any machine depending upon the principle of the electro-magnet is now generally called a dyna-



TOEPLER-HOLTZ MACHINE.

mo, which see. The mechanisms more properly designated electric machines include the two classes that depend upon friction and electrostatic induction, and are known respectively as *friction* and *influence* machines. The so-called plate electric machine is a common example of the former. It has a circular plate of glass, which may be turned on an axis by an insulated



handle. A rubber with a surface coating of an amalgam is pressed by a spring against the plate, and is in electrical contact with an insulated conductor, termed the negative conductor. At the opposite side is a device with metallic points, which connect the positive conductor. When the handle is turned, a negative charge is manifest in the rubber, and a positive charge in the glass. As the motion of the machine continues the negative charge is conducted to the negative conductor and the positive conductor becomes charged positively by the electricity on the glass. The Toépler-Holtz machine, which is generally a revolving electrophorus, comprises a common electrostatic induction machine. The machines generally used in experiments in high schools and colleges belong usually to one of these classes, but there are mechanisms of similar construction sufficiently powerful to serve many purposes in the arts and industries.

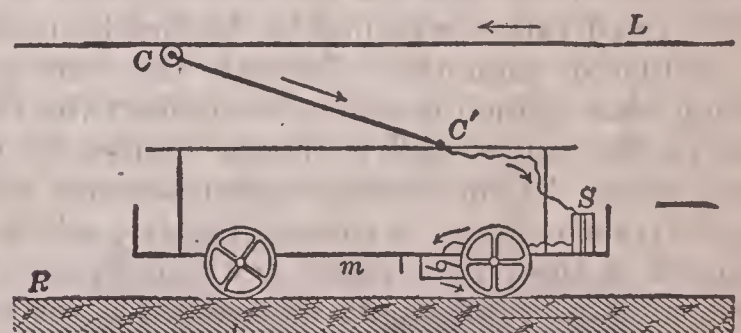
**ELECTRIC METER**, an appliance for measuring and recording the amount of electricity consumed. Three kinds are sold on the market, those known as clockwork recorders, motor meters, and chemical meters. The clockwork recorder has a stylus by which a record is made upon a chronograph sheet driven by clockwork as the current passes through a galvanometer. It is not used extensively on account of being expensive and because the clockwork devices are not easily maintained. The chemical meter is a zinc voltometer, and a record is obtained by weighing the plates from time to time. The motor meter is in general use. It is an electric motor, the speed of which is recorded by a dial device by means of a clockwork. This clockwork is connected with an armature, which revolves according to the speed of the current that passes through the meter. The watt, which is a current of one ampere, with a pressure of one volt, flowing for one hour, is the unit of measure. Each consumer of electricity usually has an electric meter, which is read once a month, and the amount paid for service depends upon the electric energy consumed.

**ELECTRIC MOTOR**, a machine used to convert electrical energy into the form of mechanical power. It is constructed on the plan of a dynamo (q. v.), but differs from it is that it is supplied with a direct electric current from an outside source, while the dynamo is used to generate electric currents. The iron masses or electro-magnets, called armatures, are set in motion by the action on them of stationary electro-magnets, hence the armature revolves as the effect of repulsion and attraction. The movement is at a uniform rate of speed, in case the

current is constant and the resistance even. In general any dynamo is reversible and can be used as a motor, but these machines are constructed for particular purposes and in practice are not interchangeable. Dynamos are much more powerful than motors and may furnish the power necessary to operate a number of motors, which may be located a long distance from the dynamo and from each other. Two motors of fifty horse power each, or ten motors of ten horse power each, may be supplied with power by a dynamo having 100 horse power.

Many machines are now operated by means of the electric motor, such as printing presses, cutting machines, elevators, pumps, etc. The advantage of the electric motor is chiefly in its convenience. It does not require a skilled operator and can be utilized in running machinery on a moment's notice. The power may be turned off as soon as a particular job or a definite part of the work is finished. The plant in which the dynamo is located may be a long distance from some or all of the motors, and the work of firing or looking after the power plant becomes centralized. In large factories, where work is done in many departments, the power plant may be in an isolated part of the building, and the employment of motors under such conditions entirely obviates the use of expensive belting, shafting, and pulleys.

**ELECTRIC RAILWAY**, a means of rapid transit on which the motive power is electricity. Various different mechanical devices are em-



ELECTRIC CAR.

ployed for this purpose, all depending upon the frictional or rolling contact of electricity supplied to a motor on the car or locomotive, either from a generating plant or from a storage battery. The electric railways are built similarly to the steam railroads, but in general the roadbed is not graded as level and is more tortuous, although the best service can be obtained on a straight and level track. The ties are of wood and the rails are iron or steel, but neither are quite as heavy as those used in steam railways. In cities the ties are now commonly laid in cement, so as to furnish a solid foundation for the street pavement, but in the outlying districts



and in the country they are usually placed in a trench excavated about four to six inches from the surface of the roadbed. The size and construction of the cars differ greatly, both for the freight and passenger service, and the manner of applying the electric current is not uniform in all systems. In most of the American lines the power plant is located at some convenient point on the line, from which the conducting current is carried on a copper wire *L* in a continuous circuit immediately overhead of the center of the street railroad track, where it is suspended from a line of poles. The motor car, to which trailers, or other cars, may be connected, has a trolley *CC'* attached to the roof, and by it the current is conducted by means of a wire through the switch *S* to the motor *m*, which has connection by gearing with the axles of the car wheels. Short copper wires or plates are bolted so as to connect the rails of the track, or the rails are united by electric welding, thus supplying a continuous circuit for the electric current, which passes through the motor into the car wheels, and thence back to the dynamo by the connected rails *R*.

Other methods include the underground or conduit, the third-rail, and the storage-battery systems. In the underground or conduit system the current is obtained by a sliding shoe, or some similar device, attached to an arm under the car, which comes in contact with an electric wire in a channel or conduit. The third-rail system is quite similar in its general operation to the overhead system, but differs from it in that a third rail is attached to the ties by means of insulated supports. Beneath the car is a sliding shoe, which operates to conduct the current to the motor, and it thence returns by the track rails. In the storage-battery system each car or train employs a storage battery, which is charged at the power plant, and usually carries sufficient power to supply motive force for one or more trips. All these systems are in use more or less, though the latter three more largely in Europe than America, while the overhead trolley system is the general system employed in America. The third-rail system is quite popular in Europe, and has the advantage of overcoming the overhead obstruction of trolley wires, but greater care must be exercised to guard against danger to pedestrians. Many of the elevated railroads make use of the third-rail system, as is evidenced in Chicago and other American cities.

Railway companies are now using electric locomotives to a considerable extent. They resemble the steam locomotive and are fully equal to it in power. The transmission used is either

the overhead trolley or the third rail. Locomotives of this kind have been in use for some time on some branches of the Baltimore and Ohio and other systems. A large locomotive has four motors of about 600 horse power each. It is provided with a whistle, sand boxes, and automatic air brakes.

The history of the electric railways dates from 1879, when Dr. Siemens (q. v.), of Berlin, Germany, demonstrated their practicability on a track 220 yards long at the Berlin Exposition. Two years later an electric railroad a mile and a half long was put in successful operation in Berlin, and from thence the enterprise spread to other European cities, and then to America. The first line in the United States was built at Allegheny, Pa., in 1882, though Edison experimented with a line at Menlo Park, N. J., some time before. At present practically all the cities of Canada and the United States with a population of about 10,000 or more have electric railways, and in the thickly settled portions hundreds of miles are operated through suburban and rural districts. There is scarcely a thriving city in the world that has not introduced electricity as a lighting or propelling agent, except in various portions of Asia. In 1906 Canada and Newfoundland had 1,073 miles of electric railways in operation, while the United States had 36,212 miles.

**ELECTRO-CHEMISTRY** (ě-lěk'trô-kěm'-is-trý), the branch of chemistry which treats of the chemical changes that are due to electrical energy, and investigates the chemical changes by which electricity is produced. That electricity causes chemical changes may be illustrated by placing two platinum rods in a strong solution of common salt, then connecting them with a battery or a dynamo, when the current will decompose the solution and the sodium will be set free at the negative electrode, while caustic soda will be formed as the sodium combines with the water, and at the same time the chlorine will escape in bubbles through the liquid being set free at the positive electrode. That chemical action produces electricity is demonstrated by placing a zinc bar in a solution of zinc sulphate and a copper bar in a solution of copper sulphate, the solutions being separated by a porous partition, and as soon as the rods are connected by wire a current of electricity will pass through the circuit. Electro-chemistry is employed in the manufacture of various chemical products, in extracting metals from their ores, and in electrotyping and electroplating. It enters into the manufacture of carborundum, chlorine, soda, and potassium chlorate.

**ELECTRO-CULTURE OF PLANTS**, the



method of stimulating the growth and development of plants by the use of electricity. Practical use has shown conclusively that electricity may be used as a stimulus in the form of electric light and by applying the current to the soil, the seed, and the plant. It has been demonstrated that seeds germinate more rapidly by applying electric stimuli before planting, requiring about half the time needed for seed untreated. Another method is to electrify a plot of ground by placing a system of wires in the soil, which are attached to a battery or electric machine at stated intervals. By either of these methods it is possible to increase the production of vegetables, especially peas, parsnips, tomatoes, beets, onions, and carrots. Both the arc and incandescent lights have a visible effect upon growing plants, in that they furnish beneficial rays and prevent injurious rays from passing through them. The flowering of Easter lilies has been hastened as much as ten days and at the same time the colors have been improved, while the yield of lettuce has been increased considerably. The use of electricity in the culture of plants is comparatively new, but it is reasonably certain that the yield of both flowers and fruit can be increased sufficiently to cover the expense.

**ELECTROCUTION** (ĕ-lĕk-trō-kū'shŭn), the method of inflicting corporal punishment by passing a current of electricity through the body of the criminal. The State of New York adopted this method in 1888, and since then it was adopted in Ohio and recommended by many commissioners and committees. It is looked upon as more humane than either hanging or decapitation, since death is painless and instantaneous.

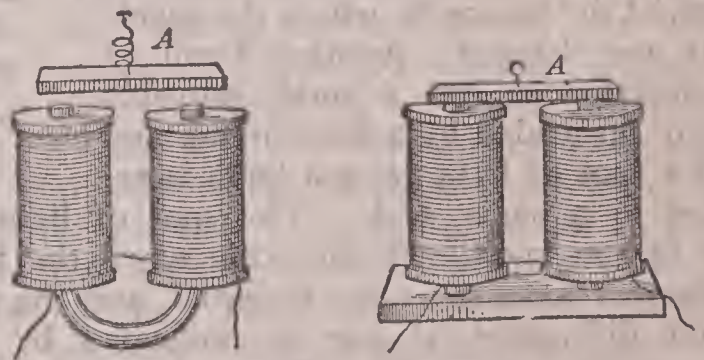
**ELECTRODE** (ĕ-lĕk'trōd), the terminals by which electricity is conveyed into and out of different media. The term is applied especially to the ends of the wires or conductors which lead from the source of electricity and terminate in the medium traversed by the current. Faraday introduced the terms *anode* and *cathode*, the former being the positive and the latter the negative electrode. The term is applied especially to the poles of the voltaic pile or battery.

**ELECTROLYSIS** (ĕ-lĕk-trōl'ī-sīs), the decomposition of chemical compounds by the action of a current of electricity. When an electric current is passed between suitable terminals or electrodes, through a compound liquid, or electrolyte, it decomposes the molecules of the electrolyte into two constituent parts called ions or radicals, which appear at the positive and negative electrodes. The electro-positive ions or radicals appear at the negative electrode, and

the electro-negative ions or radicals, at the positive electrode. In salts of the metals, the metal itself is electro-positive, and the element or elements with which it is combined are electro-negatives. Electrolysis has been a subject for much discussion in the cities where strong electric currents are utilized in the industries, since it tends to destroy the metal pipes that are used in the construction of sewers and for gas and water mains. It is due to unsuitable lines for carrying return currents of electricity, hence these find their way back to the plant through the metal pipes lying underground. The subject has been one of considerable controversy between street railway companies and corporations having control of plants which utilize metal pipes, such as gas plants and waterworks.

**ELECTRO-MAGNET** (ĕ-lĕk-trō-măg'net). See Magnetism; Electro-Magnetism.

**ELECTRO-MAGNETISM**, the science which treats of the development of magnetism by voltaic electricity. Though the exact nature of electricity and magnetism is unknown, they are generally thought to be allied phenomena, as is evidenced by the fact that an electric current always produces a magnetic flux, or magnetism, when flowing through a conductor. Besides, a magnetic flux always causes electro-motive force when crossing an electric conductor, and enters or emerges from a bend or curve in a conductor. It has been observed that a magnetic flux, surrounding a conductor through which an electric current is passing, flows around the conductor in concentric circular paths, and decreases in intensity as the distance from the conductor increases. The direction of the flow is dependent upon the electric current, and changes with every change in the direction of the current. Since the flux of all magnets



ELECTRO-MAGNET.

flows from one pole and returns to the other, as shown by the armature A in the illustration, it follows that the loop or loops of an active conductor act as a magnet, and are similar to it in having two poles. The magnet produced in this way by an electric current is termed an electro-magnet.



The strength of an electro-magnet depends upon the quantity of magnetic flux flowing through the magnet. The strength of the magnet is increased by increasing the strength of the current, but also in the same current by increasing the number of loops. Thus, the strength of an electro-magnet depends on the number of turns or loops, or upon the strength of the current; both facts are taken advantage of in the construction of electric machinery. There is an attractive force between two unequally strong electro-magnets in proportion to the square of the sum of both currents. The accompanying cut shows the horseshoe magnet, which is the form preferred, since the two poles are sufficiently near together to permit the application of the armature A to both at once.

**ELECTROMETER** (ē-lĕk-trōm'ĕ-tĕr), an instrument used in measuring the difference of potential between two charged conductors. The difference of potential is also measured by a *galvanometer*, but this is generally of high resistance, and, if calibrated to read volts, is called a *voltmeter*. Other devices used to indicate the amount of electricity with which a given conductor is charged are the *torsion balance* and the *electroscope*. Sir William Thomson (Lord Kelvin) is the inventor of the electrometer, and his quadrant-electrometer is the principal form of this instrument now in use. It has a needle of thin aluminum suspended over four quadrants which are connected in pairs; and the needle is attracted by one set and repelled by the other when the charges of electricity are communicated to the quadrant, the deflection depending upon the potential difference to which the quadrants are charged. Another form of the instrument has a small movable mirror suspended by a fine thread, and by it a spot of light from a lamp is reflected to a paper scale. The spot of light is seen in the middle of the scale when the two conductors have the same potential, and the potential difference, if any, is indicated by its movement to either side. These instruments are sufficiently delicate to indicate the potential difference of the two plates of a single galvanic cell.

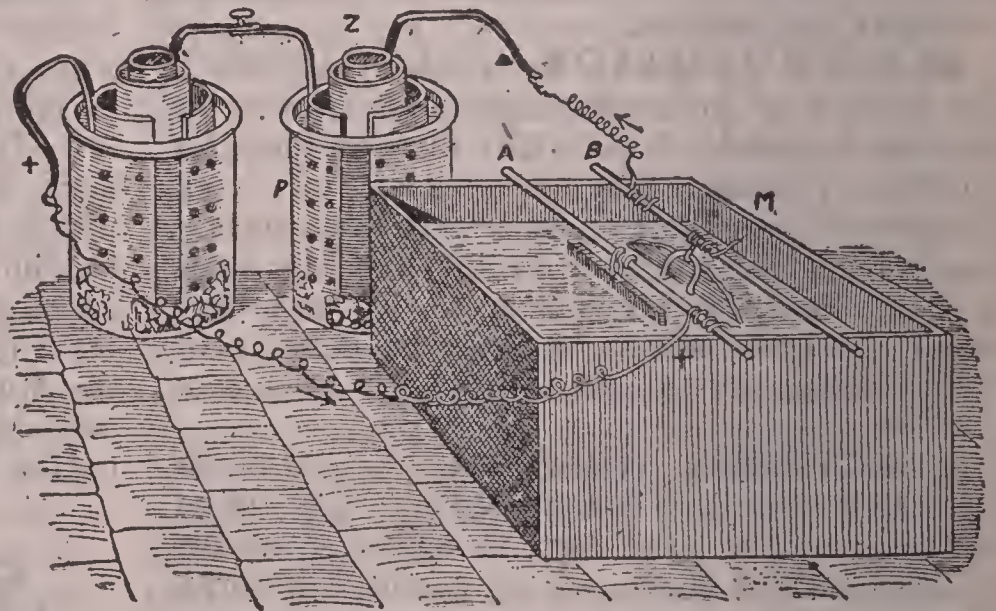
**ELECTRO-MOTIVE FORCE** (ĕ-lĕk'trō-mō'tiv), the force which produces, or tends to produce, electricity or an electric current. The words *electro-motive force* usually are contracted for convenience E. M. F. Any device by means of which an electro-motive force is

produced is called an electric source. A voltaic cell, a dynamo-electric machine, or a frictional electric machine is an example of an electric source.

The term electro-motive force is sometimes used to express the degree of electrification as equivalent to potential, or, more properly, the difference of potential at the terminals of a cell when it is on an open circuit. It is the sum of all the differences of potential in the circuit when a cell is sending a current. The practical unit of electro-motive force is the volt, which is about equal to the electro-motive force of a standard Clark's cell at a temperature of 15 C. Wires carrying an electro-motive force of less than 200 volts are not considered dangerous, but those connected with a large dynamo usually carry a voltage of from 800 to 2,000.

**ELECTROSCOPE** (ĕ-lĕk'trō-skōp). See *Electricity*.

**ELECTROTYPING** (ĕ-lĕk'trō-tīp-ĭng), the process of producing copies of engraved plates, printing type, woodcuts, and other devices used in printing by means of an electric deposition of copper upon a mold taken from the original. The process consists of taking an impression of



APPARATUS FOR ELECTROTYPING.

the object on beeswax, ozocerite, or gutta-percha, this being done on a powerful press. Various methods of treatment are employed, differing somewhat according to the material used. If beeswax is used, which is not a conductor of electricity, the surface is brushed with plumbago to render it a conductor. The mold is then suspended in a solution of copper sulphate in a vessel M, as shown in the illustration, from the negative pole B of a galvanic battery P, and a plate of copper is hung opposite on the positive pole A. As the copper is decomposed by the electric current, the metal goes to the negative pole and is deposited upon the mold.



On the other hand, the acid, passing to the positive pole, operates to dissolve the copper, thereby preserving the strength of the solution. While the process here described is still used, it is now common to obtain the electric current from a dynamo-electric machine.

After the process is completed, which usually takes several hours, the thin shell formed in the mold is removed from the beeswax and backed up with electrotype metal. When smoothed, it is ready for the printing press, is mounted on blocks provided with ratchet and a foot, or attached to a wooden block, making it type high in either case. Electroplating is a similar process, but the coating is of silver or gold. It is usually preferred to use German silver, copper, brass, or nickel silver as the base, as both gold and silver are readily deposited on these. It is necessary to thoroughly cleanse the articles to be plated. In plating with silver a plate or bar of silver is hung on the positive pole, and in about five minutes a coating is deposited to conceal the other metal, which may then be polished. Gold plating is a similar process.

**ELEGY** (ě'ě-jī), a poem written in an earnest, melancholy style. The ancient Greeks and Romans applied the term to the martial lyrics and the erotic poems, and sometimes extended its use to describe the lessons of practical wisdom by such writers as Solon. Catullus was the first great elegiac writer of the Romans, and after him came Propertius, Tibullus, and Ovid. Modern literature contains many fine lyrics, such as Tennyson's "In Memoriam," Milton's "Lycidas," and Gray's "Elegy Written in a Country Churchyard."

**ELEMENTS** (ě'ě-měnts), the constituent principles of anything which have never been resolved into more simple forms of matter. The term has a different signification in modern science than it had formerly. The Greek philosophers assumed that four elements—fire, air, water, and earth—give rise to all the things that are manifest. Modern science considers matter as existing in four forms—imponderable, gaseous, liquid, and solid—while the elements are treated as the component ingredients of bodies under whatever form they exist. Neither air, water, nor earth are elements, and fire is a component of heat. For example, water is composed of two parts of hydrogen and one of oxygen. If a molecule of water be divided into three atoms, two of hydrogen and one oxygen, each division is an element. The number of elementary substances is not known, but about seventy are now admitted without further investigation. Oxygen, hydrogen, nitrogen, and car-

bon are the chief constituents of all organic matter. Rocks are composed chiefly of oxides, silicon, calcium, magnesium, aluminium, iron, sodium, potassium, and carbon. These, together with sulphur, hydrogen, chlorine, nitrogen, and oxygen, constitute by weight 99-100 of the earth's entire crust. See **Chemistry**.

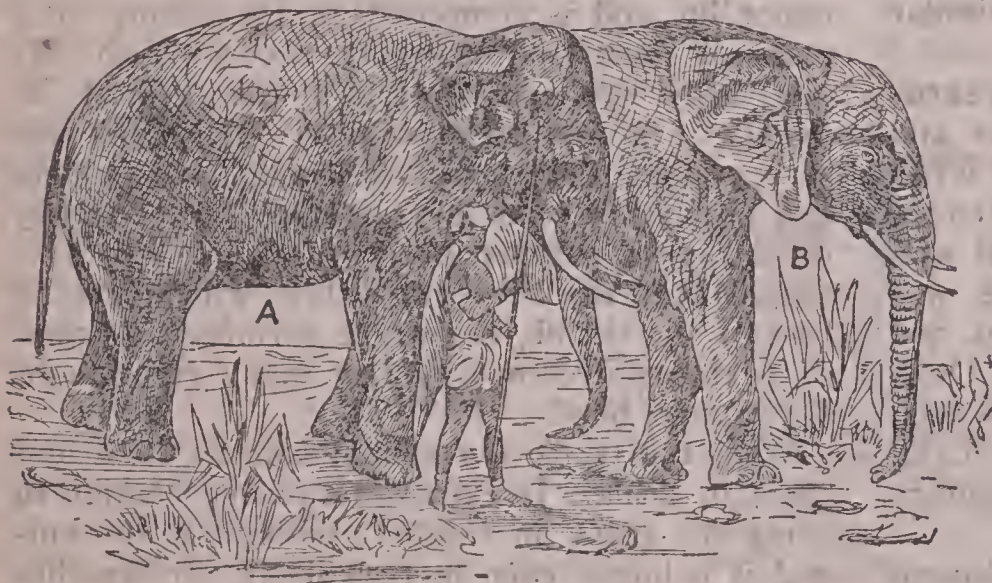
**ELEPHANT** (ě'ě-fănt), the largest living land animal, and the sole surviving representative of the suborder *Proboscidea*. Only two species of the family *Elephantidae* remain, the Asiatic and the African. The former is distinguished from the latter by its greater height, smaller ears, concave forehead, and four external hoofs on the hind foot, while the African has three. Elephants, when full grown, are from nine to fifteen feet high and weigh from 4,000 to 9,000 pounds. They live one hundred years and upwards. Elephants have remarkably large bodies, a thick skin, a scant growth of hair, a short neck, an enormous head, large legs and feet, and a proboscis or trunk. The proboscis is a huge elongation of the nose and upper lip, and is composed almost wholly of a mass of muscles, numbering, according to Cuvier, fully 40,000, which give it the greatest diversity of motion. The trunk is very strong and serves alike for respiration, smell, taste, touch, and prehension. At the extremity of the trunk, on the upper surface, are two fingerlike projections with a thick tubercle below, which acts the part of the thumb, the whole forming an organ of prehension comparable in many respects to the human hand.

With the trunk the animal collects food and takes in drink. It exercises extreme caution in using the trunk in combat; without it the animal is helpless, even to feed itself. It breathes through the openings in the trunk, which it can easily hold above the surface of the water while bathing or crossing a stream. Indeed, it is fond of an abundance of water and swims with ease and skill. It has no canine teeth and only two incisors on the upper jaw, which assume the character of tusks and attain an enormous size; a single tusk often weighs from 100 to 200 pounds. These tusks comprise the most elastic and best form of commercial ivory. In some species they attain a length of seven or eight feet, and serve to break off small branches, tear climbing plants from trees, loosen roots, fight other animals, and, in a state of domestication, to ply or carry timbers and move stones. Elephants have an ability to run quite equal to that of a horse. In lying down they do not place the hind legs beneath the body, but extend them backward in the manner of a person kneeling. The female breeds at fifteen years of



age, bearing a single young at a birth; the period of gestation is about 21 months. The young elephant sucks with its mouth and not with the trunk.

Elephants associate together in considerable herds, under the guidance of a single leader, usually the most powerful animal. It gives the alarm in case of peril and controls the movements of the herd. In times of danger the herd is remarkably anxious to protect it, which is done by crowding so eagerly to the front that the hunters often shoot some less valuable individuals before it can be reached. Sometimes an elephant is driven from the herd, and is never allowed to join another, but ever after leads a solitary life. Such individuals are known as *rogues*, or *low-castes*, and are by far the most dangerous to meet. Elephants are domesticated and serve for tiger hunting, beasts of burden, and in time of war. The Romans were frightened when Hannibal brought a troop of elephants over the Alps, but later learned to use them in war and various arts of peace. It



A, Asiatic elephant; B, African elephant.

is indicated from fossil remains of the genus *elephas* that at least fourteen species lived in former times, while the species classed with the allied genus *mastodon* were still more numerous. Fossil remains appear in the Pliocene of North and South America and in the Miocene and Pliocene of Europe, but they became extinct in the Western Hemisphere and emigrated from Europe to Asia and Africa in the Pleistocene period.

**ELEPHANTA** (ĕl-ĕ-făn'tà), a small island of British India, in the Bay of Bombay, about five miles from the mainland. It is five miles in circuit and the surface consists of two hills with a valley between them. Near the main landing place are a number of temples or caves cut into the solid rock. The largest of these is 130 feet long and 123 feet broad, the roof is

supported by pillars of great magnitudes, and the walls are sculptured by the Hindu trinity, Brahma, Vishnu, and Siva. These temples are used by the Baniya caste for certain Hindu festivals. It is thought that the temples are more recent than the birth of Christ.

**ELEPHANT BEETLE**, a giant beetle of Central America, so named from its large size. The length is about five inches, including a forked horn which projects from the head. It has a blackish color, but is covered with a yellowish fur. This fur is soft and upright and is easily removed by rubbing, hence most of the specimens are bare and appear almost black.

**ELEPHANT FISH**, the common name of the *chimaera*, so called from its upper extension of the nose, which resembles a proboscis. The flesh is esteemed as food, for which it is caught off the coast of the Cape of Good Hope and other regions of the South Pacific.

**ELEPHANTIASIS** (ĕl-ĕ-făn-tī'ă-sīs), a disease of the skin and areolar tissues, epidemic in the East and West Indies. It begins with headache and fever, after which the leg or arm becomes inflamed and tender and serum afterward exudes. Attacks will follow each other and the affected limb will become very large in size. Some cases are due to malarial infection, while others result from the bite of certain mosquitoes. The elephantiasis of the Greeks is a form of leprosy.

**ELEPHANTINE** (ĕl-ĕ-făn'tē-nâ), an island in the upper Nile, opposite Assuan, known anciently as Syene. It is formed of granite covered with a fertile soil, and is about a half a mile wide and one mile long. Herodotus mentions it as the boundary between Egypt and Ethiopia, but afterward Phyle was regarded as the southern landmark of Egypt. The island contains many ancient ruins, including several temples, fragments of pottery with Greek inscriptions, and a gateway of the time of Alexander. The Persians as well as the Romans fortified Elephantine as an important strategic point.

**ELEPHANT SEAL**, the proboscis seal, or sea elephant, so named from the proboscislike projection of the upper lip of the male. It is the largest of the seal family, often attaining a length of twenty to thirty feet. The female is much smaller than the male and has no proboscis. Two species have been described, one found off the coast of western Mexico and California, and the other in the vicinity of the Kerguelen Islands, Heard's Island, and Patagonia. However, both are becoming rare because of



extensive slaughter. These animals are hunted for their oil, which burns with a clear flame, a single individual yielding about twenty gallons. The skin is useful in making harness and other products made of leather.

**ELEUSIS** (ĕ-lū'sis), a celebrated city of ancient Attica, formerly situated on the Bay of Eleusis, near the confines of Megaris, and connected with Athens by the Sacred Road. Its fame is due largely to the festivals observed by the Greeks in honor of Demeter. The *Eleusinian Mysteries*, as the festivals were called, were divided into the greater and lesser, and, according to general account, held every five years. The lessons taught were of the highest moral character and were intended to inculcate the doctrine of the immortality of the soul. It was held that the souls of those who participated in them were filled with sweetest hopes, both of this and the future world, and that in them no one was sad. The ceremonies were awe inspiring, and their secrecy was strictly enjoined by the death penalty. Initiation in the lesser prepared for admittance to the greater, the initiation into both being followed by numerous games given amid great rejoicing.

**ELEUTHERA** (ĕ-lū'thēr-ā), an island of the Bahamas, about seventy miles long and from two to ten miles wide. The area is 235 square miles. It produces Eleutheria bark, a bitter, aromatic bark sometimes called cascarilla, fruits, live stock, and cereals. Governor's Harbor is the chief town. Population, 1908, 8,843.

**ELEVATED RAILWAY**, a line of railway built in large cities, usually on a framework erected on the surface of the street. Formerly the framework was constructed of timbers, but now it is entirely of iron pillars, spanned by crossbeams, and mounted by plate girders. Passengers ascend by stairways or elevators to the stations, which are usually from two to four blocks apart, and the fare is generally collected when passing from the depot to the platform at which the car is entered. Elevated railway transportation has the advantage of being more rapid than surface lines, since the cars stop only at the stations and are not obstructed by traffic on the streets. In 1867 the first elevated railway was built in New York, and the success of the enterprise caused the system to be extended in that city and established elsewhere. Extensive lines are now operated in Brooklyn, New York, Boston, and Chicago. The principal elevated railways of Europe are in Berlin, Paris, and Liverpool. Electricity is the chief motive power. Some of the cities in Germany have suspended railways, in which the

cars are suspended beneath the girder, such as the line between Barmen and Elberfeld.

**ELEVATOR** (ĕl'ĕ-vā-tēr), an apparatus consisting usually of a cage or movable platform, and used to raise and lower persons and goods in large buildings. These mechanical contrivances are comparatively modern and are in extensive use in the large cities of America, Australia, and Europe. They have materially increased the usefulness and convenience of high buildings. The public has become accustomed to the use of elevators, and general confidence in the efficiency and safety of these beneficial devices has led to their extensive employment. The security of the passenger elevator is assured by the multiplication of cables, by means of which the elevators are lifted and lowered while under perfect control of the operator. Four cables are usually employed to facilitate movement, two for attaching counterbalance weights, and several safety appliances are attached to guard against danger from moving downward at an excessive speed. The modern improvements added have rendered it as safe to ride in an elevator as on an ordinary street car, while the time consumed in passing to the highest fifteen or twenty story buildings has been reduced to only a moment.

Passenger elevators are operated either by hydraulic or electric power. The water pressure in hydraulic elevators is supplied from tanks, which are filled by means of powerful pumps located in the basement, air-pressure devices being utilized quite extensively for that purpose. By means of hydraulic passenger elevators it is possible to ascend with much smoothness of motion and entire safety at a rate of from 300 to 400 feet per minute. Within recent years the electric elevators of various construction have gone into general use, and are preferred to the hydraulic kind for various purposes. They are constructed in such a manner that a rope is wound around a large drum by the agency of electric motors, thus causing the cage or platform to be moved up or down with entire satisfaction. This form is simpler than the hydraulic and can be operated at a much smaller cost.

The construction of tall buildings with forty or more stories has made the hydraulic and the ordinary electric elevators undesirable, since the former occupies too much space and the latter requires a drum which is too large in size. Accordingly, a new type of the electric elevator has been devised, in which either the direct traction or the cable drive is employed. In both of these systems the application of power is identical with that employed in street railways. The term elevator is applied to buildings used for



the storage of large quantities of grain. It is applied also to a mechanical contrivance consisting of a belt to which boxes or buckets are attached, being used for the purpose of elevating grain and commodities. A good example of the latter is found in threshing machines. See **Grain Elevator**.

**ELGIN** (ĕl'jin), a city of Illinois, in Kane County, on the Fox River, about 35 miles northwest of Chicago. It is on the Chicago and Northwestern and the Chicago, Milwaukee and Saint Paul railroads and on the Chicago, Elgin and Aurora Electric Railway. The noteworthy buildings include the Northern Illinois Hospital for the Insane, the public high school, the Gail Borden Public Library, the Elgin Academy, and a college of music. Water power for industrial purposes is obtained from the Fox River. Among the manufactures are carriages, watches, farming implements, washing machines, cigars, and condensed milk. It has several cotton and soap factories and meat-packing establishments. The output of watches aggregates about 2,000 daily, in which industry 2,800 skilled laborers are employed. The streets are generally well paved and improved by grading and drainage. Elgin was settled in 1835 and incorporated in 1854. Population, 1900, 22,433; in 1910, 25,976.

**ELGIN MARBLES**, the celebrated collection of ancient sculptures brought from Greece by Thomas, seventh Earl of Elgin, and purchased in 1816 by Parliament for the British museum at a cost of \$175,000. The sculptures are among the best that adorned certain buildings on the Acropolis of Athens. They include those of Theseus or Hercules, the torso of Cecrops, the Fates, Proserpina, Iris, Ceres, the torsos of Neptune and Minerva, the heads of the horses of Hyperion, and one of the horses of Night. Their removal to England was generally condemned as an act of injustice, a view in which Lord Byron concurred.

**ELIZABETH** (ĕ-liz'ă-bĕth), a city of New Jersey, county seat of Union county, on Staten Island Sound, four miles southwest of Newark. It is on the Pennsylvania, the Central of New Jersey, and several electric railroads. The noteworthy buildings include the county courthouse, the post office, the public library, and a number of churches, schools, and hospitals. It is important as a shipping point of coal, iron, and merchandise. Among the principal manufactures are those producing cordage, sewing machines, ironware, railroad cars, machinery, fertilizers, and sailing vessels. The surrounding country is fertile and produces large quantities of cereals, fruits, and live stock. It has gas

and electric lighting, waterworks, sewerage, and a growing wholesale trade. The place was settled in 1609 by representatives of the East India Company. In the Revolutionary War it was the scene of a battle, and was made the point for exchanging prisoners during that period. It was chartered as a city in 1855. Population, 1905, 60,509; in 1910, 73,409.

**ELIZABETH CITY**, a city in North Carolina, county seat of Pasquotank County, on the Pasquotank River, forty miles south of Norfolk, Va. It is on the Norfolk and Southern and other railroads. The chief buildings include the high school, the customhouse, and the State normal school. It has a good harbor and a large trade in cotton, oysters, fish, and tobacco. Among the manufactures are cotton textiles, flour and grist, wagons, brick, lumber products, and machinery. Oysters are cultivated in the vicinity. It has systems of public sewerage and lighting. Settled in 1793, it was incorporated the same year. Population, 1900, 6,679.

**ELIZABETH ISLANDS**, a group of sixteen islands between Vineyard Sound and Buzzard's Bay, belonging to Dukes County, Massachusetts. Naushon has an area of eight square miles, is the largest of the group, and contains handsome private and summer residences. John Anderson gave Penikese, an island of this group, with an endowment of \$50,000 to Louis Agassiz, in 1873, for conducting a summer school, though the institution has since been discontinued. In summer the islands are visited by tourists and pleasure seekers. Population, 1900, 164.

**ELK**, or **Moose Deer**, the largest living species of the deer family, native to Europe and Asia. It stands, when full grown, about six feet and in weight averages about 1,000 pounds. The neck is very short and thick, adapting the animal for draft purposes. In all species the head is large, fully two feet long, and crowned with prominent horns, which branch out almost from the base into a broad, palmate form, with numerous snags. A single antler frequently weighs fifty or sixty pounds. The limbs are long and quite graceful. A fully developed elk will draw a sledge more than 200 miles a day, the gait being a shambling trot. The elk is timid and inoffensive, except when wounded, when it becomes aggressive. A single, well-directed stroke of its forefoot is sufficient to kill the largest dog. The flesh is esteemed a good kind of venison and is much sought as an article of food.

The so-called American elk does not belong to this class of animals, since it more nearly resembles the red deer, and the proper name



is Wapiti (q. v.). Occasionally one of these animals is seen in the northern part of the United States, but they are fast disappearing even in Canada. They inhabit marshy and dense timber regions and live separately, except during the rutting season. The Irish elk, which is now extinct, was closely allied to the fallow deer. Remains of it are found occasionally in the bogs and caves of the British Isles and the western part of Europe. This animal was re-



WAPITI, OR AMERICAN ELK.

markable for its large antlers, which in some specimens measured as much as eleven feet from tip to tip.

**ELKHART** (ĕlk'härt), a city of Indiana, in Elkhart County, at the confluence of the Saint Joseph and Elkhart rivers, 98 miles east of Chicago, Ill. It is on the Lake Shore and Michigan Southern and other railroads, and is surrounded by a fertile agricultural country. Among the noteworthy buildings are the Carnegie library, the high school, the city hall, and the Elkhart Institute. The principal manufactures include paper, starch, musical instruments, machinery, carriages, flour, and brass novelties. It has extensive railroad machine shops and other industries. The streets are well graded and paved, principally with brick, and the municipality has systems of sewerage and lighting. It is the center of a large trade in produce and merchandise. Population, 1900, 15,184.

**ELKHORN**, a river of Nebraska, rises in Rock County, flows in a general southeasterly direction, and joins the Platte River about 20 miles west of Omaha, after a course of 250 miles. The valley of the Elkhorn is noted for its fertility. It contains numerous enterprising

cities and is traversed by the Chicago and Northwestern Railroad.

**ELKS, Benevolent and Protective Order** of, a benevolent and fraternal society founded in 1868 in New York City. It is the outgrowth of a social club known as the Jolly Corks, a society of members of the theatrical profession, and its purposes are social and philanthropical. The largest membership is in the United States, where the order has about 950 subordinate lodges with a membership of 250,000. Eligibility to membership is limited to white male citizens of the United States of good moral character, 21 years of age, and subordinate lodges are not permitted in cities that have a population less than 5,000. This order has many fine buildings in the larger cities. Its official organ, the *Elks-Antler*, is a monthly publication.

**ELLESMERE LAND** (ĕlz'mēr), the name of a large tract of land in the Arctic region of North America. It is located north of Jones Sound and west of Greenland, from which it is separated by Smith Sound. It is part of the northernmost region of the Western Hemisphere and consists chiefly of a barren and uninhabited plateau. William Baffin visited it in 1616, and it was partly explored in 1899, when it was found that Hayes Sound does not separate it from Grinnell Land, which lies immediately north.

**ELLIPSE** (ĕl-lĭps'), an important figure in geometry. It is a plane curve, the sum of the distances of two straight lines drawn to two fixed points within the curve being always the same. These two points are called the *foci*, each being a *focus*. The diameter drawn through them is the major axis; the minor axis bisects the major at right angles. The distance from the center to the foci divided by the semimajor axis is called the *eccentricity* of an ellipse. The less the eccentricity, the nearer the figure approaches a circle. Kepler made the discovery that the planets' orbits around the sun are ellipses, the sun occupying a position in one of the foci.

**ELM**, a genus of trees which includes thirteen well-marked species, all native to the North Temperate Zone. In most species the branches are numerous and spreading, the bark is rugged, and the leaves are alternate, ovate, and doubly serrate. The flowers are small, but numerous and in clusters, and the fruit is either a small, one-sided nut, forming a winged samara, or a drupe. Elm wood is compact and very durable in water. The trees commonly grow to the height of 60 to 100 feet, and in some cases as high as 150 feet. Wagon hubs and ship locks



are made of the wood of the white elm, which is also largely taking the place of oak in the manufacture of the cheaper grades of furniture. The *slippery* or *red elm*, a native tree of America, contains a mucilaginous inner bark, while the *wych elm*, or *wych hazel*, is indigenous to Europe. Another species is the *weeping elm*, which is the most ornamental of the genus. The old white elm tree of the Boston Commons, destroyed by a storm on Feb. 15, 1876, measured 22 feet in circumference.

**ELMIRA** (ĕl-mĭ'rà), a city of New York, county seat of Chemung County, on the Chemung River. It is on the Pennsylvania, the Lehigh Valley, the Erie, and the Lackawanna railroads and is the focus of several electric lines. The streets are regularly platted, crossing each other at right angles, and are improved by grading and paving. Among the noteworthy buildings are the post office, the



ENGLISH ELM.

SLIPPERY ELM.

courthouse, the public library, and the city hall. The public school system culminates in an excellent high school course and is supplemented by Elmira College, an institution having an endowment of \$250,000. Among the charitable institutions are an industrial school, an orphanage, a home for the aged, the Arnot-Ogden Memorial Hospital, and the Anchorage. It is the seat of the State reformatory.

Elmira is important as a market and an industrial center. The manufactures include clothing, silk and woolen goods, engines and boilers, boots and shoes, steel plate, cigars, and machinery. It was settled in 1788 and incorporated in 1815. During the Civil War it had a Federal prison in which many Confederates were confined. Population, 1910, 37,176.

**ELMO'S FIRE, Saint**, the popular name of a meteoric appearance seen during thunder

storms at the tops of masts and other pointed objects. It is more frequent in southern than in northern climates, and is due to currents of electricity. It appears either as one or two flames. The former phenomenon, known as Helena, is regarded a bad omen by sailors, while the latter, called Castor and Pollux, is looked upon as a good sign.

**ELORA** (ĕl-lō'rà), or **Ellora**, a village of Hindustan, near Dowlatabad, celebrated on account of its remarkable temples hewn in rocks. These temples number about 35, some of which are cave temples, while others consist of excavations in higher strata of rock. Many of the larger structures are about 150 feet wide and 275 feet long, and are adorned by sculptures, sphinxes, and obelisks cut from solid granite. The caves are thought to have been constructed in the 7th century.

**EL PASO** (ĕl pā'sō), a city of Texas, county seat of El Paso County, on the Rio Grande. It is on the Southern Pacific, the Mexican Central, the Texas Pacific, and the Atchison, Topeka and Santa Fé railroads. The site is 3,830 feet above sea level, with a mean annual temperature of 63° Fahr., and the surrounding country has large interests in stock raising and general farming. Among the noteworthy buildings are the county courthouse, the high school, the Hotel Sheldon, the Federal building, and several private schools and hospitals. The streets are well paved and drained. It has a sewer system, gas and electric lighting, and electric street railways. The industries include smelting, cigar making, and machine shops. El Paso was settled in 1827 and incorporated in 1869. Near the city is a United States military post. Population, 1900, 15,906; in 1910, 39,279.

**EL RENO**, county seat of Canadian County, Oklahoma, on the Canadian River, 25 miles west of Oklahoma. It is on the Chicago, Rock Island and Pacific and other railroads. The surrounding country is fertile. Among the chief buildings are the high school and the county courthouse. It has manufactures of flour, earthenware, and machinery. The city maintains a system of waterworks and has electric lighting. Population, 1900, 3,383.

**ELVES**, the term applied to the mythical spirits supposed to inhabit wild and desolate places, and in various ways to exercise a mysterious power over man. See **Fairies**.

**ELWOOD** (ĕl'wōd), a city of Indiana, in Madison County, 37 miles northeast of Indianapolis. It is on the Pittsburg, Cincinnati, Chi-



cago and Saint Louis and the Lake Erie and Western railroads. Natural gas is obtained in the vicinity. The chief buildings include the county courthouse, the high school, and the public library. It has gas and electric lighting and electric street railways, and is a growing market for cereals and live stock. The manufactures include glass, machinery, cigars, and clothing. The municipality maintains systems of sewerage and waterworks. Population, 1900, 12,950.

**ELY** (ē'li), a town in the county of Cambridge, England, on the Ouse River. It has a superb cathedral founded by Etheldreda, daughter of the King of East Anglia, about the year 673. This building was burned by the Danes in 870, rebuilt as a Benedictine abbey in 970, and greatly enlarged after the first Norman conquest. It includes different parts which are built in the various styles of architecture that prevailed in Britain from the Conquest to the Reformation, is 517 feet long, and has a tower 275 feet high. The town is surrounded by a gardening district which produces vegetables for the markets of Cambridge and other cities. It was the last stronghold of the Saxons after the Conquest. Population, 1907, 8,471.

**ELYRIA** (ē-līr'ī-ā), county seat of Lorain County, Ohio, about seven miles south of Lake Erie, on the Black River. It is on the Baltimore and Ohio and the Lake Shore and Michigan Southern railroads, and is surrounded by an agricultural and dairying country. The chief buildings include the county courthouse and the public library of 17,500 volumes. Sandstone is quarried in the vicinity and shipped in large quantities. The manufactures include clothing, cheese, tobacco, machinery, and confectionery. It has pavements, electric lighting, and a large trade in produce. Population, 1900, 8,791.

**ELYSIUM** (ē-līzh'ūm), or **Elysian Fields**, in mythology, the place in which the souls of the blessed were supposed to dwell after death. The Orientals and most other peoples considered this abode to be in the upper regions of the sky, but the Greeks located it in the west, or beneath the earth, where the sun goes down. Homer described it as the Isle of the Blessed, where men live without toil or care, where snow and winter's storms are unknown, where the lovely and cooling zephyrs blow unceasingly with light murmur, and where the favorites of the gods are carried when passing from this life. He thought that Rhadamanthus, the most just of men in the upper world, alone ruled Elysium. Hesiod speaks of the happy isles of the ocean, but Pindar and the later poets put it beneath the earth.

**EMANCIPATION** (ē-mān-sī-pā'shūn), the liberation from bondage, applied in American history especially to the release of the negroes from slavery. The early constitution framed in Vermont abolished slavery in 1777 and Massachusetts did likewise in 1780. Acts of gradual emancipation were passed by Pennsylvania in 1780, New Hampshire in 1783, Rhode Island in 1784, Connecticut in 1784, New Jersey in 1804, and New York in 1799, though in the last-mentioned State an act of absolute emancipation took effect July 4, 1827. Slavery was permitted in the remainder of the colonies, and in the case of new states the question was settled at the time of admission. Soon after the Civil War commenced President Lincoln was urged by northern abolitionists to abolish slavery by proclamation. As early as 1862 laws were passed abolishing slavery in the territories, freeing escaped slaves of persons in rebellion, and abolishing slavery in the District of Columbia, the owners receiving compensation.

The Northern States entered upon the war to maintain the Union, not to liberate slaves. On Aug. 22, 1862, President Lincoln stated: "My paramount object is to save the Union, and not either to save or destroy slavery. If I could save the Union without freeing one slave I would do it; if I could save it by freeing all the slaves I would do it; and if I could save it by freeing some and leaving others alone I would do that." As the war progressed it became evident that slavery was a source of much military strength to the seceded states, and freeing them was decided on as a war measure. President Lincoln issued a proclamation on Sept. 22, 1862, in which the seceded states were notified that unless they returned to their allegiance by Jan. 1, 1863, he would declare their slaves forever free. Since the states in rebellion did not heed the notice, the Emancipation Proclamation followed on Jan. 1, 1863, by which all slaves in these states were declared free. It was given effect as rapidly as the Federal troops secured control of the territory held by the Confederates. In the proclamation the President declared it an act of military necessity, enjoined the freed slaves to abstain from violence, and offered to engage them in the military and naval service.

**EMBALMING** (ēm-bām'ing), the art of preserving the dead bodies of men and animals. There are many evidences that the art was practiced extensively in ancient Egypt, where the process was known at least 4,000 years B. C., this being evidenced by the embalmed bodies of Cheops and other sovereigns of the early dynasties. The origin of embalming is ascribed



by the Egyptians to Anubis, who embalmed his father, Osiris. One of the earliest records of embalming is that of the patriarch Jacob. We learn from reliable sources that the body of Joseph was thus prepared and transported out of Egypt. The practice prevailed, though not so extensively, among the nations of Asia and in Greece and Rome. Usually the bodies of the poorer classes were dried in the sand or washed in myrrh, and then salted for a period of seventy days.

Embalming among the middle classes consisted of removing the brain and soaking the corpse in a solution of natron, which destroyed the viscera and soft portions, leaving practically only the skin and bones. The wealthy frequently paid \$3,000 for the embalming of a single body, the process being nearly the same as among the middle classes, except that the corpses were swathed in linen bandages saturated with gum, and perfumed with aromatic substances. Within and about the bodies of different mummies have been found sulphate of soda, saltpeter, salt, soda, oil of cedar, turpentine, asphalt, myrrh, and cinnamon. Extended knowledge of the use and effect of chemicals has led to the employment of various compounds that are effective in artificial embalming, such as arsenic, sulphate of zinc, corrosive sublimate, and spirit compounds. They are forced into the blood vessels and cavities soon after death ensues, or the body is immersed for some time in spirits. At present the corpses are embalmed chiefly to prevent contagion, to make transportation less dangerous, and to overcome the necessity of immediate burial. See **Mummy**.

**EMBARGO** (ĕm-bär'gō), a prohibition by government authority of the departure of ships or merchandise from some or all its ports. It is either *hostile* or *pacific*, the former having reference to the detention of vessels of a foreign country and the latter to its own vessels. A hostile embargo is declared either as a means to settle a dispute, or to make a reprisal, while a pacific embargo is laid as a public policy or to protect the merchant vessels of a neutral nation. The first general embargo was laid by the United States in 1794. It was effective upon all vessels for sixty days, and was laid as a retaliatory measure against the British orders in council dated June 8, 1793. At the time of the War of 1812 another embargo was laid, in 1813.

**EMBER DAYS**, certain days in each of the four seasons set apart for prayer and fasting, one theme for supplication being that the blessings of God may descend on the crops. They

are the Wednesday, Friday, and Saturday after the first Sunday in Lent, after Whitsunday, after the 14th of September, and after the 13th of December.

**EMBOSSING** (ĕm-bōs'ing), the art of producing raised figures upon plain surfaces, such as paper, leather, bronze, and wood. In the two last mentioned the figures are said to be in *alto-*, *mezzo-*, or *bas-relief*, according to whether they are more or less prominent. Paper, leather, and the textile fabrics are embossed by powerful presses, in which the dies give their pattern to the object to be embossed. Steam is employed to keep the plate at a suitable temperature, depending upon the material to be embossed, and the power is applied by a treadle to straighten a bent arm, as in the old form of the printing press. Wood to be embossed is softened by steam and the impressions are made by iron molds into which it is forced. Metal is embossed largely by hand, the workman beating it up from the under side, and this method is called *repoussé work*. In embossing textile fabrics, it is done largely as needle work embroidered over figures padded with various materials, such as wool felt.

**EMBROIDERY** (ĕm-broid'ēr-ÿ), the name applied to ornamental needlework produced upon fabrics of any kind. Its production was one of the most important of the early arts in Oriental countries, and it is still practiced with much skill and diligence, the best work being done upon silk. The figures are either in colored silk or in threads of silver and gold. They consist of men, horses, dragons, etc., and are outlined with gold and filled with shades of silk, though sometimes are ornamented with beads, spangles, pearls, and precious stones. The fabric is stretched usually on a frame, with the design to be worked drawn upon it, or some other contrivance is used to guide the worker.

From the earliest times embroidery has been used to decorate the sacerdotal vestments, but it likewise has served other ecclesiastical uses. In modern times it has been employed to a large extent in women's dresses and undergarments. The Jews derived their skill in producing embroidery from the Egyptians. It appears to have been a common art, since even barbarous tribes were skilled in making showy designs upon cloth and other fabrics, using both linen and wool for the purpose. Many of the nomadic tribes of Asia and Africa still practice it as a domestic art. The process of doing embroidery work, even in modern times, employs simple tools and the work is largely by hand. They consist chiefly of needles of dif-



ferent sizes and scissors to cut the thread. The thread left on the surface of the cloth after each ply of the needle is called a *stitch*. The stitches differ in accord with the work to be done and include principally those known as the cross, darning, running, crewel, feather, rope, cushion, buttonhole, chain, canvas, and couching stitches. Various machines for making embroidery are now in use.

**EMBRYOLOGY** (ěm-brī-ōl'ō-gŷ), that branch of biology which treats of the formation of organisms. The study of this division of learning as a science dates from the last century, though Aristotle, Galen, and Harvey considered the subject and laid the foundation for the recent embryologists. The epoch of life in placental mammals, to which the study of embryology ordinarily is limited, extends from the time of conception to the period at which the anatomical connection between the young and mother is severed, though in a general sense it embraces the entire period from conception to the attainment of the perfect form. By *conception* is meant the *fertilization* of the ovum, which takes place through a spermatozoön, or male germ cell, penetrating into it, both in animals and plants. However, there are radical distinctions that give rise to divers limitations.

In most fishes and some other animals the embryo and parent have no anatomical connection, while fertilization of the ovum in many of these is effected outside the female. In oviparous animals the female retains the ovum within the body for some time after fecundation, where it is retained in a condition largely independent of the maternal body, though securing from it heat and protection. After a definite number of eggs have been ejected, the mother begins external incubation, which is continued until the young life bursts from the shell. However, a filial relationship exists after incubation by reason of which the new life is supplied with protection and food, while in other animals the lacteal function of the mother supplies the helpless young with support quite as vital as the nourishment previously extended through the placenta.

The laws announced by Rudolf Virchow (q. v.) and Karl Ernst von Baer (1792-1876), two German scholars, form the basis of study in modern embryology. The laws of the former imply that the organs and cells of new life forms originate primarily from cells deposited in the ovulum and gradually become complex through cell division and cell specialization, or the physiological division of labor. Von Baer's law maintains that the form primarily assumed

by an individual in the process of development is similar to that assumed by many types, later its organism becomes more specialized and, when fully developed, stands wholly apart from parallel types. Thus, the process of development leads to the special from the general, to the heterogeneous from the homogeneous.

Herbst explains the whole process of embryonic development by asserting that the protoplasm responds in a very intricate way to its surroundings; that it depends upon physiological responses to stimulations that come from without; in other words, that the cells and organs in the embryo move and change form in response to various stimuli, especially in eggs containing a considerable quantity of yolk. The yolk being food for the embryo, it is certain that the latter gives off waste products in the process of rapid growth, and later moves away to portions of the yolk not contaminated by such wastes.

It is quite well known that the development of the embryo differs materially in different animals, though in the successive stages there is much analogy, even in the human foetus, to the embryo or adult of the lower life forms. However, in this connection arises the discussion of the theories of *evolution* and *epigenesis*. According to the former theory the embryo exists preformed in the ovum and begins to unfold into the adult as soon as fecundation takes place; while in the latter we find the theory that holds the growth of the embryo to be a process of new formation, the cell mass giving birth to new cells in their own interior by stimulation from without, a view now most generally adopted.

**EMERALD** (ěm'ěr-ald), a variety of beryl, being distinguished in having an emerald-green color, in place of pale green, light blue, yellow, or white hues, which are the colors of the beryl. The emerald green of this gem is produced by the presence of chromium. Jewelers obtain the finest emeralds from Peru, but fine species are found in other places of South America, and an inferior quality is native to Europe. The emerald is usually in the form of a prism, and is most valuable when the surface is perfectly straight and smooth, so as to cast no darkening shadow on any of its particles. It is one of the softest of the precious stones, but acids will not affect it. Emeralds are cut on a copper wheel with emery dust, and polished on a tin wheel with rotten stone. As a gem it is considered inferior only to the diamond and ruby.

**EMERALD ISLE**, the popular name of Ireland, applied to it on account of the rich green



color of its vegetation. It came into general use through Dr. Drennan (1754-1820), who first used it in his poem entitled "Erin."

**EMERY** (ěm'ěr-ŷ), a variety of corundum, being allied to the sapphires, the ruby, and other precious stones. It is granular in texture and the hardest substance found native, next to the diamond. Emery is a dense, opaque, dull grayish-black substance, occurring in boulderlike masses and as granulates in soils. It is found in the islands of the Greek Archipelago, in Asia Minor, at Chester, Mass., and elsewhere. As a powder it is used extensively for cutting and polishing precious stones and for smoothing the surfaces of lenses and plate glass. When employed in this form, it is prepared by first breaking the stone into small lumps, then crushing them into powder by stampers. Emery paper and emery cloth are made by sifting the powder over strong sheets of paper or cloth, after brushing them with liquid glue. Emery wheels are commonly made of wood covered with leather or coarse cloth, with a surface of emery, or a compound of emery and caoutchouc molded into the shape of a grindstone and vulcanized.

**EMIGRATION** (ěm-ĭ-grā'shŭn), the removal from one country or region for the purpose of settling or residing in another. Inhabitants leaving a country are called emigrants, while those coming into a country or state are spoken of as immigrants. Among the principal causes that have led to emigration are over-population, political and social discontent, compulsory military service, religious persecution, the desire to attain greater liberty, and the general betterment of industrial conditions. The barbaric tribes of ancient times were induced to migrate and occupy territory more conducive to their arts of warfare and life, while civilized people have migrated more or less for higher purposes, especially to carry the benefits of civilization and religion to remote lands. All of Europe was settled by the over-population that pressed westward from Asia, and later, when the population of European countries became dense, the inhabitants in turn sought newer lands and greater opportunities. The fact that people are governed by certain laws of migration, such as passing to countries having a similar climate, the same natural resources, and an approximately equal altitude, has been well established.

Emigration to America on a large scale began with the departure of the Puritans, who planted colonies in New England. Soon after the Dutch colonized New York, the Germans settled Pennsylvania, the French occupied Canada and

Louisiana, the Spaniards made settlements in Florida, and the Swedes established a foothold in Delaware. In 1815 such an extensive breaking-up occurred in Europe that alarm was occasioned, though afterward it became manifest that the emigrants were made up largely of the over-population of various countries. The last century marks the greatest epoch of migration in the world's history, a period in which the Spanish and Portuguese languages were planted in Central and South America, the English in North America and Australia, and the Dutch, English, German, and French in various portions of Africa, Asia, and the Oceanic islands. Perhaps the planting of language is even overshadowed by the establishment of certain forms of religion, industries, and customs, and the molding of a new civilization. The colonial policy pursued in recent years by the great powers of Europe is tending to direct the over-population to various colonies, and thereby to strengthen more and more the foothold that these nations have in regions far remote from the mother country. This is particularly true of the Russians in Asia, and the Portuguese, French, Germans, English, and Italians in Africa.

**ÉMIGRÉS** (ă-mě-gră'), the name given to the royalists who fled for safety from France during the Revolution of 1789. The movement began shortly after the storming of the Bastille on July 14, 1789. When Prince Condé became alarmed at the course of events and was joined by many nobles in emigrating to Germany and the Netherlands. In October of the same year a concerted attack was made on Versailles, causing the royal family to remove to Paris, and this was followed by a renewal of emigration on a larger scale. The *émigrés* collected an army of 80,000 men at Coblenz under the Duke of Brunswick and the king made a disastrous attempt to join the forces, but was captured on the night of June 20, 1791. Condé and his adherents joined the Prussian army in Champagne, which caused the French government to confiscate their property and to proclaim the death penalty upon many for treason. When Napoleon gained the consulship, they were permitted to return, but the charter of 1814 made it impossible for them to regain their estates or former privileges. In 1825 the government voted to compensate them for the loss of their estates, but this was annulled as a result of the Revolution of that year.

**EMINENT DOMAIN** (ěm'ĭ-něnt dô-măn'), the supreme right possessed by a country or state to take or control private property for public use without the consent of the owner.



This right is justified in all civilized nations because it serves to promote the general welfare. It is not a confiscation of the property, since it is required that full and adequate compensation be made to the owner, and is to a large extent the outgrowth of the feudal system of land tenure in England and elsewhere. The Parliament of Great Britain provides for reasonable compensation to the owner of property taken for public use, but this is done rather as an act of justice than because of legal obligation. In the United States it is a constitutional requirement that no person shall be deprived of property without due process of law, and "private property shall not be taken for public use without just compensation." Nearly all of the states have similar constitutional provisions, and under them, or the statute laws, property may be taken for public use in the same way as it may be taken by the national government. The right of eminent domain is essential and necessary, since otherwise it might become impossible to construct public buildings, highways, canals, and railroads.

**EMOTIONS** (ĕ-mō'shūns). See **Feelings**.

**EMPEROR** (ĕm'pĕr-ĕr), the title of a sovereign who rules over an empire, considered superior to the rank of a king. It originated from the title of *Imperator*, which was conferred by the ancient Romans on the consuls in their military capacity. In later times it designated the highest authority in the state and Julius Caesar assumed this title and made Rome an empire. Charlemagne, who founded the German Empire, received the title of Emperor of the Romans in 800 A. D., and it was borne by his successors until 1806, when the Holy Roman Empire was dissolved. At present it is the official title of the emperors of Germany and Austria-Hungary. The King of England is Emperor of India, and the Czar of Russia is frequently alluded to as an emperor. China, Japan, and Turkey are empires.

**EMPIRICISM** (ĕm-pĭr'ĭ-sĭz'm), a system of practice based on the results of observation rather than on the scientific investigation of principles. It is evident from the very nature of progress in the learned professions that the early methods employed were more largely empirical than after material advancement had been made, though the value of any system of learning depends to a large extent upon practical observations based upon successful and continuous experiments. In the greater activities of modern civilization scholars aim to take advantage of every useful discovery and method made in previous ages, and, by a system of continuous investigation, to supplement such newer

and advancing methods as are evolved in consequence of thorough application. From this it is evident that all methods are to take into account the benefits of systems originated in the past, and to further accumulate and enlarge by experience and observation.

**EMPORIA** (ĕm-pō'rĭ-ā), county seat of Lyon County, Kansas, on the Neosho River, 120 miles southwest of Kansas City. It is on the Missouri, Kansas and Texas and the Atchison, Topeka and Santa Fé railroads. The surrounding country is a fertile farming region. Among the chief buildings are the county courthouse, the Carnegie library, a conservatory of music, and the College of Emporia, a Presbyterian institution. It is the seat of a State normal school. The manufactures include vehicles, ironware, canned goods, flour, dairy products, and works in marble. It has systems of electric railways, waterworks, and gas and electric lighting. Emporia was settled in 1856 and incorporated in 1870. Population, 1904, 9,346.

**EMS** (ĕms), usually called the Bath of Ems, a bathing place of Germany, about four miles from Coblenz, on the Lahn River, in the province of Hesse-Nassau. The thermal springs belong to the class which contain soda, have a temperature of 78° to 135°, and the waters are used both for drinking and bathing. It has numerous bathing establishments, many of which are finely constructed. The town is noted for its fine hotels, theaters, and private lodging houses. Thousands of visitors throng the place annually. The value of the springs was known to the Romans. Population, 1905, 7,614.

**EMU** (ĕ'mū), or **Emeu**, a large bird closely allied to the cassowary, standing from five to six feet high. It is native to Australia and the adjacent islands. The color is a dull brown mottled with gray-white, but the young are striped with black. The head is devoid of a helmet, as found in the cassowary, and the bill is depressed. Australian natives value the flesh and eggs for food, the former having a taste which resembles that of beef. Emus are easily domesticated and breed readily in that state. The eggs are not as large as those of the ostrich, being only about four inches in diameter, but require three months for incubation, which is sometimes performed by the male. They live on roots, fruits, and herbage. The only sound uttered is a loud, booming cry made by the female. This species of birds is unable to fly, but it possesses much speed in running. See illustration on following page.

**EMULSION** (ĕ-mūl'shūn), a medical preparation composed of a soft liquid resembling milk in consistency and color, its oily or resin-



ous property being united with water by a saccharine or mucilaginous substance. Among the best known is the emulsion of cod-liver oil, used in treating pulmonary disease.

**ENAMEL** (ĕn-ăm'ĕl), the name given to vitrified substances of various composition, applied to the surface of metals. It is generally put on like paint, with a brush, and then heated sufficiently to melt the enamel, which causes it to become a fixed part of the surface. The art was practiced by the Egyptians and Etruscans on pottery, and passed from them to the Greeks and Romans. In Western Europe, especially among the Saxons and Normans, it was early employed in manufactures. It is used for producing artistic designs, figures, and



CASSOWARY. EMU.

ornaments, when it belongs to the fine arts, and is employed in making the dial plates of watches and clocks and for coating culinary vessels. The basis of all enamels must be an easily fusible, colorless silicate or glass. All bases on which it is applied must be cleaned with weak acid, or some similar preparation, and moistened with gum water. Copper is the best base, but iron is used for ordinary purposes.

**ENAREA** (ă-nă'rĕ-ă), a region of Africa, in the southern part of Abyssinia, between 7° and 9° north. It is inhabited by natives of the Gallas tribes. The government is hereditary and absolute. Among the chief products are coffee, cloth, embroidery, gold, live stock, and fruits. In religion the people are largely Mohammedans. The slave trade is still sanctioned, though it has been abridged greatly in recent years. The government is administered from

Saka, a city near the Gibbe River. Population, 1908, 42,500.

**ENCAUSTIC PAINTING** (ĕn-kă's'tĭk), the method of fixing colors upon objects by the process of burning. The ancient Greeks employed the encaustic art in decorating the inner and outer walls of buildings and in ornamenting sculptures in marble. It was a common kind of painting among the artists of Rome during the empire. The colors were mixed with wax and resin, and the pictures were finished by the application of a hot iron, hence it gave the product a more glossy surface than that obtained in water-color painting. It has the advantage of being very enduring; hence the art has been revived to some extent. Polygnotus's "The Battle of Marathon" is a good example of encaustic painting and was preserved in an open portico at Athens about ten centuries.

**ENCYCLOPAEDIA** (ĕn-sĭ-klŏ-pĕ'dĭ-ă), **Encyclopaedia**, or **Cyclopaedia**, a work in which the various branches of science and art are treated separately, or in particular departments, and usually in alphabetical order. The authors of early encyclopaedias attempted to treat all subjects of human knowledge exhaustively, but, as knowledge extended, vocabularies enlarged, and specialists multiplied, it became necessary to confine the treatise to a smaller limit of subjects or make the work departmental and specialized. It is assumed that Terentius Varro wrote the first extensive work of an encyclopaedic nature in the year 30 B. C. Pliny the Elder soon after prepared his well known "Natural History," which long ranked as a highly superior work. Farabi, an Arabian writer, prepared an encyclopaedia in the Arabian in the 10th century, while Dominican Vincent of Beauvais, under the patronage of Louis IX. of France, collected the whole sum of knowledge of the Middle Ages, to which an anonymous author appended a valuable addition several years later. In 1677 Johann Jacob Hoffman published his great German work, "The Universal Lexicon," at Basel, Switzerland, and in 1697 Pierre Bayle, the French critic, issued his well-known "Dictionary of History." The most extensive of the newer German works are Meyer's "Neues Konversations-Lexikon" and Brockhaus's "Konversations-Lexikon." Ange de Saint-Priest's "Encyclopédie du XIXème siècle" is a modern work in French.

The first English encyclopaedia containing subjects in alphabetical order was the "Lexicon Technicum" published in 1704. Among the newer English works are the "Encyclopaedia Britannica," published at Edinburgh in 1788, Charles Knight's "Penny Encyclopaedia," and



"Chambers' Encyclopaedia." The English publications have been revised from time to time and have had a large sale in America. To make them more suitable in Canada and the United States, American supplements or additions have been combined with the English publications. The most extensive encyclopaedia ever published in the world is the Chinese "Encyclopaedia of Literature and Science," containing 5,040 volumes. It embraces information on practically every subject known to the people of the Celestial Empire. Among the leading American publications are "The Americana," "Johnson's Universal Cyclopaedia," and "The New International Encyclopaedia." Besides these are smaller editions of general character and numerous works treating on special subjects, such as biography, anatomy, ethnology, zoölogy, etc.

**ENDOGENS** (ĕn'dō-jĕns), one of the two primary classes of plants into which the vegetable kingdom is divided, the other being exogens. This designation of character is determined from the structure of the stem, which has the wood in threads mixed with the pith and scattered throughout every part, never forming layers, and from the wood of which the bark cannot be peeled, because of its being partly developed in the interior of the stem. The embryo has but one cotyledon, the leaves are nearly always parallel-veined, and the flowers have their parts in threes or a multiple of three, very rarely in twos or fours, but never in fives. In germination the original radicle issues from a sheath, and, in growing upward, each successive shoot of the stem issues from a former sheath. Palms, bananas, lilies, grasses, and sedges belong to this division.

**ENEMY**, in military, the term applied to either of two nations which are at war with each other. The state of enmity begins with a declaration of war, which may be either documentary or by actually taking up arms. Both parties in an armed conflict are called *combatants*, while all others that are interested but exempt from the operations of hostilities are known as *noncombatants*. During a state of war, when two or more nations are enemies to each other, all commercial relations are suspended. In some cases a state may permit its own citizens to trade with the enemy, but as a rule contracts made with an enemy cannot be enforced in the courts of law.

**ENERGY** (ĕn'ĕr-jĕ), the capacity to do work. Work is done at the expense of energy. All natural phenomena are caused by energy acting on matter. Whenever it is expended to produce a phenomenon, such energy must be

drawn or transferred from some stock of existing energy. For example, when the spring of a watch is run down, and has thus expended the energy it possessed, it requires a new store of energy to be imparted to it. If a book falls from the table to the floor, it requires that energy be imparted to it in order to raise it from the floor to the table. When the book reaches the table, it has acquired energy sufficient to enable it to do work exactly equal to the amount expended on it in raising it that distance. This energy of motion is called *kinetic energy*. So long as the book rests on the table the distance times the weight of the book is stored in the book, and the energy so stored is called *potential energy*.

Experiments in great number have proved that there is never any destruction of energy. It may be transferred from one body to another, or differently distributed among bodies at different times, but the sum total in all the bodies is not lost. Matter and energy never change. In order to effect transmission, when there is no solid or fluid matter to act as a conductor, it must either leap through empty space, or be carried by something in space which we cannot see or otherwise detect. Hence, physicists assume the existence of a medium called *ether*. The energy which resides in ether waves is called *radiant energy*. The form of energy is known by diversified terms, dependent upon the nature of its work. It is designated as light, when it affects the eye; heat, when it raises the temperature; actinic, when it produces chemical changes; and electric, when it gives rise to conditions of electrification.

Since the sum total of energy in the universe, like the sum total of matter, must constantly remain the same, it gives rise to the general law known as the *conservation of energy*. According to this law no form of energy can be produced except by the expenditure of some other form, nor can it be annihilated except by being reproduced in some other form. The general theory known as the *dissipation of energy* is based upon the tendency of all energy to be converted into heat, and in the form of heat it radiates into space and apparently is lost forever. According to this view, the sun will eventually become a cool and dark body like the earth, since its heat is constantly radiating off and is not returned to it.

**ENFIELD** (ĕn'fĕld), a town of Middlesex County, England, nine miles north of London. It is celebrated on account of the manufacture of rifles and small arms for the government. The noteworthy features include the town hall, the public library, and the remains of a royal



palace of Edward III. Enfield has a celebrated school at which Keats studied. It was the home of Charles Lamb. Population, 1907, 49,631.

**ENFIELD**, a town of Hartford County, Connecticut, on the Connecticut River, about ten miles south of Springfield, Mass. It is on the New York, New Haven and Hartford Railroad. Within the town is a community of Shakers known as Shaker Station. It has a public library and several fine schools. Among the enterprises is the famous Thompsonville carpet factory, in which about 350 looms are employed, having a capacity of 6,000,000 yards annually. It is the seat of the Hazzardville powder mills, one of the largest institutions of the kind in the world. Other factories produce vehicles, plows, sewing machines, timber products, and implements. Population, 1910, 9,719.

**ENGINE** (ĕn'jin), a machine of complicated parts for utilizing some force in nature to perform work. See **Steam Engine**.

**ENGINEERING** (ĕn-jĭ-nĕr'ing), the art of making, building, or using engines and machines, or of designing and constructing public works, requiring special knowledge of materials, machinery, and the laws of mechanics. The range of knowledge required for the different departments is quite diversified, and each of these does not admit of strict definition as now divided. The six principal divisions of this branch of learning consist of military, marine, mechanical, civil, electrical, and mining. *Military engineering* includes the planning, constructing, and maintenance of fortifications and gunnery, artillery, and telegraphy as applied in warfare. *Marine* and *naval* engineering are concerned with works partly of a military and partly of a naval character, such as the planning and construction of vessels of war, engines, and torpedoes. *Mechanical engineering* requires efficiency in the invention, contrivance, and adjustment of machinery. It is necessary that the mechanical engineer be acquainted with the quality and strength of the materials used, the power of steam, and the parts of engines. In addition it is essential that he should understand the construction of various kinds of mills, including those propelled by steam, water, and wind.

The work of a *civil engineer* covers the most diversified field of study and was not developed in England until about the middle of the 18th century. The engineers employed in that country prior to that time were generally secured from Holland. Civil engineers have to do with the construction of railroads, canals, aqueducts, harbors, highways, bridges, and drainage works. *Electrical engineering* as an art sprang into rec-

ognition in recent years, owing to the larger and more diversified uses of electricity in machinery and the arts. The work of an electrical engineer has to do with the construction, fitting, and care of electrical machinery and the building of electrical car lines, telephones, and telegraph and oceanic cables. *Mining engineering* is concerned with the construction and operation of copper, iron, coal, and other mines. The general tendency is to specialize more closely from time to time the various departments of engineering.

Many important associations of engineers have been organized and are maintained in the United States. The most important among them are the American Institute of Mining Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Society of Civil Engineers, and Western Society of Engineers. All of these have meetings at specified times to discuss important questions in relation to their interests, prepare published reports, and support libraries and periodicals for the general dissemination of knowledge and skill in their respective fields.

**ENGLAND** (in'glānd), a country of Great Britain, the most important member of the United Kingdom of Great Britain and Ireland. It occupies all of the southern portion of the island of Great Britain, except the region in the west, which is included in Wales. It is separated from Scotland by the Solway Firth, the Cheviot Hills, and the Tweed River. The outline is in the form of a triangle, with the southern base 315 miles long, and the greatest distance north and south about 360 miles. Its coast line is greatly lengthened by numerous windings and indentations, the most important of which are the Bristol Channel, the estuary of the Severn, Morecambe Bay, Solway Firth, the Wash, the mouth of the Thames, Lyme Bay, and Plymouth Sound. It is separated from Europe by the North Sea, the Strait of Dover, and the English Channel, and Saint George's Channel and the Irish Sea separate Wales and England from Ireland. The area, according to official determinations, is 50,930 square miles.

**DESCRIPTION.** The surface in the eastern and southern parts is low and gently undulating, and is nicely diversified by slightly rounded elevations and broad, fertile valleys. Ranges of mountains and hills characterize the northern and northwestern part, some of which extend into Wales and form a continuation of the highlands of Scotland. The highest elevations include the Cornish Heights, the Cumbrian Mountains, and the Cheviot Hills; the last mentioned trend from Solway Firth parallel





THE HOUSE WHERE SHAKESPEARE WAS BORN.







to the boundary line of Scotland. Scafell, one of the highest summits of England, is in the northern part and has an elevation of 3,210 feet. The Cumbrian Mountains, a region famed as the Lake District, is in the northwestern part of England and has peaks that rise about 3,000 feet above the sea. Toward the south, extending through Wales, are the Welch or Cambrian Mountains, and in the high peninsula of Devon and Cornwall are the lower summits of the Devon Range. As a whole the surface of England is more productive and better adapted to agriculture than any other part of the British Isles.

Numerous small streams drain the surface, the larger number of which flow into the North Sea, hence the general slope is toward the east. Among the rivers which flow into the North Sea are the Thames, Humber, and Tyne, all of which are important for navigation. The Severn, Mersey, and Wye flow into waters tributary to the Atlantic, and are rendered useful for navigation by various improvements and canals. Other streams include the Trent, Wear, Avon, Tees, Dee, and Eden. However, the Severn is the most important in commerce since it has tides of extraordinary height, flows through productive coal fields, and is the longest of the streams. The Mersey has its source in the Pennine Mountains, and flows through a great manufacturing district. All of the streams and the coastal waters are rich in fish, including the cod, herring, mackerel, and haddock. Hull, Grimsby, and Yarmouth are centers of the fishing industry, but London takes rank as the most extensive fish market in the world, having its center at Billingsgate. The annual production of fish is valued at \$32,500,000.

**MINING.** Coal is the most important mineral. It is produced in large quantities in Yorkshire, Lancashire, Derbyshire, and Nottinghamshire. Durham and York are among the centers of the coal mining region. Iron takes second rank in the mineral output and in its production England is exceeded only by the United States and Germany. Yorkshire and Derbyshire produce the greater portion of iron ore and tin is obtained chiefly in Devon and Cornwall. Lead and zinc are mined in Northumberland and small quantities of copper, gypsum, and salt are obtained in different sections. Building stone of all kinds is abundant, including limestone, granite, and sandstone.

**AGRICULTURE.** The land is owned by a small per cent. of the population. Fully eighty-five per cent. of the surface which is under cultivation is rented in small tracts. Much care is exercised in tilling the soil and maintaining fer-

tility. Estimated upon an acreage basis, more is paid for rent, labor, machinery, and fertilizers than in Canada or the United States. A large number of agricultural laborers have been displaced by the adoption of labor-saving machinery, especially in the sections where cereals are the principal crops. Indian corn is not grown, hence wheat, rye, barley, and oats are the chief cereals. Beans and peas receive much attention and considerable profit is obtained from fruit farming and gardening. Most of the farming is a mixture of crop growing and raising of live stock. England is noted for the Durham, Devon, Hereford, and Sussex breeds of cattle and the Cotswold, Southdown, and Leicestershire sheep. The Berkshire breed of hogs, which are grown extensively, have been naturalized in nearly all countries. Dairy farming receives marked attention. A superior class of horses is raised.

**MANUFACTURES.** Manufacturing is the principal industry. In the output of manufactures England is exceeded only by the United States. Fully five times as many persons are engaged in this enterprise as upon the farms. This condition is brought about from the natural advantage of having an abundance of coal and iron, and the additional fact that England has a large merchant marine to encourage foreign trade in the output of the manufacturing establishments. The textile industry is of first importance and the output consists largely of cotton and woolen goods. Manchester is the greatest center of cotton manufacture in the world, while Leeds has the largest woolen mills. Sheffield and Birmingham are centers of the iron and steel industry. Linens are made in large quantities at Leeds and Barnsley and silk manufacturing is carried on in Coventry and Macclesfield. Other manufactures include pottery, earthenware, chemicals, machinery, pins and needles, steel pens, chinaware, cutlery, and firearms. England has some of the largest shipyards in the world.

**TRANSPORTATION.** A fine system of canals was constructed before railroads were built and these are maintained in a high degree of proficiency. Almost every part of the country can be reached by the navigable waterways, which consist of the coastal waters, estuaries, and streams, and a system of canals that penetrates the trade centers. However, the bulk of the transportation is by railways, which have lines in England and Wales that aggregate 16,500 miles. Many of the canals are controlled by the railways and most of them have trunk lines into London. Much of the local traffic is carried by electric railways, which penetrate



from the cities into nearly all sections of the country.

COMMERCE. See **Great Britain.**

CITIES. London, situated on the Thames, is the capital of the United Kingdom and of Great Britain and is the largest city in the world. Fourteen cities, including London, have a population of more than 200,000. These include, in the order of size, Liverpool, Manchester, Birmingham, Leeds, Sheffield, Bristol, Bradford, West Ham, Kingston-upon-Hull, Nottingham, Salford, Newcastle-upon-Tyne, and Leicester. Eighteen other cities have a population of more than 100,000, including Portsmouth, Bolton, Sunderland, Oldham, Croydon, Blackburn, Brighton, Willesden, Rhondda, Preston, Norwich, Birkenhead, Gateshead, Plymouth, Derby, Halifax, Southampton, and Tottenham. About seventy-eight per cent. of the people of England and Wales live in towns and cities.

EDUCATION AND INHABITANTS. England is divided into forty counties, each of which has the right of local self-government similar to that of the counties in Canada and the United States. Educational facilities are provided under a system of local taxation and grants by the state. A nominal compulsory school attendance law is well enforced. Much of the instruction is in private and denominational schools. A board of education has control of elementary education under a law which went into effect in 1900, by which the efficiency of instruction has been greatly increased. Oxford and Cambridge were the only great centers of higher learning at the beginning of the 19th century, but within that century four others were organized. These include Victoria University and the universities of London, Durham, and Birmingham. The inhabitants number about 610 to the square mile. Emigration and immigration have been about equal the last decade. Those coming into the country are chiefly from other parts of Great Britain, Russia, Germany, and Belgium. Population, 1901, 30,805,466. See **Great Britain.**

GOVERNMENT. See **Great Britain.**

LANGUAGE. The English language spoken in modern times is entirely Germanic in its general character and grammatical construction, though it resembles more nearly the Low German than the higher class in general use. There are three periods in its history, including the Old English, Middle English, and Modern English. The first of these extends from the German Conquest of England in about 450 to the Norman Conquest in 1066; the second to about 1400; and the last embraces all the period from the latter date. Old English or Anglo-Saxon included several dialects, all of which

were highly inflected. Two languages were spoken from the Norman Conquest until about the middle of the 13th century, but these became greatly mixed, and, after a time, the French merged with the Anglo-Saxon, forming the Middle English, the language of Chaucer, Langland, and Wycliffe. Modern English differs so materially from the older forms that few words of the latter resemble the English of the present time. Discoveries, inventions, diversifications of industries, and advancement in science and subtlety of thought have all modified and enlarged the language, and, for that matter, all others. It is estimated that the English language is spoken by about 115,000,000 people, though it is understood by fully 120,000,000.

LITERATURE. English literature is naturally divided into three periods—from its beginning to the Norman Conquest in 1066, from the Norman Conquest to the Reformation under Henry VIII. in 1527-47, and from the Reformation to the present time. The literature of the period antecedent to the conquest may be divided into Celtic, Latin, and Anglo-Saxon, and is of a form that cannot be read except by students making its study a specialty. The most eminent Celtic writers include Llywarch Hen and Merlin or Merddhin, and the Latin writers embrace Ethelwerd and Bede. The Norman period extends from the Conquest in 1066 to the commencement of English literature in 1255. Prior to the Conquest a form of Anglo-Saxon literature had developed. It was represented chiefly in the *Anglo-Saxon Chronicle*, which continued to be published until 1154, when the native language went practically out of use. At that time Latin was generally used in history, law, and philosophy, while French was employed in poetry and the literature for general reading.

After the loss of Normandy, in 1204, the English-speaking people gradually attained to a majority, and we find English employed by Roger Bacon, Geoffrey of Monmouth, and Geoffrey Chaucer. The last mentioned is regarded the first great poet of England, and, though a student of French romance and chivalry, he wrote verse in the English. He translated "The Romance of the Rose" into English, and in later years made a study of Italian literature, thus giving the English the benefits of translations from Dante, Boccaccio, and Petrarch. Among the most famous writings of Chaucer are "The Assembly of Fowls," "The House of Fame," and "Canterbury Tales." Though city-bred, Chaucer was a lover of the fields and flowers and showed a marked sensitiveness to the charm and beauty of the world. His "Canterbury



"Tales" is the most noted of his works. It is written in a poetic form and relates the plan of a company of thirty who journeyed from London to Canterbury, where they designed to visit the shrine of Saint Thomas à Becket. The poem relates the different stories told by each member of the company. Among the contemporary writers of Chaucer are the poets, John Gower (1325-1408), Robert Langland (1332-1406), and the prose writer, John Wycliffe (1324-1384). The writings of this period took on the form of the English as written at the present time.

The writers of England between the time of Chaucer and the end of the 16th century were largely imitators of that poet, including James I. of Scotland, John Skelton (1460-1529), and Sir Thomas More (1478-1535). It may be said that this period was generally barren, but with the invention of printing an appetite for literature began to awaken. This was due largely to the fact that the crusades came in contact with Greek scholarship in Constantinople and Southern Europe, where a taste for Greek and Roman literature was still alive. When the Turks drove the Greek scholars from Constantinople in 1453, they spread rapidly toward the west and found many young persons eager to learn the classics and philosophy of Greek and Roman masters. There was not only a tendency to journey to Italy for the purpose of studying, but scholars were induced to come to Western Europe and gradually found their way to England. It was the height of ambition to be able to read Homer and Plato, and to discourse on the writings of Demosthenes and Cicero.

The discovery of America induced a greater interest in geography, opened new avenues of commerce and social activity, and rapidly prepared for a transition from the Middle Ages to the dawn of learning. While Erasmus, the Dutch scholar and philosopher, was teaching Greek at Oxford, he aroused an interest in the New Testament, and published "The Christian Soldiers' Dagger." William Tyndale translated the New Testament into English, which he published in Germany in 1525, and circulated it extensively in England. In the meantime the Reformation in England came on in the reign of Henry VIII., who separated England from Rome, thus paving the way for the enthusiasm always attending a great epoch prominently affecting a large number of people. Sir Thomas More, the author of "Utopia," was beheaded, and many other writers suffered a similar fate.

Among the prominent literary men immediately after the Reformation are Sir Thomas Wyatt,

the first artistic poet, and Henry Howard Surrey, a writer of sonnets and blank verse. These and other writers gave an impetus to literature by making songs and sonnets national, and prepared the way for the Elizabethan age of literature. This age is famous because of the large number of men who came forward with writings of merit, such as Edmund Spenser, William Shakespeare, Ben Jonson, Roger Ascham, Francis Bacon, and Lyle the Euphuist. Other writers of this period include Peele, Marlowe, Greene, Herbert of Cheshire, Middleton, Marston, Raleigh, and North. The writings of Shakespeare, which appeared between 1585 and 1616, are the most prominent of the period and in many respects are the finest in English literature. They possess a wealth of imagination rarely equaled, and embody passages of the gravest wisdom, the purest motives, and the tenderest feeling.

Ben Jonson holds a high rank as a song writer and produced a number of excellent comedies and other plays. Philip Massinger (1583-1640) ranks among the dramatists of this period; Abraham Cowley (1618-1667), among the lyric poets; Thomas Hobbes (1588-1679), among the historians; and John Milton, among the poetical and prose writers. Milton's "Paradise Lost" is a masterpiece of English literature. Other writings of Milton include "Paradise Regained," "Il Penseroso," "Hymn on the Nativity," and "L'Allegro." Other religious writers of the same period include James Usher (1581-1656), Jeremy Taylor (1613-1667), John Biddle (1615-1662), and Richard Baxter (1615-1691). John Bunyan, author of "Pilgrim's Progress," marks an epoch in English literature. Few works have been so widely translated and so extensively read as his masterpiece, the "Pilgrim's Progress."

John Dryden wrote many popular plays after the Restoration. He is the author of "Hind and Panther," a religious discussion, and "Absalom and Achitophel," a famous satire. The death of Dryden in 1700 marks the beginning of the Augustan age in English literature and its greatest poet is Alexander Pope. This age witnessed the advent of many scientific and philosophical writers, among them Sir Isaac Newton, John Ray, John Locke, Richard Steele, Joseph Addison, Jonathan Swift, James Thompson, and Thomas Gray. James Thompson is best remembered by his "Seasons," Thomas Gray by his "Elegy Written in a Country Churchyard," and Daniel De Foe by his "Robinson Crusoe." Samuel Richardson published "Pamela," one of the first modern novels, and Henry Fielding is favorably known by his



"Joseph Andrews," "Tom Jones," and other novels.

Samuel Johnson stands as the literary representative of the second half of the 18th century. His most famous works include "Lives of the Poets" and "Vanity of Human Wishes." The name of Oliver Goldsmith is inseparably connected with that of Johnson. He is the writer of "Vicar of Wakefield," "The Deserted Village," and the comedy "She Stoops to Conquer." William Cowper is an eminent poet of the latter part of the 17th century and is noted for his introduction of profound religious sentiment. Richard B. Sheridan is the author of "School for Scandal" and a number of other popular writings. David Hume, Adam Smith, Edmund Burke, and Edward Gibbon are among the most eminent historians and political writers of the latter part of the 18th century.

The 19th century is the greatest in the history of English literature, both in the character of the productions and in the number of writers. The early writers of this period include Samuel T. Coleridge, whose "Ancient Mariner" represents the finest type of ballads; William Wordsworth, author of "Recollections of Early Childhood," and Sir Walter Scott, writer of "Ivanhoe," "Rob Roy," "Kenilworth," "Lay of the Last Minstrel," and "Lady of the Lake." Other poets of the 19th century include Lord Byron, Percy Shelley, John Keats, George Crabbe, Leigh Hunt, Thomas Moore, Alexander Smith, Elizabeth Browning, Robert Browning, Lord Lytton, Robert Buchanan, Alfred Tennyson, William Morris, Matthew Arnold, and Charles Mackay. The novelists embrace Jane Austen, Lord Lytton, Benjamin Disraeli, Charles Dickens, Charlotte Brontë, Charles Reade, Charles Kingsley, George Eliot, William Thackeray, George Meredith, R. D. Blackmore, George MacDonald, and Thomas Hardy. Among the philosophical writers are John Stuart Mill, Alexander Bane, Sir W. Hamilton, Charles Darwin, Herbert Spencer, Max Müller, Thomas H. Huxley, John Tyndall, and T. H. Greene. The historical and biographical writers include Thomas B. Macaulay, Thomas Carlyle, John R. Green, Lesley Stephen, John Morley, Cornwall Lewis, James A. Froude, Alexander W. Kinglake, William E. Lecky, and Dean Stanley. Among the prominent theological writers are Isaac Taylor, Julius Hare, Stopford Brooke, Henry P. Liddon, Augustus Hare, John H. Newman, Richard Whately, and John Maurice. Other writers of note include John Ruskin, Harriet Martineau, W. E. Gladstone, Sir Arthur Helps, Matthew Arnold, Thomas De Quincey, George Grote, Michael Far-

aday, Edward A. Freeman, and Thomas Henry Hall Caine.

The beginning of the 20th century marks a period of great activity in the field of literature. In 1907, which is a representative year, there were issued a total of 7,701 new books in England, besides 2,213 new editions of books formerly published. The greatest number were in the line of fiction, a total of 1,862 new books and 920 new editions of old books. Those coming next in numerical order are books on the arts and sciences, theology, history, politics, education, and poetry. The period is noticeable for its greater exchange of books with Canada and the United States, especially in the lines of fiction, theology, and politics. Among the more widely read recent authors may be named Winston Churchill, H. Rider Haggard, Alfred Austin, Frances Hodgson Burnett, Edith Wharton, Rudyard Kipling, James Bryce, George Otto Trevelyan, Arthur James Balfour, Andrew Lang, and John Morley.

**HISTORY.** England was invaded by the military forces of Caesar in 55 B. C. and later became a Roman possession. Its history proper begins with the withdrawal of the Roman forces in the early part of the 5th century A. D., when the Germanic people invaded portions of what was known as Albion or Britain. These Germanic people first moved west from Germany into the lands now called Denmark and Schleswig. Later many removed to England, being attracted by opportunities of development and numerous settlements that had previously been made by the Gauls, Germans, Iberians, Dacians, Italians, Phrygians, and others that located in the country during the time of the Roman occupation. Those conquering the country were made up largely of Jutes, Angles, and Saxons, the term Anglo-Saxon originating from the latter two, and the country itself deriving its name from the Angles or Inglisc.

The German ideas and forms of local government began to be introduced about the middle of the 5th century, and from them the language and civil institutions largely originated. From this mixture of races, which was influenced, no doubt, by non-Aryan races that preceded them, among them the Euskarians and Celts, sprang the English, a self-reliant, industrious, ambitious, and daring people, who built up a language and institutions which have in a large measure influenced the trend of modern arts and civilization.

The early history and events that led to the final building of an independent kingdom were complicated by many civil and religious struggles, which extended themselves over a



period including many centuries. The Jutes formed settlements in the Isle of Wight, Kent, and adjacent regions, while the Saxons occupied tracts in the south, and the Angles in the north. The struggle for supremacy which resulted from conflicting claims cover a period of 150 years. It finally terminated to the advantage of the Teutonic tribes, who ultimately occupied the entire southern portion of Britain, except only Wales, West Wales, and Strathclyde. The territorial divisions were small, though seven of the most important formed an alliance of friendship known in history as the *Heptarchy*. This protracted struggle in the course of time resulted in annexing the smaller divisions to the more powerful neighbors. Egbert succeeded in securing sovereignty over the seven kingdoms in 827, and made himself ruler of a large part of the country, to which the name England was first applied. Prior to the Teutonic conquest Britain was largely isolated from continental Europe, but soon after the learning and culture of older civilization was introduced, a closer intimacy was established, and a written literature began to form. Though the conquerors were strangers to Christianity, they were converted district by district after a severe contest, which reached its height in the 7th century. Soon after the Danes began to make incursions. About fifty years after the formation of the United Kingdom they became masters of the whole of England, though their reign was only momentary.

Alfred the Great ascended the throne in 871 and succeeded in defeating the Danes at Ethandune in 878. The nine succeeding monarchs were more or less in conflict with Danish incursions, the latter of whom, Edmund II., was compelled to surrender a portion of his kingdom to Canute, and, when the former was assassinated in 1017, the sovereignty of the entire country fell into the hands of the Danes. The name *Great* was attached to Canute on account of his personal qualities and the extent of his possessions, which included, besides England, Denmark and Norway. He was followed by two Danish kings who managed the government with moderation, though their reign was disturbed by Norman incursions and Saxon revolts. Two Saxon kings followed the Danish, but in 1066 the country was conquered by William of Normandy. This military achievement, known in history as the *Norman Conquest*, caused the country to be governed by Norman kings 69 years. After the death of Henry I., Stephen, son of the Count of Blois, raised an army in Normandy with which he proceeded to England and claimed the kingdom. Civil

war was carried on for a series of years, but finally terminated in a peace, in which Stephen was recognized as sovereign for life, but Henry, son of Matilda, daughter of Henry I., was to succeed him on the throne. As Stephen died in 1154, Henry II. became his successor, and the Plantagenet line of succession ruled England for 245 years.

During the reign of the Plantagenet line the country was more or less disturbed by conflicting claims of the people against the feudal system of land ownership established after the Norman Conquest. Wars with Wales and Scotland likewise tended to distress the government, but they operated to unite the people of England as against foreign invasion, although they were divided by the conflicting pretensions of the Lancasters and Yorkites. The claims of the people to their ancient rights and liberties were recognized in the *Magna Charta*, called the Great Charter, on June 15, 1215, and, under the leadership of Simon de Montfort, Henry III. was seized and required to pledge the organization of Parliament, which gave the people the right of representation and led to the permanent establishment of the House of Commons. Richard II. was compelled to surrender to 60,000 malcontents. He was succeeded in 1399 by Henry IV., the first representative of the house of Lancaster, which governed England for 62 years. The prosecution of the Lollards took place in the reign of Henry IV. He was succeeded by Henry V., in 1413, who gained marked successes over the French and was to succeed to the throne of France. However, the advantages he gained were lost by his son, Henry VI., largely through the achievements of Joan of Arc. His reign was succeeded by the York dynasty after a long line of struggles for supremacy.

Henry Tudor gained the Battle of Bosworth in 1485, in which Richard III. was slain, and the throne was ascended by Henry VII. During the reign of his successor, Henry VIII., England was disturbed by the Reformation. Events formed quickly by which Elizabeth ascended the throne and became the nominal head of the Protestant faith. Her reign was characterized by remarkable rivalry in architecture, literature, and commercial competition for colonization in opposition to Spain. She was succeeded by James VI. of Scotland, son of Mary, Queen of Scots, who assumed the title of James I. of England. This placed the Stuarts upon the throne after a long contention, but their sovereignty was weakened by constant disputes with the Parliament and the rise of the republican forces, stimulated largely by Oliver Crom-



well. The people finally wrung from the king the right of petition, by which the power to levy taxes became vested in the House of Commons, and the king was abridged in his authority to govern in many matters of vast interest. Cromwell succeeded in establishing the Commonwealth in 1649, with himself as Lord Protector, though it survived him but a short time, terminating abruptly under the feeble protectorate of his son, Richard, and Charles II. was called to the throne by the Restoration of 1660.

The old dissensions between the king and Parliament soon broke out anew and William of Orange, supported by the Whig party, drove James II., successor of Charles II., from the country and became the first parliamentary king. When Queen Anne ascended the throne, she found the grand alliance with Holland and Germany of much value. Her government was further strengthened by the success of her army at Blenheim in 1704 and at Ramilies in 1706, under Marlborough. The history of England became merged into that of Great Britain in 1807, by virtue of the act of union passed in that year uniting England and Scotland. In 1714 the Hanover dynasty succeeded to the throne and the last attempt of the Stuarts was thwarted in 1715. For more recent history, see **Great Britain.**

Below is a complete list of English sovereigns:

DYNASTY AND TITLE.	BEGAN.	YEARS.
ANGLO-SAXON LINE.		
Alfred, King of Wessex.....	871	30
Edward I., King of Wessex.....	901	24
Athelstan, King of England.....	925	15
Edmund I.....	940	6
Edred.....	946	9
Edwy.....	955	4
Edgar.....	959	16
Edward II.....	975	3
Ethelred.....	978	38
Edmund II.....	1016	1
DANISH LINE.		
Canute.....	1017	19
Harold I.....	1036	3
Hardicanute.....	1039	2
SAXON LINE.		
Edward III.....	1041	25
Harold II.....	1066	..
NORMAN LINE.		
William I.....	1066	21
William II.....	1087	13
Henry I.....	1100	35
HOUSE OF BLOIS.		
Stephen.....	1135	19
PLANTAGENET LINE.		
Henry II.....	1154	35
Richard I.....	1189	10
John.....	1199	17
Henry III.....	1216	56
Edward I.....	1272	35
Edward II.....	1307	20
Edward III.....	1327	50
Richard II.....	1377	22

DYNASTY AND TITLE.	BEGAN.	YEARS.
HOUSE OF LANCASTER.		
Henry IV.....	1399	14
Henry V.....	1413	9
Henry VI.....	1422	39
HOUSE OF YORK.		
Edward IV.....	1461	22
Edward V.....	1483	..
Richard III.....	1483	2
HOUSE OF TUDOR.		
Henry VII.....	1485	24
Henry VIII.....	1509	38
Edward VI.....	1547	6
Mary.....	1553	5
Elizabeth.....	1558	45
STUART LINE.		
James I.....	1603	22
Charles I.....	1625	24
COMMONWEALTH.		
Oliver Cromwell.....	1649	10
Richard Cromwell.....	1658	..
STUART LINE.		
Charles II.....	1660	25
James II.....	1685	3
HOUSE OF ORANGE.		
William and Mary.....	1688	14
STUART LINE.		
Anne.....	1702	12
HANOVER LINE.		
George I.....	1714	13
George II.....	1727	33
George III.....	1760	60
George IV.....	1820	10
William IV.....	1830	7
Victoria.....	1837	64
Edward VII.....	1901	..

**ENGLAND, Church of,** the dominant religious body of England and the established church of that country. It claims to be a true and apostolical church, teaching and maintaining the doctrines of the apostles. The law recognizes it as the national church and protects it in the endowments; that is, the gifts of land and tithes made to it in ancient times. As at present organized, it dates from the time of Henry VIII., who abolished papal authority in England and established the independence of the Church of England. He became the supreme head of the church, dissolved the monasteries, and convoked an assemblage of clergymen to pass upon ten articles of faith drawn up at his suggestion. This convocation declared against the invocation of saints, the worship of images, and the belief in purgatory, and expressed the view that the whole Christian faith is to be found in the Bible. This was soon followed by the publication of the Bible in English, which greatly tended to spread the reformed doctrine, and prayers and services began to be in English. During the short reign of Edward VI., son of Henry VIII., the reforming element had complete sway, and came to look with favor upon the teachings of Luther and Calvin, but a strong reaction occurred when Mary, who was a Catholic, ascended the throne. She exerted an unrelenting influence



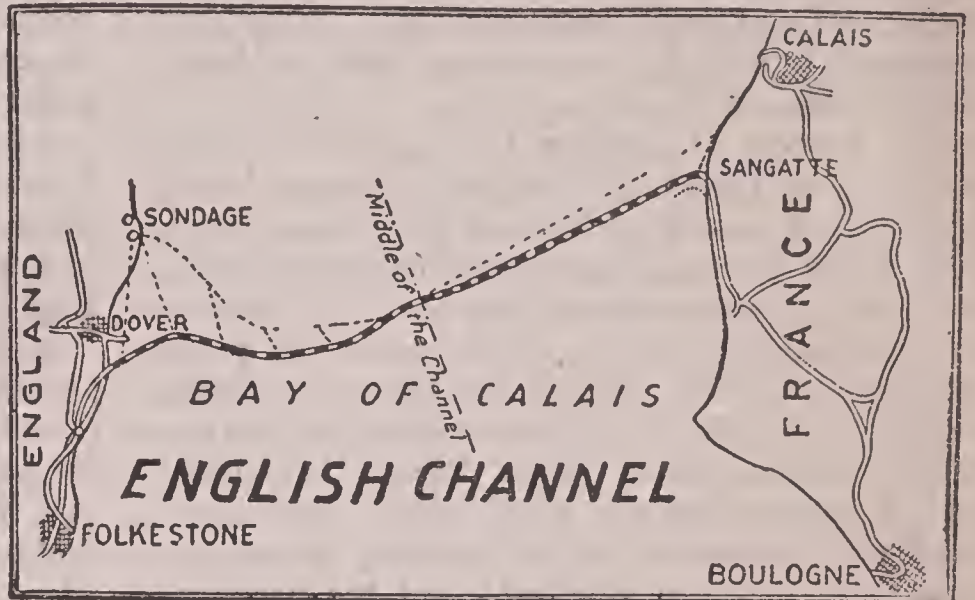
to reestablish Catholicism, and many of the reformed clergy escaped to the continent, while those remaining in England were persecuted as heretics or compelled to retract.

Queen Elizabeth ascended the throne in 1658 and favored the Reformation, but contentions now arose with the Puritans, who had gained many adherents during the reign of Queen Mary. The Thirty-Nine Articles, originally 42 in number, but now 39, had been drawn up in 1551 under Cranmer and Ridley, and these were reviewed and revised. A convocation of the clergy accepted the amended articles and they were ratified by the queen, and Parliament legalized them in 1563 and later made it compulsory for the whole clergy to subscribe to them. Together with the homilies and prayer books, they constitute a complete exposition of the tenets held at present by the Church of England on all the main points of doctrine and discipline. The church has possession of the ancient religious edifices and the cemeteries attached to them. It is protected by law in the exercise of its right and its teaching is accepted by the state. It is one of the states of the realms and has an integral part in all legislation.

The government of the Church of England is under a system of jurisprudence made up of three elements; namely, the common law, the canon law, and the statute law. The first consists of customs and precedents; the second, of canons passed or accepted by the English synods; and the third, of acts of Parliament relating to the church. Two archbishops, those of Canterbury and York, preside over the two provinces into which the country is divided, but the Archbishop of Canterbury is the primate of all England. The provinces are divided into dioceses, which are presided over by bishops, and those subject to them include the archdeacons, deans, canons, prebendaries, rectors, vicars, and curates. Missionary work is carried on in all parts of the civilized world. The Episcopal Church (q. v.) is a branch of the Church of England.

**ENGLEWOOD** (ĕn'g'l-wōd), a city of New Jersey, in Bergen County, fourteen miles north of New York City. It is situated near the Palisades of the Hudson River, on the Erie Railroad, at the edge of the Hackensack Valley. The chief buildings include the public library, a hospital, and the high school. Many New York business men reside in Englewood. It was incorporated as a village in 1860 and chartered as a city in 1896. Population, 1905, 7,922.

**ENGLISH CHANNEL**, an important body of water which connects the Atlantic Ocean with the North Sea and separates France from England. On its eastern end it is connected with the Strait of Dover, where it is twenty-one miles wide, and at the western end it has a width of about one hundred miles. A strong current running eastward passes through the channel, influenced largely by the Gulf Stream, and its waters are often disturbed by storms.



ROUTE OF PROPOSED TUNNEL FROM ENGLAND TO FRANCE.

The Isle of Wight and the Channel Islands are within the channel. Among the English ports are Brighton, Dover, Falmouth, Plymouth, and Southampton. The French ports include Boulogne, Calais, Cherbourg, Dieppe, and Havre. A plan to construct a railway tunnel from Dover, England, to Calais, France, was proposed as early as 1875. Several bills were before Parliament in 1908 and since, but no material progress has been made, aside from surveying the route from Dover to Sangatte. The estimated cost of the tunnel is \$80,000,000.

**ENGLISH LANGUAGE.** See **England**.

**ENGLISH LITERATURE.** See **England**.

**ENGRAVING** (ĕn-grāv'ing), the art of cutting marks or figures on wood, stone, or metal. Engraving is very ancient, being mentioned in Exodus xxviii, 36. The oldest records were cut in stone, some by making depressions and others by cutting the stone away and leaving the characters in relief. In Egypt the hieroglyphics were cut in the granite monoliths and on the walls of tombs and chambers. Later the Greeks learned the art from the Egyptians and Phoenicians. The discovery of the practicability of taking impressions upon paper from an engraving was made by a Florentine artist named Maso Finiguerra, about 1440. In taking a cast in sulphur of some engraved church ornaments,



a quantity of dust and charcoal, which had gathered in the lines of the engraving, came out upon the sulphur and gave an unexpected and suggestive effect.

Many kinds of engravings are employed in the arts, depending upon the purposes they are to serve. They include *line engravings* on metal plates, usually copper or steel; *etchings* on metal in which the lines are corroded by means of acid; *mezzotints*, in which there are no lines, but only shades produced by roughening the surface of the metal; and *woodcuts*. Wood engravings intended for printing long preceded those made of metal.

The process of printing from engravings was common in China in the 10th century, but it remained a secret with them for many years. The Italians and Germans attained considerable skill in engraving as early as the 13th century, but the earliest known niello proof on paper was made in 1452. Within the three succeeding centuries the art became extremely productive under such artists as Albert Dürer (1471-1528) and Peter P. Rubens (1577-1640), and developed until imitations of all varieties of engravings were made in woodcuts, but the practiced eye sees at a glance that the result is nothing but a woodcut. Through lack of encouragement, change of fashion, and the adoption of other cheaper methods of production the woodcut and line engravings are going rapidly out of use. Besides, there are not sufficient inducements for young men to pursue study in this particular process of engraving, for the reason that the newer and more rapid methods are supplanting it.

Copper is used extensively in making plates for certain kinds of engravings, especially those in which a soft metal is serviceable. The invention of steel engraving in the United States has brought that metal into use for the finer pictures, owing to its greater hardness, which enables it to overcome the wear of printing and makes it possible to take a larger number of impressions than can be gotten from a copperplate. Etchings are made by covering a prepared metallic surface with a thin coat or ground, which is not affected by acid. The design is traced with a pointed tool, which lays the metal bare wherever it touches. A wall of wax is raised around the design to hold the diluted acid, when poured on. For a copperplate this consists of five parts water and one part nitrous acid; for steel, pyroligneous acid one part, nitric acid one part, water six parts. The acid corrodes on the lines made through the ground. This is called biting in. When a sufficient depth is attained for lighter tints of

the etching, the acid is removed and the surface is washed and allowed to dry. The parts of sufficient depth are now varnished and, when dry, another biting in deepens the lines not varnished, and, when deep enough for the second tint, it is removed again. This may be repeated several times, if necessary. The process of deepening the lines in this way is called *rebitting*. Etchings are sometimes finished by a graver and partake of the character of a line engraving. Glass may be engraved in a similar manner. Soft-ground engraving is another of the many ways of drawing the design. In mezzotint engraving the entire surface of the plate is roughened slightly, after which the drawing is traced, and then the portions intended to show high lights or middle lights are scraped or burnished, and the shadows are strengthened. Engravings so produced resemble photographs.

It is to be noted that the photomechanical processes of engraving have been improved materially since 1880. These include the *half-tone process* invented by Frederic E. Ives, an American, in 1881; the *line-relief process*; the *intaglio-engraving process*; and the *wax process*. The half-tone is used largely in the better class of magazines; the line-relief process, for cheap newspaper illustrations; the chalk-plate, for small newspaper cuts and generally by the government in making weather maps; and the wax process, for making railroad, geographical, state, county, and town maps.

**ENID** (ē'nīd), county seat of Garfield County, Oklahoma, about 35 miles north of Kingfisher. It is on the Saint Louis and San Francisco, the Chicago, Rock Island and Pacific, and other railroads, and is surrounded by a fertile farming region. The chief buildings include the high school, the county courthouse, and several churches. It is important as a shipping center for grain and live stock. The manufactures include flour, brick, ice, clothing, confectionery, and machinery. It has grown very rapidly since 1893, when the Cherokee strip was opened for settlement. Population, 1900, 3,444; in 1910, 13,799.

**ENSILAGE** (ěn'sī-lāj), in agriculture, a process of preserving green forage crops for stock food. Dairy farmers have a method of storing green fodder in mass and covering it over in deep trenches cut in a dry soil, by which the natural condition is readily preserved, though the ordinary way of handling ensilage is by cutting the crop, usually corn, and placing it in an air-tight mow or silo for curing. The crop product is stored as near as practicable to the place of feeding in order to insure the greatest possible convenience. In corn culture



for ensilage farmers aim to produce the largest possible quantity of both corn and forage. The crop is cut a brief period before being ripe enough for ordinary cutting. It is then taken to the mow and, after being cut in proper lengths, is carefully stored by placing successive layers and tramping them as firmly as possible. The ensilage may be stored to a height of 20 or 30 feet, and, after settling several days, the upper portion may be refilled. Another method which has been introduced recently is to cut the fodder by a machine, which at the same time elevates the finely cut product into the top of the silo by a current of air. The silo should be air tight and so constructed that it can be emptied from the side. This class of forage crops is a very nutritious and wholesome food for cattle, sheep, and horses. Successive experiments have proved that more food can be secured per acre by the culture of crops and their preservation as ensilage than in any other way.

**ENTOMOLOGY** (ĕn-tō-mōl'ō-jŷ), the science which treats of insects. Aristotle called attention to one of the essential characteristics by pointing out that the bodies of insects are cut or divided into segments, from which their name was derived. See **Insects**.

**ENTOZOA** (ĕn-tō-zō'ā), the name given by Karl Asmund Rudolphi (1771-1832), a Swedish naturalist, to a class of animals living within the bodies of other animals. They are found in the intestines, liver, brain, muscles, and other tissues. According to a group of writers the entozoa are divided into three classes: coelmintha, or hollow worms; sterelmintha, or solid worms, as the tapeworms; and accidental parasites. Some writers treat them as equally mature and immature; the latter, inclosed in cysts, being far the most dangerous when found in inclosed cavities, as the lung or liver. See **Parasites**.

**ENVELOPES** (ĕn'vēl-ōps), in botany, the whorls of alternated leaves designed to protect the organs of fructification from injury. In very rare cases there are none, sometimes one, though generally two—the calyx and the corolla. The name also applies to paper coverings for letters or notes that came into extensive use with the growth of the postal system. They are now shaped, folded, and gummed by machinery. A single machine of the larger type has a capacity to turn out 50,000 envelopes per day.

**ENVIRONMENT** (ĕn-vī'rūn-mĕnt), a term used to indicate the sum of external conditions that limit or direct the activities of an individual. It is frequently used in distinction of the term heredity, which is the tendency possessed

by an individual to resemble the ancestral stock in general characteristics, while environment includes everything which is not identified with the individual self. The subject divides itself into two kinds, the physical and the social. The former includes all the outside influences with which one may come in contact, such as climate, food conditions, the physical features of a country, the absence or presence of enemies, etc. Social environments embrace principally the customs, habits, industries, religion, institutions, etc. Physical environments exercise a marked influence upon both animal and plant life, and social environments refer more particularly to the animal kingdom.

The word *environment*, in the field of education, expresses best the things which make for character by their silent influence. These mold lives from day to day by their silent impressions upon the individual. Children reared in clean and tidy homes, under the influence of moral and humane teaching, obtain a bent of desires and thoughts toward the orderly and noble. The home and the school share, perhaps, equally the responsibility of early impressions, hence the need of providing such environments as will tend toward and uplift the moral and physical life of the young. Such influences, together with the part exercised through outside factors, are potent in determining the character of an individual as well as of the community in which he lives. It may be said that under primitive conditions of civilization social environments exercise a minor influence, but with the advancement of society and the enlargement of communities comes the need of exercising great care in selecting or shaping the environments with which the young may come in contact.

**EOCENE** (ē'ō-sĕn), in geology, the first great division of the Tertiary period. It was the dawn of the present order of shells and mollusks, a few birds, reptiles, and all the invertebrate animals still living. Among the plants both endogens and dicotyledons were numerous. Man had not appeared upon the earth. The Eocene strata consist of marl, limestones, clays, and sandstones. In most cases the strata were deposited in salt or brackish waters.

**EOZOIC** (ē-ō-zō'ik), the name given to rocks of the Laurentian age, in which, so far as at present known, the earliest traces of life are found.

**EPACT** (ē'păkt), a number introduced into the Gregorian calendar, employed to express in days the age of the moon on Jan. 1, and thus to determine its age on March 21. The Council of Nice appointed Easter Sunday to be the first



Sunday after the first full moon following the vernal equinox, and this Sunday is now found by a formula. When the epact is known, it is possible to calculate the dates of all the following lunar phases throughout the year. To find the epact it is necessary to know the golden number, which is ascertained by adding 1 to the date of the year and dividing the sum by 19. The remainder is the golden number, except when the remainder is 0, when the golden number is 19. Having found the golden number, the epact of any year between 1900 and 2199 may be found by the following table. Suppose the golden number to be 15, it will be seen that the epact is 3:

GOLDEN NUMBER	EPACT	GOLDEN NUMBER	EPACT
1	29	11	19
2	10	12	30
3	21	13	11
4	2	14	22
5	13	15	3
6	24	16	14
7	5	17	25
8	16	18	6
9	27	19	17
10	8		

**EPHESUS.** (ěf'ě-sūs), an ancient city of Asia Minor, situated in Lydia, near the mouth of the Cayster River. It was classed with the twelve Ionian cities founded by the Greeks, and was regarded sacred from an early period, though its importance dates from a time quite more recent than the Trojan War. The first of its great temples was founded about 650 B. C., completed after 120 years, and destroyed in 356 by Herostratus. It passed successively under the possession of the Lydians, Persians, Greeks, and Romans. In the time of Augustus it attained its greatest importance as a trade center, and was for three years the residence of Saint Paul, who afterward wrote his "Epistle to the Ephesians," while in prison at Rome, to the church at Ephesus. The second magnificent temple was destroyed by the Goths in 262 A. D., and they so plundered the city that it never again recovered its importance. The Third Ecumenical Council of the Christian church was held at Ephesus in 431, at which resolutions condemning Nestorius were agreed upon.

The famous temple of Diana, counted among the seven wonders of the world, was located a mile east of the city, and at the birth of Alexander the Great the Ephesians burned it to add luster to his name. Many contributions were given and heavy taxes levied for the purpose of rebuilding it with even greater splendor, the new structure being the greatest of Grecian temples and containing 130 columns. This remarkable structure was 225 feet wide and 423

feet long, and contained statues and pictures of the most noted Grecian masters. Nero robbed it of its treasures and the Goths burned it, and its destruction was finally accomplished by an edict issued in 381 against pagan worship by Theodosius I. After numerous excavations were made by Europeans, the site of the temple was discovered in 1869, and many interesting remains were secured. In 1899 the Austrian Institute at Ephesus excavated several valuable relics, among them statues, a great market place, and a remarkable theater. Aiasoluk, a small village, is near the site of the city.

**EPIC** (ěp'ík), a poem characterized by its narrative and descriptive style, especially one that celebrates in stately, formal verse the real or mythical achievements of heroes or great personages. Epic poetry is distinguished from lyric by giving prominence to the narration of action rather than the expression of emotion, and from drama in that the epic contains frequent allusions to the author as narrator. Among the great sacred epics of the world are Dante's "Divina Commedia" and Milton's "Paradise Lost." The heroic epics include Homer's "Iliad" and "Odyssey," Virgil's "Aeneid," Tasso's "Jerusalem Delivered," and Aristo's "Orlando Furioso." Among humorous epics are Pope's "Rape of the Lock," "Battle of the Mice," and "Reynard the Fox." Byron's "Childe Harold" is written in a narrative style, but abounds in sentiment, and is both epic and lyric. This is true of Burns's "Cotter's Saturday Night," Bryant's "Thanatopsis," and Longfellow's "Evangeline."

**EPIDEMIC** (ěp-ĩ-děm'ík), a disease which attacks many persons at the same time, spreading suddenly, often extremely virulent and fatal at first, then gradually becoming spent and feeble, so that the earliest stages are usually the worst. The plague, cholera, influenza, and la grippe are epidemics, while scarlet fever, typhoid fever, smallpox, diphtheria, and chicken pox are usually so regarded. However, some of these are classed more generally as contagious diseases. All that can be said with certainty about epidemics is that at the beginning there must be some distempered conditions around us, and our systems be predisposed to the reception of the specific poison, which causes the disease.

**EPIDERMIS** (ěp-ĩ-děr'mīs), in anatomy, the cuticle or scarf-skin, constituting the external layer of the skin and protecting inner ones. In man it is thickest on the palms of the hands and soles of the feet. It possesses an organized structure, but has no nerves or blood vessels. The outermost layer of cells covering



the surface of plants, when there are several layers of tissue, is also called epidermis.

**EPIGRAM** (ěp'ĩ-grām), a name given by the Greeks to a poetic inscription on a public monument. It was applied originally to a short verse or poem having only one subject, and was finished by a witty or ingenious turn, but is now applied to any short composition expressed neatly and happily, as "The child is father of the man."

**EPILEPSY** (ěp-ĩ-lěp'sŷ), or **Falling Sickness**, a disease which derives its name from the suddenness of the attack. Usually the patient becomes unconscious and falls to the ground convulsed, turgid, and livid. This condition is generally accompanied by frothing at the mouth, a choking sound in the windpipe, biting of the tongue, and a suffocating tendency. After the patient reaches an exhausted, comatose condition, life is no longer in danger. Epilepsy may be caused by fear, passion, or an injury to the brain. In severe cases there is little hope of a cure, but patients may be afflicted with it from childhood until old age. Children often outgrow it at the period of adolescence.

**EPILEPTICS** (ěp-ĩ-lěp'tiks), the persons afflicted with epilepsy. Within recent years considerable progress has been made in colonizing persons suffering with this disease, the purpose of which is to treat and care for them in the most satisfactory and efficient manner. The first colony for epileptics was established by Pastor von Bodelschwingh near Bielefeld, Germany, in 1867, and is known as the Bethel Colony. In 1890 the settlement contained, with its officers, physicians, nurses, and employees, about 3,600 persons. Under frugal treatment it has been possible to render much good to the unfortunates afflicted with the disease, the number of cured discharged at the end of each year aggregating twenty-one per cent. of the entire number treated, while about the same per cent. are discharged as incurable.

The marvelous development and success of the German colony led to a widespread movement in Europe and America to establish like institutions. Similar colonies are now located at Zurich, Switzerland; in Holland, France, and England, while the movement in the United States has attracted the attention of many State legislatures. The colony for epileptics in the State of New York is located at Sonyea; that of Pennsylvania, at Oakbourne; that of Massachusetts, at Monson; and that of New Jersey, at Skillman, though there are many others. Colonies of this class are usually located on farms comprising from 200 to 1,200 acres of land, on which the labor of those afflicted is

utilized in facilitating the support. A late report shows that the number of epileptics in the United States is 135,000, of which 9,500 are in Illinois, 12,500 in New York, and a proportional number in the other states and territories.

**EPIPHANY** (ě-pĩf'á-nŷ), a festival of the Christian church, instituted to commemorate the visit of the Magi or wise men to the infant Jesus Christ, for whom they brought presents from the East. It is celebrated on January 6th and is sometimes termed the *manifestation of Christ to the Gentiles*.

**EPIRUS** (ě-pĩrŷs), a country of ancient Greece, surrounded by Illyria, the Ambracian Gulf, the Pindus Mountains, and the Ionian Sea. It corresponded quite nearly to modern Albania. Among the interesting towns were Donoa and Ambracia. The region was noted on account of its supply of heavy timber and the production of corn and domestic animals. Among the people were several colonies, the Grecians proper occupying largely the southern coastal district. Pyrrhus was the most celebrated king of Epirus and long waged war upon the Romans, but it finally became a province of Rome in 168 B. C. To prevent further insurrections the Romans plundered the country, razed seventy towns, and sold 150,000 of the people into slavery. It shared in the fortunes of the Roman and the Byzantine empires for many centuries, and was conquered by the Turks in the 15th century. Since the 14th century a large per cent. of the inhabitants have been made up of Albanians. A small strip of land situated east of the Arta River was ceded by Turkey to Greece in 1881, along with most of Thessaly.

**EPISCOPAL CHURCH** (ě-pĩs'kō-pəl), or **Protestant Episcopal Church**, a Christian denomination, the American branch of the Church of England. It became an independent ecclesiastical body in 1789, when it adopted its constitution at Philadelphia, Pa. It adheres strictly to the doctrine, discipline, and worship of the mother church, but the prayer book is altered so as to be consistent with the changes in the political condition of the country. Little progress was made in extension work until 1811, and within a period of ten years churches were organized in thirteen of the states. A movement toward suppressing the outward developments of what is known as ritualism caused extended controversies, especially in the general conventions of 1868 and 1874, and the two factions came to be known as the *low church* and the *high church* parties. Those opposing the ritual belong to the former, but the high churchmen are the dominant influence.



Changes in the prayer book or the constitution of the church can be made only by the general conference, which holds a session every three years. This body is composed of two houses, known as the house of clericals and lay deputies, and as the house of bishops. Within the United States there are 65 dioceses and 22 missionary jurisdictions, and an extensive line of missionary work is done in all the continents. In 1907 the church had 7,564 parishes and missions, 5,203 clergy, and 860,998 communicants. Among the organizations to promote Christian and charitable work are the Brotherhood of Saint Andrew, the Daughters of the King, the Church Temperance Society, and the Foreign and Domestic Missionary Society.

**EPITAPH** (ěp'ĩ-táf), an inscription upon a tomb or monument in honor or memory of the dead. The Egyptians first used epitaphs, usually with some prayer to Anubis or Osiris, and a similar custom was in vogue among the Greeks and Romans. Subsequently the practice became general throughout all Christian nations. The usual characteristic features in modern epitaphs are the name, date of birth and death, and some sentiment or expression of faith or affection. In many cases the sentiment is a quotation from the Bible, though epitaphs exemplify every variety of sense and taste, from lofty pathos to the vilest scurrility. Curious as it may seem, books containing collections of epitaphs are among the most amusing.

**EPITHELIUM** (ěp-ĩ-thě'lĩ-ŭm), the layer of cells which lines the internal surfaces of the body, being continuous with the epidermis, which covers the external surface of the skin. Its main function is to act as a covering for the soft and moist surfaces that secrete the various fluids of the body. It lines the entire respiratory tract and the alimentary canal, and forms essential elements in the true glands, such as the pancreas and liver. The ciliated epithelium has hairlike projections known as cilia (q. v.), which have a continuous vibratory motion. Epithelium of this kind is found in the bronchial tubes, the air passages, the Eustachian tube, and the lachrymal appendages.

**EPIZOA** (ěp-ĩ-zō'á), the name given to parasitic animals which live upon the external surface of other animals, such as lice, itch insect, etc. See **Parasites**.

**EPIZOÖTIC** (ěp-ĩ-zō-öt'íc), an epidemic disease among animals. It is usually mispronounced in America as *ep-i-zoo-tic*. The very fatal contagious catarrhal fever which raged throughout the country in 1870 and at different times since was a form of the disease.

Thousands of horses and cattle died at that time. Some pathologists claim to trace a connection between this disease and la grippe. See **Influenza**.

**E PLURIBUS UNUM**, meaning one out of many, the national motto of the United States. Adams, Franklin, and Jefferson were a committee to prepare a seal and proposed this motto, which was adopted on July 4, 1776.

**EPOCH** (ěp'ök), or **Era**, a point in the course of history from which preceding and ensuing years are computed. The creation of the world and the birth of Christ are the most important epochs, and on the former are based many notable chronologies. The *Era of Creation* is placed by Catholics and Protestants at 4004 B. C., the *Era of Constantinople* at 5508 B. C., the *Era of Antioch* at 5502 B. C., and the *Era of Alexandria* at 5492 B. C. In Jewish writings the creation is placed at 3760 B. C., on which the Jews base their era. The *Christian Era*, a mode of computing time from the birth of Christ, went into extensive use among Europeans about the year 1000, though it was introduced in the 6th century. The event of Christ's birth took place four years earlier than the date written in our calendar. The *Julian Epoch* begins with 4713 and is based on the coincidents of the lunar, solar, and indictional periods. Mohammedans compute time from July 16, 662, this being the anniversary of the *Hegira* of Mohammed. Among the Chinese it is customary to compute time by cycles of sixty years, and to apply a different name to every cycle.

**EPPING FOREST** (ěp'pĩng), a beautiful pleasure resort near London, England. It comprises 5,600 acres of magnificent woodland, rises 760 feet above sea level, and is improved by many structures and conveniences. In early ages it formed a portion of the hunting ground of the kings, and constituted a part of the forest that covered all of Essexshire. The crowded populations of London utilize this resort extensively for pleasure walking and driving.

**EPSOM SALT** (ěp'sŭm sàlt), or **Magnesium Sulphate**, a cathartic salt, so named because it was first obtained from the famous mineral springs of Epsom, a market town of England. It is soluble in water and is used as a purgative. This salt is obtained by an artificial process from magnesian limestone, the latter being treated with sulphuric acid, or by dissolving it in boiling water and allowing the insoluble matter to settle. Afterward the water is evaporated from the solution, leaving the salt.

**EPWORTH LEAGUE** (ěp'wŭrth lēg), a



young people's religious society of the Methodist Episcopal Church, organized in 1889. In 1908 it had 31,340 chapters and a membership of 2,700,000. The chapters are classed as *senior* and *junior*, about one-fourth of the members belonging to the latter class. The object is to promote an earnest, practical, intelligent, and loyal spiritual life in the young people of the church, and corresponds to societies maintained for similar purposes by the Baptist, Lutheran, Catholic, Presbyterian, and other churches. It is the largest denominational society in the world. The *Epworth Herald* is the official organ.

**EQUATOR** (ĕ-kwā'tēr), the great circle imagined drawn around the earth midway between the poles, and which divides it into the Northern and Southern hemispheres. The distance from it to the poles is 90°. It forms the basis for measuring the latitude of places both north and south. Twice in the year, on Sept. 21 and March 21, the rays of the sun shine vertically on the Equator, when the days and nights are equal all over the earth, from which the name *equinox* has been derived. The *magnetic Equator* of the earth corresponds quite nearly to the geographical Equator, and marks the point midway between the magnetic poles. On the Equator the magnetic needle is horizontal, and, as the poles are neared, the dip of the needle increases, while at the poles it points vertically downward. Lines connecting places which have the same angle of dip are *isoclinal* and correspond in a very remarkable manner to the isothermal lines, showing a dependence of the intensity of magnetism on the distribution of the sun's heat.

**EQUATORIAL TELESCOPE** (ĕ-kwā-tō'rī-āl tĕl'ĕ-skōp) an instrument mounted upon a fixed axis parallel to the axis of the earth, which renders its motion parallel to the plane of the ecliptic. The principal axis turns upon a second movable axis, making it possible to continuously observe and note the right ascension and declination of heavenly bodies. Some equatorial telescopes revolve round the polar axis by an attached clockwork, which may be regulated to vary the velocity of rotation to meet the requirement in examining a particular heavenly body, such as a planet, a fixed star, a satellite, or the sun.

**EQUESTRIAN ORDER** (ĕ-kwĕs'trī-ān), or *Equites*, an order of the people in ancient Rome. Originally they were a military organization and formed the cavalry of the army. Livy attributed their origin to Romulus, who is said to have selected the first three hundred out of the three chief divisions of the patricians.

They were divided into *turmoe* of thirty men each and again subdivided into ten, and in the time of war were obliged to serve on horseback. The *equites* continued as an exclusively military body until 123 B. C., when a law was enacted that required that the jurors (*judices*) be selected from them. In addition they enjoyed the privilege of officiating as *publicani*, or farmers, of the public revenues. They wore a robe with a narrow purple border and a gold ring to distinguish them. During the republic they exercised much influence, but disappeared from the political life under the later emperors.

**EQUINOX** (ĕ'qwī-nōks), the time at which the sun, in passing the Equator, renders the days and nights of equal length over the entire earth. This occurs when it enters one of the *equinoctial points*, the two equinoctial points being where the ecliptic and celestial equators intersect each other. The *vernal equinox* occurs on March 21, when the sun is in the first part of Aries, and the *autumnal equinox* takes place on Sept. 21, when it is at the first of Libra. At all other times of the year the length of the day and night is unequal, the greatest difference occurring at the poles. After the vernal equinox, the sun passes from south to north, causing the days to lengthen in the Northern Hemisphere; while, after the autumnal equinox, it passes from north to south, causing the days to shorten in the Northern, but lengthen in the Southern Hemisphere. The precession of the equinoxes is due to the equinoctial points moving westward at the rate of 50" in a year. The equinoxes, in March and September, are accompanied by gales which are known as *equinoctial storms*. They are most severe on the Atlantic coasts of America and Europe.

**EQUITY**, in law, a particular system of jurisprudence, which is based upon justice rather than precedent. It is sometimes defined as natural justice to distinguish it from the fixed and technical rules of law. In some countries, as in England, equity is administered by courts of chancery, but in some states the cases in equity are referred to the courts of law. The aim is to extend relief in causes which are not recognized in a strict sense by the law, hence the decisions are based upon modifying circumstances rather than upon the statutory law. Usually the plaintiff and defendant state their claim and defense in a formal statement, which is termed *pleadings*, and the question raised in this way constitutes the *issue*. In some instances the issues of fact are disposed of by the judge and jury, while in some countries the cases in equity are tried only to the court. In



general, it may be said that courts of equity serve to bring all parties interested in a cause before the tribunal and adjust the rights of the several parties according to the circumstances which bear upon the issues.

**ERA OF GOOD FEELING**, the name applied to the period of United States history between 1817 and 1823, during the administration of President Monroe. At that time national political contests were suspended, the Democratic party had a large majority, and the Federalists had dwindled down to a very small number. It succeeded the War of 1812, when the new issues of tariff and internal improvements had not arisen, which soon after came into prominence and caused much political strife in Congress and the nation.

**EREBUS AND TERROR**, the names of two volcanoes in the Antarctic region, located in the northern part of South Victoria Land. They were discovered by Sir James C. Ross in 1841 and were so named from the two vessels used in the expedition. Mount Erebus is 12,370 feet high and is situated 30 miles east of Mount Terror, which has an elevation of 10,900 feet.

**ERECHTHEUM** (er-ekh-thē'um), the name of a sacred edifice on the Acropolis, in ancient Athens. It was so named from Erechtheus, a fabulous hero of Greece, and it is thought to have contained the shrine of that hero and of Athene. The original building was burned by the Persians, but a new temple was built on the same site in 393 B. C. and dedicated to the Ionic order. It had three porticos and contained the sacred olive tree of Athene and a salt spring said to have been made by the trident of Poseidon. The ruins of this building, located north of the Parthenon, contain the Porch of Caryatides, in which six female figures somewhat larger than life support the entablature.

**ERFURT** (ēr'fōort) a city of Germany, in the Prussian province of Saxony, 145 miles southwest of Berlin. It is conveniently connected by numerous railroad lines with the important commercial and educational centers of continental Europe. The cathedral, a splendid Gothic structure, is one of the finest in Germany. This structure has a famous bell, the Maria Gloriosa, which weighs thirteen tons. The University of Erfurt was founded in 1378, but was suppressed in 1816, and now ranks as an academy of science. Its buildings have been well maintained and its library contains about 75,000 volumes. The monastery is now called Martinsstift (Martin's establishment) and has been converted into an orphanage. It was the residence of Luther from 1501 to 1508. The

surrounding country is agricultural. The city has modern facilities and produces woolen, cotton, silk, and linen goods, machinery, tobacco, leather, chemicals, and scientific instruments. The city was founded in the early part of the 5th century, when it was called Erpesford from its founder, Erpes. In the Middle Ages it grew rapidly, became strongly fortified, and until 1873 was counted a fortress of second rank. Owing to its convenient location, it has been a point of contention by foreign invaders, became a part of Prussia in 1803, and was the seat of the celebrated congress of Erfurt in 1808, which was attended by the Emperor of Russia, Napoleon, and various German monarchs. Population, 1905, 98,849.

**ERGOT** (ēr'güt), a fungus found in rye, wild rye, and other grasses, the principal symptom being that the seed, besides becoming black, grows elongated so as to resemble a rooster's spur, whence the name ergot comes. When the disease begins, sphacelae appear upon the pistils, and after a time a viscid fluid exudes from them. The disease is very fatal to the plants attacked, and, if eaten with sound grain, is dangerous to both man and animals. It causes contraction of the minute arteries by acting on their muscular walls, and is useful to check bleeding in parturition. In large quantities it produces nausea, delirium, stupor, and death. On the western plains it appears largely in wild rye, often causing much damage to large herds of domestic animals.

**ERIE** (ē'rī), a city in Pennsylvania, county seat of Erie County, on Lake Erie. It is on the Pennsylvania, the Philadelphia and Erie, the Pittsburg, Bessemer and Lake Erie, the Lake Shore and Michigan Southern, and other railroads. The harbor is one of the best on Lake Erie, being the only harbor in Pennsylvania, and is protected by Presque Isle, a peninsula which forms a natural breakwater about six miles long. The city is midway between Cleveland and Buffalo, in close proximity to the coal and natural gas fields of Pennsylvania. It has a large export and import trade with the cities on the Great Lakes, being on the route of many steamship lines. The streets are well lighted and paved. They are lined with elegant mansions and beautified by fine trees and gardens. An abundant water supply is secured from the lake, the water being pumped into a tower 251 feet high, which is classed as the highest water pipe in the world.

Erie has an area of about seventy square miles. The noteworthy buildings include the county courthouse, the Federal building, the public library, and the high school. It has a



number of fine public parks, a soldiers' monument, and several well-improved boulevards. Among the noted institutions are the Soldiers' Home, Saint Vincent's Hospital, Home for the Friendless, Erie Academy, Clark's Business College, Erie Art School, and Saint Benedictine Academy.

As an industrial and jobbing center it holds a high rank. It has extensive machine shops, refineries, and foundries. The manufactures include fabrics, lumber products, tobacco, beverages, machinery, ironware, and hardware. Erie occupies the site of Presque Isle, a French fort built in 1753. The English captured it in 1760. In the War of 1812 it was the headquarters of Commodore Perry. The first settlers came here in 1795 and it was incorporated in 1805. Population, 1900, 52,733; in 1910, 66,525.

**ERIE, Battle of Lake**, a naval engagement of the War of 1812, fought near the island of Put-in-Bay, in the western part of Lake Erie, on Sept. 10, 1813. The American fleet under Commodore Perry consisted of nine small vessels, which had been built hastily at Presque Isle, and the British fleet under Commodore Barclay had six vessels. Commodore Perry used the *Lawrence* as his flagship, on which the British concentrated their fire and disabled it, hence he was compelled to shift his flag to the *Niagara*. The fighting became general and the British were compelled to strike their colors. Perry reported the victory to the government officials in these words: "We have met the enemy, and they are ours—two ships, two brigs, one schooner, and one sloop." As a result of the battle the Americans secured control of the Great Lakes and the Northwest Territory.

**ERIE CANAL**, the largest and most important canal of the United States, extending from Buffalo to Albany, N. Y., a distance of 351 miles. The canal was first suggested by Gouverneur Morris and he was appointed at the head of a commission of seven members in 1810. The project was delayed by the War of 1812, but a law authorizing it was enacted in 1817, and the first canal boat passed through from Buffalo on Nov. 4, 1825, Governor Clinton being a passenger on the same. This canal greatly revolutionized trade with the lakes and the interior, since railroads were yet unknown. By means of it the time of travel between Buffalo and Albany was shortened from twenty to ten days, and the freight per ton was reduced from \$100 to \$3. The canal as originally constructed was forty feet wide and four feet deep, and cost \$7,602,000. In 1895 the sum of \$9,000,000 was appropriated to deepen the canal to

nine feet and otherwise improve it. However, the work cost more than twice that amount. Up to 1871 the propelling power consisted almost entirely of horses, though at that time steam-propelled boats were introduced, and at present electric motive power is used with success. However, the greatest share of freight is still carried in tow boats drawn by horses. The canal is twice carried over the Mohawk River on aqueducts, contains 72 locks, of which 57 are double-lift locks, and is considered one of the most scientific canals in the world.

**ERIE, Fort**, a fortified place in Welland County, Canada, on the Niagara River, nearly opposite the city of Buffalo, N. Y. It was occupied by the British under General Vincent, who abandoned and fired it with all its stores on May 28, 1813. The same day it was occupied by the Americans, who afterward withdrew from the Canadian shore, and the British rebuilt it. General Brown invaded Canada in July of the same year and required the fort to surrender. The fort was now strengthened by the Americans, and in August of the same year the British under General Drummond assaulted it and captured the main bastion of the fort, but a magazine blew up and rendered the attack unsuccessful. In November, 1814, the Americans finally abandoned Canada and Fort Erie was blown up.

**ERIE, Lake**, one of the five Great Lakes of North America, between lakes Huron and Ontario. It washes part of the northern boundary of New York, Ohio, and Pennsylvania, the eastern shore of Michigan, and the southern shore of the Province of Ontario. The discharges of lakes Superior, Michigan, and Huron flow into it through the Detroit River, while the outflow is into Lake Ontario by the Niagara River. Its width is from 30 to 65 miles; length, 260 miles, and area, 9,600 square miles. The Sandusky, Maumee, Detroit and Grand (in Canada) are the principal rivers flowing into it. Canal connections are maintained with the Hudson River by the Erie Canal, with the Ohio by the Ohio and Miami, and with Lake Ontario by the Welland. It has excellent fisheries and a large commerce. The naval victory gained by Commodore Perry over the British in the western part of the lake is commemorated by a monument at Cleveland and by a stone on the island of Gibraltar, near which the battle was fought. Among the chief harbors in the United States are those of Erie, Buffalo, Sandusky, Cleveland, Toledo, and Dunkirk. Those of Canada include Harrow, Rondeau, Port Rowan, and Welland.

**ERITREA** (â-rê-trá'á), or **Erythrea**, a possession of Italy, on the western coast of the Red



Sea, extending as a narrow strip of country about 670 miles along the coast, from Nubia to French Somaliland. The area is about 50,500 square miles. It is inhabited chiefly by nomadic tribes of Arabs, but the southern part has some settlements of Afars or Danikils. A resident civil governor is nominated by the King of Italy and is under the direction of the Italian minister of foreign affairs. Farming is largely pastoral, its products being butter, meat, and hides, supplied by cattle, sheep, and goats. There are pearl fisheries of considerable importance along the coast, while the import and export trade is quite large. Massowah is the capital and local seat of government, with a population of 9,250. It is connected with Saate and several other points by railroad and telegraph lines. Numerous wars between the Italians and dervishes have occurred, though the boundary line was fixed at its present limit in 1897. Population, 1906, 279,551.

**ERMINE** (ēr'mīn), or **Stoat**, a small mammal allied to the weasel family, found in the



ERMINE.

northern portion of Europe, Asia, and America. The body in summer is reddish-brown above and white beneath, and in winter it is wholly white, except the tip of its tail. Its body is about ten inches long, without the tail, which is about five inches. The fur is soft and silky and is used for ladies' winter garments, and in some countries for robes of kings, judges, and other high officials. When used as linings for cloaks, the black tufts of the tail are sewed to the skins at irregular intervals. The ermine lives in holes in the ground and under rocks, and feeds on mice, rats, birds, chickens, and other small animals, sucking the blood.

**ERNE** (ēr'n), a river and lake of Ireland, in Ulster County. The river rises in Lake Gowna and flows into Donegal Bay, passing through Lough Erne in Fermanagh County. It is sixty miles long and is navigable from Ballyshannon to the outlet. Lough Erne consists of two lakes, the upper and the lower, and is usually

known as Lake Erne. It is rich in fish and eels, and the scenery is interesting and attractive.

**EROSION** (ē-rō'zhūn), in geology, the influence of running water, waves, and wind in wearing away rocks and other substances. Immense quantities of silt are deposited at the mouths of rivers as deltas, which show that the geological structure of the earth's crust is changing from this agency. The erosion theory attributes the excavation of valleys and other depressions chiefly to the erosive power of water in the form of glaciers, instead of regarding them as due to depressions, cracks, or fissures in the strata produced by strains during upheavals through volcanic action.

**ERRATIC BLOCKS**, or **Erratics** (ēr-rāt'īks), in geology, the boulders on the surface of the ground which have been transported from their original location by the action of glaciers and icebergs. They consist largely of granite, and in some cases were transported great distances from their original location. Many rocks of this class are found in the south central part of Canada and the north central part of the United States, extending from Saskatchewan through North and South Dakota and southward into Iowa.

**ERYSIPELAS** (ēr-ī-sīp'ē-lās), an inflammatory disease of the skin. It is attended by fever and diffused redness and swelling of the parts affected, and later by peeling off of the scarf-skin in the milder forms, or by suppuration of the deeper parts in severer cases. There is usually considerable pain, with heat and tingling in the affected parts. The treatment consists for the most part in watching closely the progress of the case, keeping the bowels well regulated, and obviating special dangers as they may occur. Iron is sometimes used as a specific remedy. The disease is frequently an epidemic.

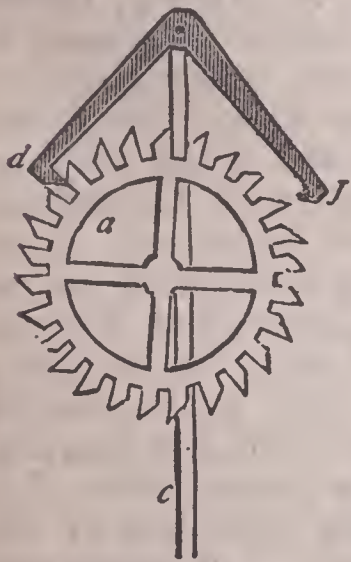
**ERZERUM** (ēr-zrōm'), a city of Turkish Armenia, situated in the southern portion of a wide valley, at an elevation of 6,200 feet, and surrounded by mountains of considerable elevation. It is the capital of a Turkish vilayet, which has an area of 19,180 square miles and a population of 645,728. The streets of the city are angular and the houses largely ancient, though there are numerous fine buildings, bazaars, and public edifices. The manufactures consist largely of ironware, clothing, copper, fabrics, and utensils. Erzerum forms an important strategical center. It has considerable trade with many points in Western Asia and the Persian pilgrims gather here in large numbers, when on their way to worship at Mecca. In 700 A. D. it fell into the hands of the Arabs, and was later successively conquered by the



Byzantines, Mongols, and Turks. The Russians took possession of it in 1829 and again in 1878, though later restored it to the Turks. The governments of Germany, France, Russia, and England maintain consul residences and are represented officially. Population, 1907, 41,865.

**ERZGEBIRGE** (ěrts'gē-bēr-gē), a range of mountains in Europe, trending a distance of 120 miles and forming a natural boundary between Bohemia and Saxony. The name in German means Ore Mountains and originated from the wealth of iron, copper, cobalt, lead, silver, coal, and arsenic found in the region. The culminating peaks in Germany attain a height of 3,850 feet and the average elevation is 2,500 feet.

**ESCANABA** (ēs-kā-nā'bā), a city in Michigan, county seat of Delta County, near the central part of the northern peninsula of the State. It is on the Chicago and Northwestern and the Chicago, Milwaukee and Saint Paul railroads, has a good harbor on Green Bay, and is an important shipping point. The chief buildings include the county courthouse, the high school, and the public library. Among the manufactories are mills, iron foundries, and woodenware factories. Among the municipal improvements are waterworks, gas and electric lighting, sewerage, and street paving. It was settled in 1863 and incorporated as a city in 1883. Population, 1910, 13,194.



ESCAPEMENT.

lock d j, and through these the power imparts to the pendulum c, or balance wheel (time measurer), an impulse sufficient to overcome the friction and resistance of the atmosphere, and thus keeps up the vibration. These alternate motions of the lock serve to arrest and release the escape wheel at uniform intervals, thus governing the movement of the timepiece. The principle is the same whether the moving power consists of springs or weights. Among the different escapements in use are the chronometer, anchor, lever, cylinder, duplex, and horizontal.

**ESCURIAL** (ēs-kū'rī-āl), or **Escorial**, a

building about 30 miles northwest of Madrid, Spain, celebrated as a palace, church, convent, and burial place. It was built by Philip II. on a slope of the Sierra de Guadarrama, about 3,700 feet above sea level, and dedicated to Saint Lawrence in commemoration of the victory of Saint Quentin over the French on Saint Lawrence's day, Aug. 10, 1557. Since Saint Lawrence suffered martyrdom by being broiled to death on a sort of gridiron, its form is considered to be on the plan of a gridiron. The main building was begun in 1563 and completed after 21 years. This great building has a length of 740 feet, a width of 580, and a dome with a height of 220 feet. Its collection of pictures long ranked among the finest in Europe, but large numbers of the more noted were transferred to Madrid in 1837. A fire injured the library in 1691, but Ferdinand VII. restored it, and in 1808 the French army inflicted damages to the masonic portion. Marble tombs contain the remains of all the kings of Spain from Charles V. to Alfonso XII., except Philip V. and Ferdinand II., the tombs being in tiers over each other in niches constructed in the walls. A bolt of lightning struck the Escorial in 1872, by which serious damage resulted.

**ESDRAELON** (ēs-drā-ē'lōn), or **Plain of Jezreel**, a fertile valley of Palestine, extending from the Mediterranean toward the Jordan, along the eastern side of the Carmel range. It is drained by the Kishon River and noted for its present high state of cultivation, though prior to 1869 it was laid waste periodically by the Arabs. This valley is the site of Gideon's victory over the Midianites and that of Napoleon over the Turks in 1799.

**ESDRAS, Books of**, the name of two apocryphal books of the Old Testament. They are usually given as the *First Book of Esdras* and the *Second Book of Esdras*, and generally appear as the first two books of the Apocrypha. The former contains a portion of *Nehemiah*, the *Book of Ezra*, and two chapters of *II Chronicles*, and was translated from the Hebrew. The latter, according to recent critics, was composed about the year 90 A. D., and was written in Hebrew or Greek. See **Bible**.

**ESKIMOS** (ēs'kī-mōz), or **Esquimaux**, a race of people supposed to be of Turanian descent, found native in the northern part of North America, Greenland, the Arctic islands, and the northeastern portions of Asia. The name applied to them is supposed to be of Indian origin, meaning *eaters of raw fish*, though the designation they applied to themselves is *Inu-it*. There are at least three principal divisions of this race—the Eskimo proper, in Labra-



dor; the Greenlanders; and those occupying the country west of Baffin Bay and extending westward along the Arctic region to a district about 400 miles west of Bering Strait. Their height and coarse, black hair correspond to those of the American Indians, but the color of the skin shows a tendency toward brown. The eyes are often oblique, the cheek bones are prominent, the nose is flattened, and the weight is quite large considering the average height. Their summer residence consists of tents made with poles and skins.

In the winter time the Eskimos build houses



ESKIMO FAMILY AND DOGS.

of snow and ice, though in some cases their habitations are permanent, being constructed of stone in which turf is used for cement. The food consists of the flesh of the walrus, whale, seal, and other animals, though this is usually eaten raw. They use a boat, or *kyak*, made of oiled skins with much skill. From fifty to several hundred inmates occupy a single house, which in the winter time is warmed by lamps consuming whale oil as fuel. The attire of the males and females is similar, consisting of trousers and a coat or sack, with a hood of skins drawn over the head.

Government among the Eskimos is tribal. The oldest are selected as chiefs, who officiate among the tribes and groups of tribes. Large numbers have been converted to Christianity by Danish missionaries, though some still adhere to totem worship. As hunters and fishers they show much skill with spears, arrows, and lances, these usually having bone or metal points. The Eskimo dog is their only domestic animal, and serves as a valuable help in hunting and drawing sledges. It is larger than the English pointer and has short, but strong, legs, and from its bushy tail has a wolfish appearance. By means of a team of trained dogs the Eskimo is able to travel sixty miles a day. The total number of Eskimos is now placed at 45,000.

**ESKIMO DOG.** See Eskimo.

**ESPARTO** (ěs-pär'tō), a species of grass grown extensively in Spain and Northern Africa. It is especially valuable for its strong fiber, which is used in the manufacture of paper, maps, nets, and cordage. It has been acclimated in the United States and is grown to some extent as a commercial product.

**ESPERANTO** (ā-spā-rān'to), a universal language invented by L. L. Zamenhof, a scholar of Warsaw, Russia. He prepared an exhaustive grammar in that language in 1887, which has since been translated into about thirty of the leading languages, and a large number of publications are issued regularly to disseminate interest in its use. Esperanto societies are maintained in the leading cities of Europe and America. Regular courses of study are carried by many periodicals, such as the *English Review of Reviews*. The new language combines the more commendable features of the leading languages of Europe, in which respect it is superior to the Volapük (q. v.) and students may learn to read and speak it with facility

in a comparatively short time. The English sentence, "The international language should be comprehensible to the whole educated world," appears as follows in Esperanto: "La lingvo internacia estas komprenita de la tuta mondo edukita."

Some one language has occupied a place of supremacy at all times. The Babylonian tongue was the language of diplomacy in the 2d century B. C. Alexander the Great made Greek the leading language, but it in turn gave way to Latin during the prosperity of Rome, which remained the language of scholars in Europe



throughout the Middle Ages. French became the language of diplomacy in the 18th century. English sprang into use as the language of commerce in the 19th century, while German came to be indispensable to the scholar.

In a perfect system of communication each idea has its own separate symbol, as we find in the mathematical formulas and the chemical signs, but the connotation in the natural languages is very imperfect. English is the most imperfect in respect to spelling, while the inflected languages, as Latin and German, demand plural forms of the article, adjective, and verb with the plural nouns. An artificial language is intended to correct these and other difficulties. In Esperanto these faults are reduced to a minimum and each sound represents only one idea. Since it has no synonyms, puns are impossible in Esperanto. Those who have taken a leading part in the spread of the language maintain an organization known as the International Esperanto Congress. The fourth meeting of this body was held at Dresden, Germany, in 1908, at which about thirty countries were represented by delegates.

**ESQUIMALT** (ěs-kwí'malt), a seaport of Canada, in British Columbia. It is located on Vancouver Island, three miles southwest of the city of Victoria, on the Strait of San Juan de Fuca. The harbor is landlocked and contains a navy yard and a dry dock. Esquimalt is the headquarters of the British Pacific squadron, is strongly fortified, and is connected by railway with the coal mines at Nanaimo. Population, 1906, 1,845.

**ESSAY** (ěs'sâ), a literary composition shorter and less formal than a treatise, and which embodies the opinion of the writer on some general subjects. The term is sometimes used interchangeably with the word *treatise*. The writing of essays as a separate form of literature began in the 16th century, although such ancient writers as Plutarch and Cicero are rightfully classed with the essayists. Montaigne, the eminent French writer, may be credited as the father of the essays. Voltaire, Lamartine, and Rousseau are among the leading French essayists, and those of Germany include Lessing, Schlegel, and Hermann Grimm. The following list contains the leading essays of European and American literature:

Joseph Addison's....."The Spectator"  
 Matthew Arnold's....."Essays in Criticism"  
 Francis Bacon's....."Of Studies"  
 Thomas Carlyle's....."Sartor Resartus"  
 Ralph W. Emerson's....."Conduct of Life"  
 Hermann Grimm's....."Fifteen Essays"  
 Oliver W. Holmes's... "Breakfast Table Series"

Washington Irving's....."Salmagundi Papers"  
 Samuel Johnson's....."Rambler"  
 Alphonse de Lamartine's....."Confidences"  
 Charles Lamb's....."Essays of Elia"  
 Gotthold E. Lessing's....."The Laokoon"  
 John Locke's....."Essay on the Understanding"  
 James Russell Lowell's....."Among My Books"  
 Thomas B. Macaulay's....."Milton"  
 Jean Jacques Rousseau's....."Emile" and  
 ["Confessions"  
 John Ruskin's....."Sesame and Lilies"  
 Friedrich von Schlegel's... "Philosophy of Life"  
 Henry David Thoreau's....."Walden"  
 Jean Voltaire's....."Essay on the Nations"

**ESSEN** (ěs'sen), a city of Germany, in the kingdom of Prussia, about twenty miles northeast of Düsseldorf. Numerous railroads and electric car lines connect it with cities at a distance. The streets are well paved and its architecture is durable and imposing. The cathedral, founded in 873, contains many treasures of art. Other noteworthy buildings include the courthouse, the town hall, the municipal theater, and many schools and hospitals. A fine monument of Alfred Krupp stands in front of the town hall. Among its industries is the celebrated Krupp steel and iron works, rated among the most extensive establishments in the world. These works were founded with only two workmen in 1827, but at present occupy a site of 1,000 acres and give employment to 45,500 workmen. The guns, steel plate, and munitions of war produced at this establishment are known in all the civilized countries. Other manufactures include clothing, fabrics, tobacco, earthenware, and machinery. The municipality maintains systems of sewerage and waterworks. Essen was founded in the 9th century, but its growth is comparatively recent. In the 17th century it was captured by the Dutch and the Spaniards. Since 1813 it has belonged to Prussia. Population, 1905, 231,360.

**ESSEQUIBO** (ěs-sâ-kě'bô), the largest river of British Guiana, rises in the Tumuc Humac Mountains, and flows into the Atlantic near Georgetown. It has a course of about 600 miles and its estuary is 20 miles wide. Several tributaries flow into it, chiefly from the west, and the region through which it flows has fine forests of ebony, locust, ironwood, and greenheart.

**ESSEX**, the name of a United States frigate used in the War of 1812, then under command of David Porter. The *Alert*, a British sloop of war, commanded by Captain Laugharne, made an attack upon the *Essex* on Aug. 13, 1812, but was captured by its opponent. Later the *Essex* was attacked at Valparaiso, South America, by two British men-of-war, the



*Phoebe* and the *Cherub*, and her crew was forced to surrender. This engagement took place on March 28, 1814.

**ESTATE**, the interest which an owner may have in property, either real or personal. The term *fee simple* is applied where the ownership is absolute, hence the owner may encumber or sell it as he may choose. An estate in *fee tail* is one which is owned by the possessor, but he may dispose of it only to his own issue. A *life estate* pertains to the ownership of land, but the title is held only during the lifetime of the possessor. In general, the term estate has reference to the degree, quantity, nature, and extent of interest which a person has in real estate. From this circumstance we speak of an estate in *expectancy*, in *remainder*, in *common*, in *reversion*, etc.

**ESTHER, Book of**, a book of the Old Testament, so named from Esther, a Jewish maiden and the foster-daughter of Mordecai. It recounts how Esther was raised to the position of queen by Ahasuerus, King of Persia, that she and her uncle Mordecai frustrated the plans of Haman to extirpate the Jews, that Haman fell and was succeeded by Mordecai, and that a festival was instituted to commemorate the deliverance of the Jews from their enemies. Recent critics think that it was written about 640 B. C. The language of the original manuscript is Hebrew, intermingled with numerous Persian words. The purpose of the book is to illustrate that God takes care of His people.

**ESTHETICS.** See **Aesthetics.**

**ETCHING.** See **Engraving.**

**ETESIAN WINDS** (ĕ-tē'zhan), the name of winds that prevail in the southern part of Europe during the summer season. They blow from the north and northeast across the Mediterranean, and are due to the sun heating the surface under the Tropic of Cancer, causing the air to be drawn in over the desert of Sahara. Though the air is charged with moisture in passing across the Mediterranean, the clouds are dispersed when they reach the margin of the hot sands and the vapor is dissipated in the rarefied air.

**ETHER** (ē'thēr), in astronomy and physics, the tenuous fluid that fills all space. It is regarded the medium for the transmission of light, heat, and electric action, through the molecules of solids and liquids as well as throughout all gases. This medium is thought to be more elastic than any ordinary form of matter. Electric and magnetic phenomena are but strains and pulsations in the ether. Physicists assume the existence of ether from the wave theory of the motion of light (q. v.).

**ETHER**, the name of a volatile liquid, usually divided into two classes known as simple ether and compound ether, or as ether and ethereal salt. These liquids are fragrant substances, burn easily, and have a wide use in medicine. Ether is employed in the solution of iodine, sulphur, phosphorus, strychnine, and other alkaloids. It is useful in the preparation of freezing mixtures. When inhaled, it produces intoxication. Sulphuric ether, so called from the use of sulphuric acid in its preparation, is employed to dissolve fats and resins. It is much used in medicine as a stimulant and anaesthetic.

**ETHICS** (ĕth'iks), or **Moral Science**, the science which relates to human duty. It investigates the nature and the right of conduct, actions, and aims, embracing the supreme good and the ultimate ground of obligation. Writers usually treat the science of ethics under two divisions—theoretical and practical. *Theoretical ethics* aims to ascertain the principles of the ideal moral manhood and life, while *practical ethics* applies these principles in directing man to the attainment of the ideal character and life.

Ethics as a science is frequently compared in various aspects to geometry. In geometry we have an intuitive idea of extension; then special forms of extension, as a line, a circle, etc.; and finally we arrive at intuitive truths called *axioms*. Similarly, in ethics we first have an intuitive idea of right; then an idea of particular forms of right, as kindness, honesty, etc.; and ultimately recognize certain principles, as "it is right to be kind," "it is our duty to be honest," which may be regarded *moral axioms*. Various systems of ethics have been proposed, all differing more or less widely in their conclusions as to the origin and nature of the faculty by which human duty is recognized. Many of the systems had their origin in antiquity, and with them the names of Socrates, Plato, Epicurus, Aristotle, and the Stoics are associated. With the introduction of Christianity ethical speculation turned on a new element, and among Christians moral obligation came to be based on the injunctions of the Scriptures.

Most modern writers regard the true, the beautiful, and the good as the three rational ideas of the mind, and of these the good, which is by some called the right, is held to be the highest idea. There has been a wide difference of opinion as to the question of right, the essential query being as to what it is that makes a thing right. Among the answers proposed are utility, highest happiness, divine law, the divine nature, and the eternal nature of things.



Those holding to the view founded on *utility* urge that whatever is best adapted to the welfare of man is right, while the opposite things are regarded as wrong, because they retard the individual and the race in progress toward the ideal life. Those holding that right is based on the *highest happiness* of the individual similarly commend all that is essential to the happiness of man. By *divine law* is meant the revealed will of God, which some writers hold to be the ultimate right, but there is a wide difference of opinion as to what the revealed will of God is, which is likewise the case of the character of *divine nature*. Those holding that right is based on the *eternal nature of things* regard right and wrong as self-existent. Viewed from this aspect, they are said to have no origin, and that they are eternal. The view that right and wrong are eternal principles is probably correct, since we cannot conceive a condition under which either can change or be terminated. When looked upon from this high plane, we conceive that right is wrapped up in the universe, one ever-existing ultimate principle.

Locke, in his "Essay on the Understanding," assailed the theory that morality is intuitive, and urged that there are no principles universally received among men, that children are not possessed of any moral rules, and that moral rules require a reason to be given for them, these all being conclusive that virtue is not innate. In reply to this view, writers have urged that all nations agree in enjoining some moral rule, but this is a departure from the original question, since we are to determine which of any opposite standards of morality is correct, as, for instance, monogamy or polygamy. Those who oppose the idea of innate virtue usually hold that the idea of right is the product of education. According to this view virtue depends wholly upon the manner of instruction, which likewise determines how the individual will class conduct in the categories of right and wrong. Others hold that education does not account wholly for the origin of the idea, but refer its development at least partially to instinct. In the philosophy of Kant, reason is held to recognize the obligation of right conduct, and action is classed as good only when it is done from a good motive, though the motive must be entirely freed from natural inclination to the act performed. Adam Smith, in his "Theory of Moral Sentiments," suggests that the sympathetic feelings of the impartial and well-informed witness of an act constitute the criterion of right, while William Paley (1743-1805) holds that virtue consists in

doing good to mankind for the sake of everlasting happiness.

**ETHIOPIA** (ē-thī-ō'pī-à), the Kush of sacred history, the ancient name applied to all the nations inhabiting the Southern Hemisphere, as known in early ages. However, some writers applied the name to the dark-brown or black-colored people, who are generally spoken of as Ethiopians, meaning *sunburned*. Later it had reference particularly to the country lying south of Egypt and the Red Sea, which corresponded to modern Abyssinia, Nubia, Kordofan, and other districts, though the boundary was not clearly defined. It was also applied to an island formed by two tributaries of the Nile, known as the kingdom of Meroë, whose capital was Napata. This island was fertile, producing an abundance of cereals, animals, and metals. It was given credit as the site of an oracle of Jupiter Ammon. Ethiopia, as a country, had a large trade with Egypt, Libya, Carthage, Arabia, and even India, but it attained its greatest prosperity about 1000 B. C., and formed a distinguished and powerful kingdom of ancient history. About the middle of the 8th century B. C. it became independent of Egypt, secured a predominating influence in the valley of the Nile, and imposed a dynasty on Lower Egypt.

The Persian Cambyses invaded Ethiopia in the 6th century B. C., though independence was maintained until it became a possession of the Romans in the reign of Augustus, the Ethiopian queen, Candace, becoming one of his vassals. The only evidences remaining of the ancient civilization of Ethiopia are numerous ruins of monuments and temples on which battles, religious ceremonies, and the industries are represented by sculptures. Their first king was Menelik, who is supposed to have been the son of Solomon and the Queen of Sheba. The names of thirty kings and queens have been found sculptured on some of the ruins. Later the country came to be known as Abyssinia, but the monarchs of the present Abyssinia still designate themselves rulers of Ethiopia. The language of the Ethiopians, more correctly called the Gees language, was introduced from South Arabia, and formed the ancient ecclesiastical and official language of Abyssinia. Semitic in construction, it resembles the Hebrew, Aramaic, and Arabic. The modern nomadic tribes of the Sudan and Tigré speak a language quite closely allied to it. The literature of the Ethiopian language includes a translation of the Old and New Testaments and the Apocrypha, besides other important Christian literature.



**ETHNOLOGY** (ěth-nŏl'ŏ-gŷ), the science which treats of the various races of mankind, investigates their distribution, and attempts to trace them to their origin. The science was developed from *ethnography*, which relates to particular tribes and localities, and to which it has a relation similar to the connection between geology and geography. *Anthropology* is the general science or natural history of mankind, of which ethnology and ethnography are important branches, while anthropology again is a branch of *biology*. In this article we can give only the leading facts of the unity of plurality of the species of mankind, since the whole study covers a wide range of details to be investigated. The distribution of man is much more general than that of lower animals, owing to the greater power of adaptation to change of circumstances. On account of this, man is found in all climatic zones and at all elevations above sea level, except only the small areas above the snow line.

The view that all mankind descended from a single family or species is the one most commonly supported. This view holds that Adam and Eve were the first parents, the common progenitors of all, racial differences now existing being attributed to climatic influences acting on individual families for a long period of time. Another view is that the various types have not descended from a single family, but were created separately in different localities. The advocates of this theory maintain that the physical form, personal characteristics and general appearance of mankind could not have been so greatly diversified, as demonstrated by the different races, through mere climatic conditions. However, the difference in color, stature, size, and intelligence is largely overcome by the anatomical structure, which is invariably the same in all races. Besides, the racial differences are characterized by almost insensible gradation, which points to a gradual modification of an original race through changes in external circumstances, by means of which the principal species were produced. According to this view, it is assumed that all the varieties of races have descended from the Caucasian. Other evidences pointing to a single parent family are found in the similarity of earlier myths and legends, from which it is reasonably certain that the remote ancestors of the various races originally dwelt together. There is a close resemblance of the language of widely separated races, this being regarded the strongest proof of the early unity. By extended comparisons many scholars have been led to believe that the languages had their origin in the one parent nation, which dwelt in

the neighborhood of Mount Ararat in prehistoric times.

Various classifications of mankind have been attempted. However, it has been difficult to find physical characteristics that belong exclusively to a single race, though there are some that predominate in certain races. The Dutch anatomist, Pieter Camper (1722-1789), attempted to make a scientific racial distinction by measurement of the facial angle. Though Camper's method illustrates nicely existing differences, they may be paralleled quite as distinctly by variations found in a single community. He classifies, for instance, the facial angle of the anthropoid apes at  $42^\circ$ , the African Negro at  $70^\circ$ , and the Europeans at  $80^\circ$ . J. F. Blumenbach (1752-1840), a German ethnologist, classified the human family into five races, basing the distinction on the differences found in the shape of the head, while Cuvier classified mankind in three divisions. As classified by this writer, the races are Caucasian, Mongolian, Ethiopian, Malay, and American, the two last mentioned being considered by him as subdivisions of the Mongolian. There is a more recent classification into three strongly marked types, the Caucasian, Mongolian, and Negro, and the three secondary races, the Malay, American, and Australian.

The *Caucasian* race is found in Southwestern Asia and most of Europe and America, and is widely distributed in small colonies in other portions. The *Negro* type prevails most largely in Africa and the *Mongolian* in portions of Eurasia not occupied by the Caucasian. Among the chief characteristics of the Caucasians are a round, oval face, fair complexion, arched forehead, symmetrical features, vertical teeth, smooth hair, and ample beard. The Mongolians have an angular face, broad head, oblique eyes, straight, coarse, black hair, high cheek bones, pale lemon to brownish-yellow skin, and a scanty beard. This race includes the inhabitants of most of Asia, the Laps and Finns of Northern Europe, the Magyars of Hungary and the Turks. The Eskimos, who inhabit the northern portion of North America and Northeastern Asia, are commonly classed with this race. The Negro race is characterized by a narrow and elongated head, projecting jaws, thick lips, crisp, curly hair, black or dusky skin, scanty beard on upper lip, and broad feet. It shows great differences in civilization, ranging from the cruel and vindictive Gallas to the debased Hottentots, from the cringing slave to most profound and enlightened scholars. This race is found in large numbers on the continent of Africa and has migrated to all portions



of the warmer zones. The *Malay* race resembles the Mongolian. However, the eyes are horizontal, the hair is coarse and straight, and the skin is mostly a dark olive color. It is found in large numbers on the island of Madagascar, the southern Malay peninsula, and the islands of the Indian and Pacific oceans.

The *Australian* race is considered a sub-species of the Papuan branch of the Malays. It is characterized by deep-set eyes, large head, abundant beard, dark hair, and dark brown skin. In civilization it is wholly destitute and has shown little, if any, tendency to improve under a system of education. The *American* race resembles the Mongolian in some respects, though it is characterized by the top of the skull being more rounded and the sides less angular. This race once occupied all of America, though since the discovery and settlement it has been more or less assimilated. This is true especially of South and Central America, where the most highly advanced tribes of this race were found. At the time of discovery of America the people of the Andean plateaus were advanced in civilization, understood the art of working metals, and possessed remarkable temples, tombs, aqueducts, and pyramids, while those of Central America showed evidences of a still higher and more ancient civilization. The former probably were of Asiatic origin, while the latter have been traced by some writers to a Semitic or an Egyptian source. Placing the entire population of the earth at 1,500,000,000, the numerical strength of the different races is as follows: Mongolian, 650,000,000; Caucasian, 575,000,000; Negro, 175,000,000; Malay, 40,000,000; America, including all of the red race, 20,000,000; Australian and mixed races, 40,000,000.

**ETIOLATION** (ē-tī-ō-lā'shŭn), the process of bleaching plants by excluding the light of the sun. It is made use of in bleaching celery, by which it is rendered quite tender and less acrid. Plants subjected to etiolation for some time become pale and almost colorless, since no chlorophyll is produced in the absence of sunlight. See **Chlorophyll**.

**ETNA** (ĕt'nà), a borough of Pennsylvania, in Allegheny County, on the Allegheny River, opposite the city of Pittsburg. It is on the Pennsylvania and the Pittsburg and Western railroads, and has electric railway facilities. Etna has extensive furnaces, rolling mills, and machine shops. Population, 1910, 5,830.

**ETNA**, or **Aetna**, the most celebrated volcano in Europe, situated in Catania, Sicily, towering 10,865 feet above sea level. This mountain rises abruptly from the sea, having a

circumference of over one hundred miles at the base, and ends in a single cone, in which a crater nearly three miles in circumference and 1,000 feet deep has been formed. A number of smaller cones are situated on the side of the mountain, the principal one being Monti Rossi, formed during the eruption of 1669. The mountain contains three climatic zones—the lower mild region, the central temperate, and the upper or snow covered. In the milder regions many varieties of lemons, oranges, date palms, olives, almonds, figs, and bananas are cultivated. The temperate belt has forests of oak, birch, chestnut, cork oak, maple, and pine, and in the upper part is a desert region covered partly with stunted vegetation and partly with ashes, lava, and sand, and much of it is buried most of the year with snow. A splendid view of the whole of Sicily, Malta, Calabria, and the Lipari Islands is obtained from the summit. At the height of 9,080 feet is an observatory, which is the highest inhabited structure of Europe.

Several great eruptions of Mount Etna occurred long before the Trojan wars. They are related in the mythical writings of the ancients. The earliest to which a definite date is given occurred in 475 B. C. and the most remarkable overwhelmed Catania in 1169, when 15,000 persons were destroyed. In an eruption in 1329 a new crater opened. About a century later, in 1444, a large cone formation fell into the crater during an eruption, and in 1669 a chasm twelve miles long burst open and lava flowed over the country for forty consecutive days. An earthquake accompanied the eruption in 1693 and caused the destruction of 60,000 lives. Vast eruptions occurred in 1832, 1853, 1865, 1874, and 1879, and there were numerous minor manifestations of external disturbances, numbering in all about one hundred, fully twenty of which occurred in the last century. Premonitory symptoms generally precede eruptions, thus giving ample warning to the people that danger is imminent.

**ETON COLLEGE** (ĕ'tŭn), an educational institution situated in Eton, England, about twenty miles from London. It was founded by Henry VI. in 1440, though its completion was retarded by political contentions until 1523. The institution is managed by a board or governing body, whose members are nominated by learned electors, including those of Oxford and Cambridge. Students from Eton may obtain valuable scholarships at Cambridge on merit, which is determined by competitive examinations. The buildings are substantial and convenient and associated with them are libraries,



apparatus, a beautiful campus, and several parks. The attendance numbers about 1,000. Its courses of study are still based somewhat on the mediaeval idea that Greek and Latin are the basis of all good education. Among its distinguished graduates are Fielding, Fox, Chatham, Bolingbroke, Channing, Gray, Hallam, Wellington, Shelley, and Gladstone.

**ETRURIA** (ē-trōō'ri-à), the ancient name of the portion of Italy which is situated south of the valley of the Arno and west of the Tiber and the Apennines. In its greater prosperity it embraced the valley of the Arno, extending south of the Tiber, when it included the valley of the Po. For practical purposes it may be said that Etruria corresponded to modern Tuscany, but included several adjoining regions. The traditional history of the Etruscans begins about 1044 B. C., and its fairly authentic history precedes the foundation of Rome more than two centuries. The state was formed as a confederation of twelve great cities or cantons, each of which constituted a representative republic. Among the most flourishing of these cities were Cortona, Veii, Caere, Volsinii, Tarquinii, and Perugia. Veii was a rival of Rome for four centuries, and in its prosperity covered sixteen square miles, but was destroyed under Camillus in 396 B. C. The famous tomb of the Tarquins is located at Caere. Volsinii resisted Roman attacks for many years and constituted one of the most powerful centers of Etruscan strength.

The naval power of the Etruscans was a strong element in their prosperity, enabling them to control large portions of the Mediterranean, establish supremacy over central and northern Italy, and include Rome itself within their territory for several centuries. From them the Romans secured the circus, many arts of industry, architectural methods, and the gladiatorial combats. They formed an alliance with the Carthaginians in 538 B. C. for the purpose of expelling Greek colonists from Corsica, fought against the Greek colony of Cumae in 525 B. C., and were rated the greatest military power of Italy in 467 B. C., though two years later their strength was partly shattered by the Greeks. Subsequently their territory was invaded by the Gauls, Samnites, Greeks, and Romans. The Roman victory over Veii in 396 B. C. completely destroyed Etruscan power, while their last determined resistance ended at the Battle of Lake Vadimonian in 283 B. C. Even after this their state was considered an independent ally of Rome, though Roman customs were gradually adopted until the final union was effected in 89 B. C., after which many of the leading families

of Etruria attained to high positions in the Roman government.

The name applied to the people of Etruria by the Romans was *Etrusci*, while the Greeks called them *Tyrrheni*. These people constituted a sturdy race. They were characterized by black hair, a dark color, and a large head, and more nearly resembled the people of Western Asia than the Europeans. Their civilization was marked by culture, a definite literature, codified laws, and a flourishing commerce. Although their poems, dramas, and histories are numbered among the extinct writings of the past ages, we know something of their ability to compound and apply medicine, calculate mathematical and astronomical problems, mine and work metals, build highways, and construct architectural edifices by studying their ruins and deciphering the inscriptions found on monuments and in the tombs.

Many products of the Etruscans are extant, such as vases, lamps, and utensils. The vases made by this race are especially noteworthy, being ornamented by bands of beautiful foliage and figures of a highly artistic character. It is known from excavations that their homes were adorned with decorated walls, mirrors, jewelry, pottery, and convenient furniture, though in art they borrowed largely from the Greeks. Many of the exquisitely painted vases known and preserved as Etruscan were undoubtedly the production of Grecian workmen, for the reason that many of the inscriptions are in the Greek. The language of the Etruscans is known as Rasena and was spoken for about 1,000 years before the Christian era, when it gave way to the Latin. Numerous coins and gems bearing inscriptions in Rasena are extant.

**ETRURIA**, a kingdom founded in Italy by Napoleon I. in 1801. It comprised the territory of Tuscany and was governed by the Bourbons of Parma until 1808, when it was incorporated with the empire of France. Elise Bacciocchi, a sister of Napoleon, was made Grand Duchess of Tuscany in 1809, but it reverted to Ferdinand III. after the fall of Napoleon in 1814.

**ETRUSCAN VASES** (ē-trūs'kən). See *Etruria*.

**ETYMOLOGY** (ēt-ī-mōl'ō-jŷ), that branch of philology which treats of the origin, form, and meaning of words. Numerous Greek philosophers, including Plato, the grammarians of Alexandria, the Roman Varro, and scholiasts of different ages, wrote on etymology and traced the origin and history of particular words and forms of language. In more recent times the intense interest given to the investi-



gation of Sanskrit has led to its scientific study. By means of extended investigations language has been classed in groups and families and the similar and dissimilar words have been studied from the standpoint of relationship and origin. This has led to a recognition of the fact that the growth of language is not accidental or premeditated, but enlarges or declines under certain laws. In grammar etymology is the division which treats of the parts of speech, their inflections, and the elements of the sentences.

**EUBOEA** (û-bē'â), an island of the Aegean Sea, formerly called Negroponte. It is ninety miles long and thirty miles broad at its widest point, and is the largest island in the Aegean Sea. The narrow channels of Talanti and Egripos (*Euripus*) separate it from Greece. Much of the surface is fertile and well wooded, though several mountain peaks rise to a height of about 7,000 feet. Chalcis and Karysto are the principal towns and trading centers. Besides minerals, there are productions of live stock, cereals, and fruits. Euboea was settled by the Ionians in 1100 B. C., after which it became the home of Aristotle and the seat of the Euboean school of philosophy. Athens subdued it after the Persian wars and it became a possession of the Turks in 1470. It is now a province of the kingdom of Greece. Population, 1907, 107,218.

**EUCALYPTUS** (û-kâ-lîp'tûs), a genus of trees, mostly native to Australia, which grow



EUCALYPTUS.

to the height of 480 to 500 feet, and form one of the most characteristic features of the vegetation in that part of the world. The leaves, instead of having one of their surfaces toward the sky, often grow with each side equally exposed to the light. Many of the species abound

in resinous secretions and are known as gum trees. The bark is thick and hard, containing a large per cent. of tannin. In the red gum, bay king, and iron bark species, a red juice flows freely from a wound and hardens into irregular, inodorous, transparent masses called *eucalyptin*, which is analogous to tannin. The wood is used extensively for shipbuilding. A species of the eucalyptus known as the blue gum tree has been introduced into Cape Colony, Algeria, Mexico, Roman Campagna, and elsewhere. The climate and soil of many parts of California and Florida are well fitted for the cultivation of the eucalyptus tree, hence it has been introduced with good results. It has acquired a reputation for drying marshy soils and absorbing malaria, on account of which it is called the fever tree. A saccharine substance similar to sugar, a powder having the qualities of quinine, and a secretion resembling manna are obtained from these trees.

**EUCHRE** (û'kêr), a game of cards played by two, three, or four persons, but only the aces, kings, queens, jacks, tens, nines, and eights are used. The cards rank in the order named, except that the trump suit jack is called the *right bower*, which is the highest, while the jack of the next suit which is like in color is called the *left bower*, hence is the second highest card. The game is one of the most popular played with cards.

**EUDIOMETER** (û-dî-ôm'ê-têr), an instrument used to determine the composition of gases. Priestley invented an apparatus of this kind to analyze atmospheric air and determine its proportion of oxygen. Many forms of the eudiometer are now in use, but the kind employed most extensively is a U or V shaped graduated glass tube, one end of which is closed and provided with electrodes fused into the glass. The air is tested by removing the carbonic acid contained in the air within the tube by means of a strong liquor potassae over a mercury bath, when the proportion of carbonic acid in the atmosphere is indicated by a rise of the mercury within the tube. An electric current is used, by means of the electrode, to explode a given quantity of hydrogen introduced in the tube. The volume of free oxygen in the tube is determined after cooling, and is equal to one-third of the loss of gas in the explosion. It is necessary to use a very thick tube in order to withstand the shock.

**EUFAULA** (û-fa'la), a city of Barbour County, Alabama, on the Chattahoochee River, eighty miles southeast of Montgomery. It is on the Central of Georgia Railroad. The chief buildings include the high school and the Union



Female College. The surrounding country is agricultural and fruit growing. It has manufactures of cotton goods, vehicles, canned fruit, lumber, and tobacco. The municipality owns and operates the waterworks. Population, 1900, 4,532; in 1910, 4,259.

**EUGENE** (û-gên'), a city of Oregon, county seat of Lane County, 125 miles south of Portland. It is finely situated on the Willamette River and the Southern Pacific Railroad, and is surrounded by a fertile farming and fruit-growing country. The Willamette River furnishes excellent water power for manufacturing purposes. Among the manufactures are leather, lumber, furniture, brick, and flour. It is the seat of the University of Oregon and has a number of fine public schools and churches. Electric lights and waterworks are among the public utilities. The first settlement in its vicinity was made in 1854 and it was incorporated in 1864. Population, 1900, 3,236.

**EUPHRATES** (û-frâ'têz), an important river of Western Asia, rising by two head streams in the Anti-Taurus range, in Armenia. The western branch, known as Kara-su, rises about 25 miles northeast of Erzerum and joins the Murad Chai, the eastern branch, some distance to the southwest of that city. The great river is joined by the Tigris at Kurna, and the united streams take the name of Shat-el-Arab for the remaining distance to the Persian Gulf, into which its waters flow. The total length of the Euphrates is 1,740 miles, and the area of its basin is 260,000 square miles. It is navigable about 1,200 miles, though the larger warships cannot safely ascend farther than 125 miles, owing to rapids and shallows. During May and June vast floods are caused by the melting snows on the Taurus and the Anti-Taurus ranges, causing the current to rise in velocity from three to five miles an hour and often occasioning great floods. The Bible mentions the Euphrates as one of the four rivers of the Garden of Eden, in Gen. ii, 14. In the prosperity of Babylon extensive canals served in irrigating the flood lands. Nebuchadnezzar connected that city by canals with the interior, and converted the flood lands into the most productive district of the ancient world.

**EURASIA** (û-râ'shî-â), the region included in the two continents of Europe and Asia. The term *Eur-Asiatic* is frequently applied to the geological formations of the two continents. In like manner, *Eurasian* has reference to both Europe and Asia, as the Eurasian plain.

**EURASIANS** (û-râ'shans), the name applied to the people of India who descended from Hindu and European parents. They are the

result of inter-marriages, and are usually educated in the manner of Europeans. Though they speak English quite well, their pronunciation is not clear and concise. Young men of this class engage in mercantile pursuits or enter the government service, and many of the girls marry British officers. The Eurasians have a much darker complexion than the Europeans.

**EURE** (êr), a river of France, rises in the department of Orne, and flows into the Seine after a course of 115 miles. It receives the inflow from the Iton, its principal tributary, and is navigable about 50 miles.

**EUREKA** (û-rê'kâ), the exclamation of Archimedes when he discovered a method of detecting the exact amount of alloy in the crown of King Hiero, the meaning being "I have found it." The word is now used to signify an expression of triumph at the time of making a discovery.

**EUREKA**, county seat of Humboldt County, California, on Humboldt Bay, 225 miles north of San Francisco. It has a good harbor and is a shipping point for lumber and produce. The noteworthy buildings include the county courthouse, the Carnegie library, the high school, and several churches. Sequoia Park is a fine public resort and contains a tract of redwood forest in its virgin state. Among the manufactures are dairy products, lumber products, woolen goods, and machinery. It has a large export trade in wool, lumber, fruits, butter, and fish. The surrounding country is lumbering, mining, and agricultural. It was settled in 1850 and incorporated in 1856. Population, 1900, 7,327.

**EUREKA**, a city of Utah, in Jaud County, 65 miles south of Salt Lake City, on the Rio Grande Western and the San Pedro, Los Angeles and Salt Lake railroads. It is surrounded by a productive gold, silver, and lead mining district. Near the city is a canyon of the Oquirrh Mountains, which is noted for its valuable silver mines. It has several fine schools and a considerable trade. Population, 1900, 3,085.

**EUROPE** (û'rûp), a grand division lying north of Africa and west of Asia, and with the latter forming Eurasia. From the standpoint both of history and politics it is the most important of the grand divisions. It is the most densely populated, but is smaller than any of the others, except Australia. The northern boundary is formed by the Arctic Ocean; eastern by the Ural Mountains, the Ural River, and the Caspian Sea; southern by the Black Sea and the Mediterranean; and the western by the Atlantic Ocean. The extreme northern point is Cape North; eastern, a point in Russia lying





PHYSICAL MAP OF EUROPE.



about 65° east of Greenwich; southern, Punta da Tarifa, in the Strait of Gibraltar; and western, Capt Finisterre, in the Iberian Peninsula. Its greatest length from north to south, between Capt Matapan and Cape North, is 2,400 miles, and the greatest distance from east to west is 3,400 miles; that is, measured from Capt Saint Vincent on the west to Ekaterinburg on the east. The total area is 3,782,000 square miles.

The coast line is characterized by a large number of indentations, hence it has a more irregular and extended coast in proportion to its size than any of the other grand divisions. Including the more important indentations, the coast line is about 25,000 miles, but it is nearly double that length if all of the indentations are followed. Many islands lie off its southern and western coasts. The former, which are the more important, include Ireland, Iceland, the British Isles, and the Faro Islands. South of Europe are Corsica, Sicily, Sardinia, Crete, Malta, the Ionian Islands, and the Balearic Islands. Numerous seas and inland waters abound near all of its coast line. These include Cheskaya Bay, the White Sea, the North Sea, and the Baltic Sea on the north; the Caspian Sea, the Black Sea, the Adriatic Sea, the Aegean Sea, and the Mediterranean on the south; while the expansive Bay of Biscay is on the west. The Mediterranean and other seas have arms extending far inland, such as the Sea of Azov, the Gulf of Genoa, the Gulf of Finland, and the Gulf of Bothnia. No lakes occur in the eastern part of Europe, and those of considerable extent are in the northern portion. These include Onega and Ladoga, in Russia, and Vener, Vetter, and Mälar, in Sweden.

**SURFACE.** The surface of Europe is characterized by a great plain extending from the Black Sea to the White Sea, and occupying the interior from the mountains in the south and west to the Asiatic boundary on the east. Its mountains form several complicated groups belonging to different geological ages, and occupy largely the southern and western portions. The most prominent system extends in a curved line from the Strait of Gibraltar along the Mediterranean to Asia Minor, and continues as the Caucasus Mountains between the Black Sea and the Caspian. This system is highest in the center, where the Alps attain a general elevation of about 12,000 feet, though Mont Blanc is 15,787 feet above sea level and forms the highest peak in Europe. However, Jungfrau, Matterhorn, and Monte Rose are but little inferior in height. Communication between the

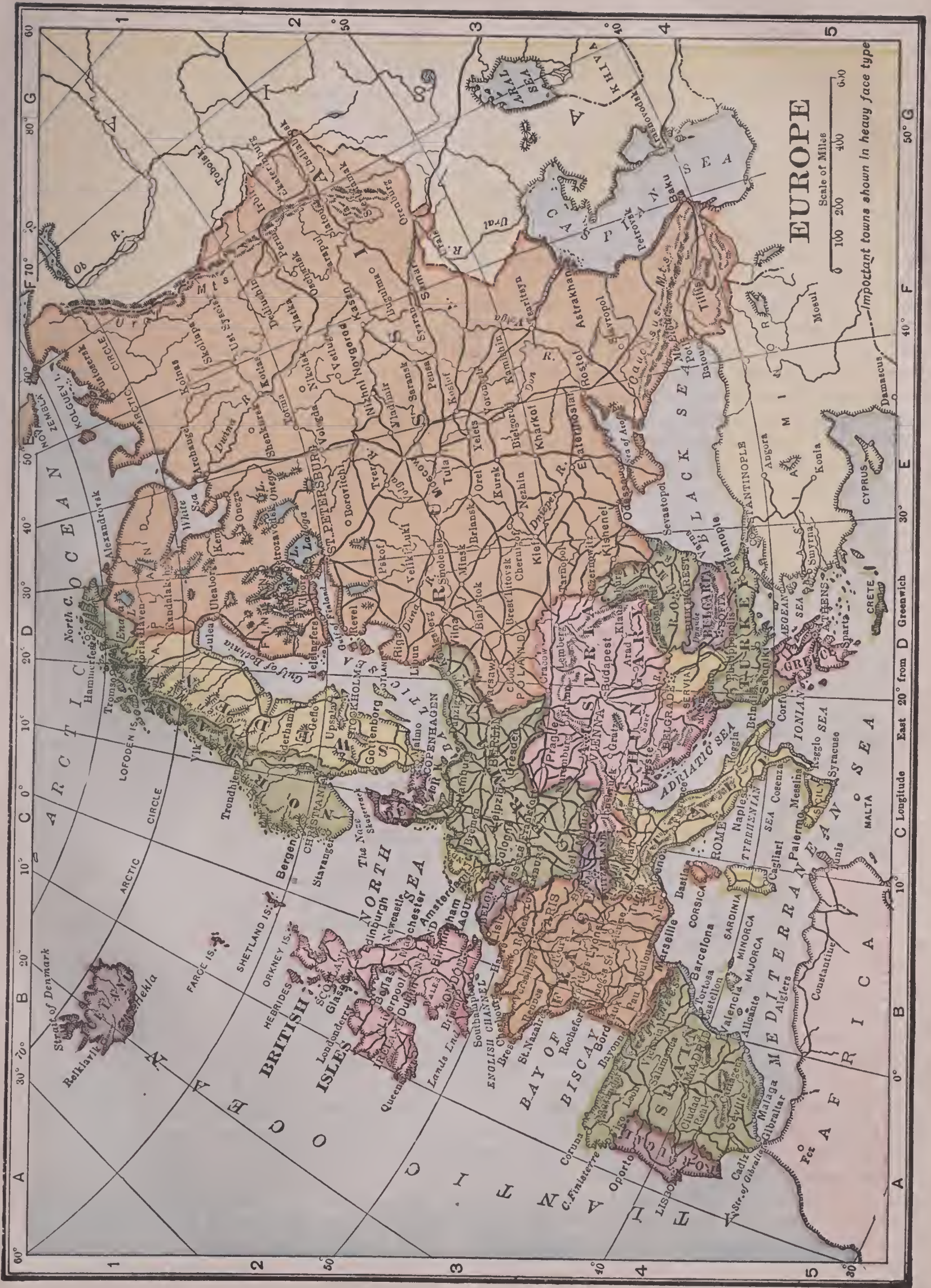
north and the south through these mountains is made possible by a number of famous railway tunnels, which include the Simplon, Mount Cenis, and Saint Gothard tunnels.

Several ranges extend from the central group, among them the Cevennes and adjoining ranges in France and the Cantabrian and Pyrenees in Spain, the latter containing peaks over 11,000 feet high. The system extends eastward in two curves to the Black Sea by the Transylvanian and Carpathian, which trend north of the Balkans and Dinaric Alps. North of the Alps are the ranges lying between the valleys of the Upper Danube and the Oder, and the different chains extending through Austria-Hungary. The mountains in the Scandinavian peninsula extend from the southern point of Norway to the Arctic Ocean, a distance of about 900 miles, the highest summit being about 8,000 feet. These ranges include the Kjölen and several broad plateaus that descend abruptly into numerous deep-cut valleys called *fjords*, and which are penetrated by the sea almost to the heart of the plateaus. The Ural Mountains extend along the boundary between Europe and Asia, in the north, and some distance to the west of the boundary in the center, trending on a line almost parallel to the meridians, and terminate in a plain north of the Caspian Sea.

**RIVERS.** Most of the rivers flow in a southeasterly direction, and have their source either in the great central plain or in the mountains of the central west. The four largest rivers rising in the Alps are the Danube, Rhine, Po, and Rhone. Of these the Po flows into the Adriatic; the Danube, into the Black Sea; the Rhine, into the North Sea; and the Rhone, into the Mediterranean. These four rivers have large deltas. The central plain is drained toward the northwest by the Dwina and Petchora into the Arctic; by the Oder, Vistula, Duna, and Nieman into the Baltic; and by the Rhine, Weser, and Elbe into the North Sea. Toward the south and east it is drained by the Dnieper, Don, and Dniester into the Black Sea and the Sea of Azov, and by the Ural and Volga into the inland basin of the Caspian. Numerous rivers are found in all the peninsulas, the most important of these being the Tagus, Douro, and Gaudiana in Spain and Portugal; the Po in Italy; the Loire, Seine, and Garonne in France; the Ebro and Guadalquivir in Spain; and the Glommen in the Scandinavian peninsula.

In the northern part of Europe the lakes are frozen the greater part of the year, especially lakes Onega and Ladoga, in Russia, and Stor Lake, in Sweden, but the lakes of the south, though small, are important for their fisheries





# EUROPE

Scale of Miles  
0 100 200 400 600

Important towns shown in heavy face type

Longitude East 20° from D Greenwich 30° E 40° F 50° G







and as a basis for inland commerce. The most important of these are located near the Alps. Those south of the Alps include lakes Iseo, Como, Maggiore, Garda, and Lugano; those on the north include lakes Thun, Geneva, Zurich, Lucerne, Neuchâtel, and Constance.

**CLIMATE.** The climate of Europe is peculiarly genial, though it is marked by periods of extreme cold in the north. The shores are exposed to the warm winds and warm oceanic currents from the southwest, by which the temperature is moderated and rendered favorable to the development of plant and animal life. As we proceed east the extremes of temperature become greater, the summer being hotter and the winter having greater cold. The most favorable effects of the oceanic currents are those experienced on the British Isles and the Scandinavian peninsula, in fact these otherwise would be almost uninhabitable. Northern Russia and the extreme north of the Scandinavian peninsula lie partly within the Arctic zone, and correspond in temperature to the extreme northern parts of North America.

As a whole, the climate of Europe is less severe in the western than in the eastern part, since the mean temperature is not perceptibly affected by the sea in the interior. At Sartov, in eastern Russia, the mean temperature is  $41^{\circ}$ ; at Warsaw,  $45^{\circ}$ ; at Berlin,  $48^{\circ}$ ; and at Greenwich  $49^{\circ}$ . All parts of the grand division have an abundance of rainfall, but in some places it does not occur at the time of the growing season. This is true of Spain, where irrigation is resorted to in agriculture. However, rainfall is most abundant on the western coast and decreases toward the east in proportion of the increase of distance from the Atlantic.

**MINERALS.** Europe is rich in the useful minerals and many of these have been worked from times immemorial. Carboniferous coal deposits are abundant between the parallels of  $40^{\circ}$  and  $60^{\circ}$  north. They are worked with a high degree of efficiency in Great Britain, Germany, France, Belgium, and Austria-Hungary. Iron ore is found in the same or adjoining fields. The output of iron is especially important in Spain, Germany, and Great Britain. Sweden has large deposits of superior steel-making ores, hence the products of this country are shipped very extensively. Nearly all of the world's supply of platinum is obtained from Russia, while sulphur is secured in large quantities from Sicily and Italy. In the production of gold in the world, Russia takes fourth rank, while Germany ranks fourth in the output of silver, and Spain and Portugal are exceeded only by the United States in the production of

copper. Fine grades of marble are obtained in Italy, and granite, limestone, and other building materials are abundant in widely separated regions. Other mineral products obtained largely include petroleum, tin, quicksilver, and lead.

**VEGETATION.** The great range of temperature makes Europe suitable for many species of plants. In the north, which extends beyond the Arctic Circle, the continent assumes the aspect of the tundra, where vegetation is very scant or entirely absent. Here thrive the saxifrage, crow-foot, poppy, scurvy-grass, and other forms common to the Arctic region. Forests of considerable value extend almost to Cape North, where the birch predominates, and farther south are fine forests of fir. The northern part of Russia and the Scandinavian peninsula do not yield cereals, but barley can be grown as far north as  $70^{\circ}$  north latitude and wheat thrives at about  $60^{\circ}$ . As we proceed south from this locality, we come in contact with fine forests of oak and beech and enter sections where all classes of cereals thrive.

Rye is grown extensively in many parts of Europe, while maize, oats, and barley yield abundantly. Rice is cultivated in some parts of Spain and Italy. Much attention is given to the culture of the mulberry in the vicinity of the Mediterranean. Many varieties of fruits thrive in the southern portion, such as lemons, oranges, vines, olives, almonds, and peaches, while the hardier varieties are cultivated extensively far into the north. The steppes of Russia are very similar to the great prairies of North America and extend as treeless plains from the borders of Holland to the Ural Mountains. They are especially rich in grasses and have been converted into a productive field for agriculture.

**ANIMALS.** Formerly the continent was peculiarly rich in wild animal life, but it is now quite rare, except in the northern part and in regions under government protection. Polar bears and reindeer are numerous in the north, while wolves, foxes, bears, and lynxes infest the forests and mountains. Other species more or less widely distributed include the roebuck, ibex, porcupine, stag, and fallow deer. The fisheries are valuable, especially those bearing the cod, anchovy, salmon, mackerel, herring, and tunny. Much interest is vested in the rearing of domestic animals, hence the grades are superior from careful breeding. They are very similar in all sections of the grand division, except in the extreme north, where dogs and reindeer are used as animals of draft.

**INHABITANTS.** The people of Europe belong to various races and are greatly intermingled in



most of the states. At an early period the Celts occupied the region from the Alps to the British Isles, but they were driven westward by successive waves of migration under the Roman conquests and the insurrections of the Germanic tribes until they were pressed largely to the extreme west, or were assimilated by the most powerful divisions of the Germanic people. The Celtic language is represented at present only by the Gaelic in the islands of Scotland, the Irish in portions of Ireland, the Cymric in Wales, and the Armorican in Brittany. Next eastward we find the Teutonic races, comprising the Germanic and Scandinavian divisions. In the former the Germans, Dutch, and English are included, while the latter comprise the Danes, Norwegians, and Swedes. Farther east the Slavonians are mixed with the Teutons to a greater or less extent. The different branches comprise the Russians, Poles, Bohemians, Czechs, Servians, Croatians, and other minor branches. The Greek and

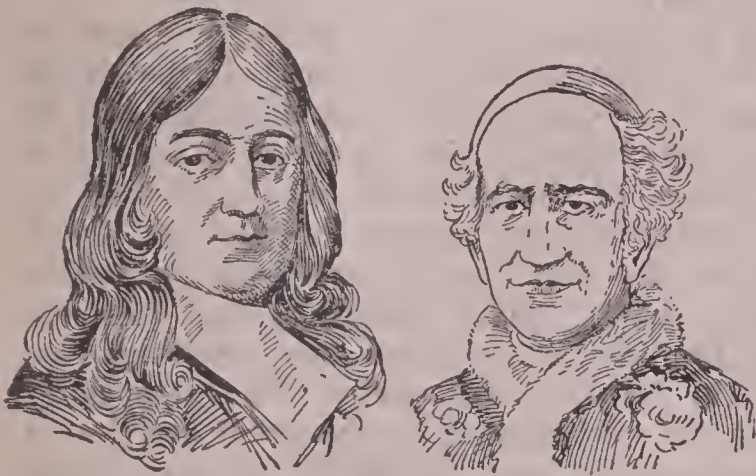
the non-Aryan, by about 18,000,000. Each of the languages has numerous dialects, though the number of distinct forms of tongues is about fifty.

The Christian religion prevails almost exclusively, the only exceptions being the Jewish in widely distributed but minor communities and the Mohammedan in Turkey. In the western part of the grand division various sects of the Protestant and Roman Catholic religion prevail, while the Greek Catholic is the predominating religion of Greece and Russia. Europe holds an important place in the field of education, but the advancement in educational lines has its greatest development in the Protestant nations of the western part, especially in Germany, England, and the Scandinavian Peninsula, where illiteracy has been reduced to a minimum. However, great universities are maintained in France, Austria-Hungary, Italy, and Russia, and the educational uplift in all the countries is marked.

**POLITICAL DIVISIONS.** The countries of Europe as at present organized are governed wholly as independent states, and all of the more powerful nations have extended their political influence by the acquisition and control of territory in other grand divisions. All of them are monarchies, except Andorra, France, and Switzerland, which have republican governments. The alphabetical list of European states is as follows: Andorra, Austria-Hungary, Belgium, Bulgaria, Denmark, France, Germany, Great Britain, Greece, Italy, Liechtenstein, Luxemburg, Monaco, Montenegro, Norway, Portugal, Rumania, Russia, Servia, Spain, Sweden, Switzerland, The Netherlands, and Turkey.

**HISTORY.** According to some writers, Europe was named from Europa, a mythical person of Greece, who was carried off by Jupiter, though other authorities attribute its origin to the Phoenician traders, who applied it to the land of sunset, from the word *Erebh*, meaning darkness.

It is quite certain that Europe was first peopled by successive waves of migration that moved westward from Asia, each pressing the weaker farther and farther westward toward the Atlantic Ocean. The date of these great movements is unknown, though their occurrence is evidenced clearly by the present and past settlements in the European countries. Writers generally agree that authentic history dates in Greece from about 776 B. C. All the earlier periods are estimated from circumstantial evidence. The most successful epoch of Greece is assigned to about 430 B. C., and this date marks approximately the time when all



GERMANIC.

ROMANIC.

Latin people occupy the south and southwestern parts of Europe. Among the Latin, or Roman, races are the French, Spanish, Portuguese, and Italians. All the peoples named above are of the Aryan or Indo-European family.

The Mongolian race is represented in Europe by the Turks, Magyars, Lapps, and Finns, all these having emigrated into Europe within comparatively recent times and secured a foothold by successive conquests or friendly terms of settlement. Another class comprises the Basques, who are thought to belong to the Turanians. Owing to the great mixture of the population it is difficult to classify them on a racial basis; the better way is, perhaps, to base the classification upon languages. By this test it is found that the Teutonic language is spoken by 125,000,000; the Slavonian, by 110,000,000; the Roman, by 114,000,000; the Letts and Lithuanian, by 3,000,000; Armenian, by 1,150,000; Greek and Albanian, by 5,450,000; Celtic, by 3,600,000; and



colonies pressed westward. Grecian education moved westward to Rome and made it the predominating influence for many centuries. Greece was conquered by Rome in 146 A. D., and the latter soon made itself master of Spain, Gaul, Helvetia, Illyria, Dacia, and portions of Germany and Brittany. Roman extension carried superior laws, greater industrial activities, and social advancement to the regions conquered, and by its theory of government provided favorable conditions for the spread of Christianity. The northern nations migrated extensively shortly after the Roman Empire began to decline, and paved the way for great commercial and educational activities in the northwest. These movements were accompanied by the settlement of the Anglo-Saxons in England, the Franks in France, the Lombards and Ostrogoths in Italy, and the Visigoths in Spain, who by superior arts rendered the original inhabitants subject to their institutions or became assimilated with them.

A great Germanic empire was established under Charlemagne in 771. After the decline of the Holy Roman Empire, as the German nation came to be called, the territory was organized into the kingdoms of Germany, France, Burgundy, Italy, Lorraine, and Navarre. These movements were followed shortly by the populations of Eastern Europe establishing themselves in regions now more or less influenced by their occupation. The most prominent movements among them were directed toward establishing kingdoms in the north of Germany, Bohemia, Russia, and Poland, while the Magyars invaded Hungary and the Normans established principalities and governments in France, England, and various regions of the southeast.

The Christian Crusades, organized to rescue Jerusalem from the Mohammedans, exercised a wide influence on the habits and learning of the western peoples, while the Turkish conquest of Constantinople, in 1453, distributed the Greek teachers and philosophers throughout Western Europe. This caused a great impetus in the revival of learning, led to the invention of printing, and ultimately resulted in the Reformation. Spain became the most powerful nation shortly after the discovery of America. France soon after rose to a high plane of influence and the territories of Prussia and Russia were greatly enlarged and the sphere of their power was widened. A vast emigration to America greatly affected all the countries that had become over-populated and was the indirect cause of several extended wars. These conflicts were followed by the French Revolution, the Napoleonic wars, the dissolution of the

German Empire, and the colonial development of several nations.

Among the more recent events in European history may be enumerated the independence of Greece; the absorption of Poland by several states; the unification of Italy; the consolidation of Germany into an empire; the establishment of the French Republic, as a result of the Franco-German War; the curtailing of Turkish influence by the independence of Bulgaria, Rumania, Servia, and Montenegro; and the War of 1897 between Greece and Turkey. The Anglo-Boer War (1899) strengthened the foothold of Great Britain in South Africa, the Russo-Japanese War (1904) deprived Russia of its preponderance of influence in the East, and the dissolution of the union between Sweden and Norway (1905) restored the independence of Norway among the nations.

**EUSTACHIAN TUBE** (û-stā'kī-ān), in anatomy, the canal extending from the pharynx to the middle ear. Its function is to equalize the pressure of the air on either side of the tympanic membrane. In birds, reptiles, and mammals it is closely connected with the auditory organs. Diseases of the Eustachian tube impair the hearing.

**EUTAW SPRINGS** (ū'tā), **Battle of**, an engagement of the American Revolution, fought about sixty miles northwest of Charleston, S. C., on Sept. 8, 1781. General Greene commanded the American forces of 2,000 men, while the British under General Stuart numbered 2,300. The former made an attack at four o'clock in the morning and were victorious, but the British rallied and held their position until night, when they withdrew to Charleston. The Americans lost 554 and the British lost about 800. Though a tactical defeat for the Americans, it proved a strategic victory in that the British were shut up in Charleston.

**EUTERPE** (eu-ter'pe), in mythology, one of the nine Muses, the inspirer of delight. She presided over lyric poetry and played on the flute, of which she was the inventor. In sculpture she is usually represented as a virgin crowned with flowers, holding a flute or some other musical instrument in her hand.

**EVANGELICAL ALLIANCE** (ē-vān-jěl'ī-kāł āl-lī'āns), an association of Christians of various denominations. The first effort to form such an organization was made at London, England, in 1846, when a meeting was held by representatives of a large number of Protestant churches. About 800 persons were in attendance, representing the Baptists, Lutherans, Methodists, Presbyterians, Episcopalians, Moravians, and a number of other denominations.



Among the countries represented were England, France, Germany, Ireland, Switzerland, and the United States. A branch was organized in America in 1867, and this is well represented in Canada and the United States. General conferences in the form of Protestant ecumenical councils represent officially the whole Alliance, but influence is exercised only to promote moral and spiritual lines of action. The purpose is to unify the Protestant missionary work, to cooperate along lines of Christian work without interference of denominational barriers, and to extend religious liberty in all parts of the world. This association has accomplished much good in obtaining reform and greater religious liberty in Japan, Russia, and Turkey.

**EVANGELICAL ASSOCIATION** (äs-sō-sī-ā'shūn), a religious denomination founded by Jacob Albright in Pennsylvania in 1807. He was a member of the Methodist Episcopal Church and traveled as an evangelist in the large German settlements of his native State, and carried on a line of effective work in promoting a higher religious life. The book of discipline does not differ in essential points from that of the Methodist Episcopal Church, which it resembles in polity, government, and methods of worship. In 1891 a division was made on account of a difference of opinion in regard to church government, which resulted in organizing the United Evangelical Church. This branch has about 40,000 members and the Evangelical Association proper has 115,000 communicants. The latter is represented by organizations in Canada, the United States, Germany, Japan, and Switzerland. Originally the members were exclusively German or of German descent, but now a large membership is English-speaking. Many charitable, missionary, and educational societies are maintained. The Young People's Alliance is an auxiliary organization.

**EVANSTON** (ēv'anz-tūn) a city of Illinois, in Cook County, about twelve miles north of Chicago, with which it is connected by surface and elevated electric street railways. It is on the Chicago and Northwestern and the Chicago, Milwaukee and Saint Paul railroads. The site is on a beautiful plat of ground on the margin of Lake Michigan. It is the seat of the Northwestern University, the Norwegian-Danish Theological School, the Garrett Biblical Institute, and the Visitation Academy. The streets are finely paved and lighted by electricity. Evanston was the home of Frances Willard. It was settled in 1835 and incorporated in 1890. Population, 1900, 19,259.

**EVANSTON**, a city of Wyoming, county seat of Uinta County, in the southwestern part of the State. It is located on the Bear River and the Union Pacific Railroad, and is surrounded by an agricultural and coal-mining district. The manufactures include flour and machinery. Mineral oil and building stone are obtained in the vicinity. It is the seat of the State institution for the insane and has a number of fine schools. Population, 1905, 2,741.

**EVANSVILLE** (ēv'anz-vīl), a city of Indiana, county seat of Vanderburgh County, on the Ohio River, about 160 miles northeast of Saint Louis. It is on the Louisville and Nashville, the Illinois Central, the Southern, and other railroads, and has communication by regular lines of steamboats. Productive coal fields are worked in the vicinity. It has a large shipping trade in coal, timber, brick and tile, flour, pork, grain, and tobacco. Among the manufactories are flouring mills, iron foundries, furniture factories, cotton mills, sawmills, breweries, and machine shops.

Evansville has regularly platted and well-improved streets. Much of the paving is of brick, stone, and asphalt. The chief buildings include the county courthouse, the Federal building, the city hall, and the Willard Library. It has a marine hospital, an insane asylum, and a fine high school. Cooks and Garvin parks are well-kept public resorts. Evansville was founded in 1816 and so named from Gen. Robert M. Evans. It was incorporated in 1847. Population, 1900, 59,007; in 1910, 69,647.

**EVAPORATION** (ē-vāp-ō-rā'shūn), the conversion of a liquid or solid by heat into vapor. Some solids, such as arsenic and camphor, pass into a state of vapor and are said to be sublimated. The rapidity at which evaporation proceeds depends upon the extent of surface exposed, for the reason that it takes place at the surface; the quantity of the same vapor already present in the air, because when the air is saturated no more of the liquid can evaporate; on the removal of the air, because evaporation ceases when the air over the liquid is saturated; on the temperature, because warm air can hold more vapor than cold air; and on the pressure on the surface, since diminished atmospheric pressure increases the rapidity of evaporation. From every water surface and even from masses of ice and snow there is constantly arising, at all temperatures, an invisible vapor. A volatile liquid, when placed in a vacuum, rapidly evaporizes without external heat. If a drop of such liquid be passed into the empty space above the mercury of a thermometer tube, it disappears by changing into vapor. When



the vapor more than fills the vacuum, the mercury is depressed, thus showing that it possesses tension. If more liquid be passed into the tube, it reaches a point when no more can be evaporated, but simply floats on the surface of the mercury. The vapor is then at its greatest tension and the space it occupies is said to be saturated.

The pressure remaining the same, there is for every liquid a certain temperature at which it boils. After it boils, all the heat it receives is rendered latent, and it can never be raised above that temperature while its vapor is allowed to escape. When vapor loses heat and condenses, the latent heat again appears as sensible heat. Thus, large buildings are heated by steam being passed through pipes, and, as it condenses, these pipes give out its latent heat. We are cooled by fanning because the warm air, thus brought in contact with the skin, causes a rapid evaporation of the moisture of the skin, thereby lowering the temperature. If water be placed in a vacuum space and the vapor which escapes from it be removed as rapidly as it forms, it is frozen by its own evaporation. Various machines used in manufacturing ice utilize this principle. The moisture taken up by the atmosphere in the form of vapor rises to considerable heights, forms clouds by partial condensation, and descends in rain when the point of saturation is reached.

**EVELETH** (ěv'ě-lěth), a city of Minnesota, in Saint Louis County, seventy miles northwest of Duluth, on the Duluth and Iron Range and the Duluth, Missabe and Northern railroads. It is surrounded by an iron-mining district. The chief buildings include a number of schools and churches. It has a large trade in merchandise and produce, and is important on account of the enterprises connected with the iron industry. Population, 1905, 5,332.

**EVENING SCHOOLS**, a class of schools established in many countries, generally in large cities, as a part of the public school system. The purpose is to give to those of school age, who cannot avail themselves of the advantages of the day school, an opportunity to obtain an elementary education and to enable adults, who have finished the course of instruction in the public day school, to acquire additional knowledge, especially on subjects relating to their particular occupation or profession. Schools of this class are now maintained in Austria, France, Germany, Great Britain, Switzerland, and other countries of Europe. In some countries they are supported at the expense of the state and are attended by both sexes, and the purpose is to furnish educational facilities for

children employed in factories. Schools for the education of the children belonging to the industrial classes were formerly open on Sunday and evening schools more recently succeeded the Sunday schools, though in some countries the two are combined.

The evening schools of America may be said to date from 1850, when they were made an adjunct to the educational system in many large cities. They have been particularly proficient in teaching the English language to foreigners, and for that purpose many employ teachers who speak the language of the students. However, the main purpose is to teach the common school branches and to give instruction in commercial lines. The Drexel Institute of Philadelphia and Cooper Union of New York City are among the noted institutions that maintain evening classes for general and special instruction. Experience has demonstrated that evening schools constitute an essential part of every common school system, particularly in large communities, in which many children are obliged to leave the day school before they acquire the rudiments of an education. The office of technical schools, while different, is no less important, since an increase of skilled labor in any community is one of the most valuable elements of its wealth and prosperity.

**EVEREST** (ěv'ěr-ěst), **Mount**, the highest mountain peak in the world, situated in Nepal, Asia, among the great peaks of the Himalayas. Its height is 29,002 feet above sea level. The name was applied in honor of Sir John Everest (1790-1866), who was surveyor general of India.

**EVERETT**, a city of Massachusetts, in Middlesex County, in the extreme eastern part of the State. It is on the Boston and Maine Railroad and a number of electric interurban lines. The noteworthy buildings include the Whidden Memorial Hospital, the Parlin and Shute libraries, and the high school. It has systems of sewerage and waterworks, graded and paved streets, and a large trade in produce. The manufactures include bicycles, chemicals, baby carriages, furniture, hardware, and gloves. The surrounding country is agricultural. It was settled in 1643 and became a city in 1892. Population, 1905, 29,111; in 1910, 33,484.

**EVERETT**, a city of Washington, county seat of Snohomish County, on Puget Sound, about 35 miles north of Seattle. It is on the Northern Pacific, the Great Northern, and other railroads, and has a fine harbor. The customhouse, the public library, the high school, the county courthouse, and the theater are the chief buildings. It has extensive shipyards, railroad



shops, flouring mills, machine shops, and smelting mills. The public utilities include electric lights, sewerage, waterworks, and paving. It was settled in 1891 and incorporated in 1893. In recent years it has had a rapid growth in wealth and commerce. Population, 1900, 7,838; in 1910, 24,298.

**EVERGLADES** (ěv'ěr-glāds), a tract of swampy land in the southern part of Florida, 150 miles long and 50 miles wide. It includes numerous marshy islets covered with dense thickets and groves of pines and palmettoes. Many shallow streams and lakes characterize the region. Formerly it was infested by vast numbers of alligators. The Everglades were made historical by the Seminole Indian War, in which the chief, Osceola, took a prominent part against Gen. Andrew Jackson.

**EVERGREEN**, the trees and shrubs which retain their verdure through all seasons, as the fir, laurel, cedar, holly, cypress, juniper, etc. Evergreens usually shed their leaves in the spring, after their successors have reached a state of development, but in some instances a set of leaves lasts several years. The leaves are generally of thicker and firmer texture than those of deciduous trees, and the undiminished thickness of the foliage, characteristic of the northern scenery both in summer and winter, affords exceptional winter shelter for animals. Evergreens form very popular ornamental shade trees, and their boughs are used on festive occasions for decorative purposes.

**EVERLASTING FLOWER**, the popular name of various flowering plants, the bloom of which may be kept many years without a material diminution of beauty. They include the amarath, some species of cudweed, and a number of others. See *Immortelles*.

**EVIDENCE** (ěv'ĩ-děns), in law, that which tends to prove or disprove any matter in question. It differs from the proofs by which human judgment is ordinarily determined in non-judicial matters, chiefly in certain rules established for the sake of felicity in disposing of complicated questions of fact, or of public policy, when by lapse of time or other causes there would be a deficiency of evidence. The rules under which evidence is admitted differ more or less, though in general they have many points in common, and for convenience are reduced under four heads, as follows: 1. Cases in which evidence is excluded on the ground of being untrustworthy and tending to show by its very nature that it likely is untrue. 2. Cases in which a rule is prescribed for the purpose of getting at a certain conclusion, though arbitrarily, when the subject is intrinsically liable to doubt from

the remoteness, discrepancy, or actual defect of proofs. 3. Cases in which a legal presumption is substituted for actual proof, or in place of what could be proved, being supposed to be more consistent with the real rights of the parties than any result which could be expected from positive testimony. 4. The graduation of the weight of evidence, which will be found in some instances to be arbitrary in its origin, and, perhaps, not altogether in accordance with the ordinary process of judgment.

Evidence is usually studied under four heads: oral or documentary, direct or circumstantial, primary or secondary, and prima facie or conclusive. *Oral evidence* consists of statements made under oath by witnesses in court, while *documentary evidence* includes proofs in writing, which are submitted to the court or jury for inspection. *Direct evidence* is proof in itself of the existence of a fact, while *circumstantial evidence* is indirect, tending to show by circumstances that the fact sought to be established has existence. *Primary evidence* proves a fact by the best evidence obtainable, while *secondary evidence* is admissible only when primary evidence cannot be shown. For instance, when a case hinges upon a written contract, the agreement in writing must be produced if possible, but, if it is shown that it cannot be procured as evidence, then its existence may be proven by a copy or by oral testimony. *Prima facie evidence* is such as the law declares, or in fact appears, to be sufficient proof, while *conclusive evidence* establishes a fact and renders inadmissible any evidence to contradict it. While the rules governing evidence are very extensive, the essence of this branch of the law hinges upon what can be proved, rather than what is true.

**EVOLUTION** (ěv-ō-lū'shŭn), in biology and geology, the steps by which organic and inorganic matter came to exist in their present forms. It is evident to every inquiring mind that times come when both the infantile and philosophic are led to ponder the question of the origin of things. In attempting to answer man has constructed a cosmogony which seeks to give an account of the origin of the universe. There are three classes of cosmogonies that merit thought. These represent that the world has existed in its present form from eternity; that the matter, but not the form, of the world existed from eternity; and that the matter and form of the world are due to a spiritual cause. The last two are termed evolution and creation, respectively. Evolution seeks to trace the growth of the world and the expansion of life forms from cause to effect, while creation dis-



poses of the whole matter by attributing all laws of the universe, of life and being, to a divine godhead.

The very nature of the universe, with its varied changes through long periods of time, renders philosophies attempting to account for the laws that underlie cause and effect incapable of being grasped by even the highest effort of the intellect, and they are contradicted by various other philosophies and by the evidence of experience. The study of natural sciences has thrown light upon various questions relative to astronomical, geological, and biological phenomena. Through it have been fathomed many questions formerly incomprehensible, but there always remain conditions that point to a first cause which the most powerful intellect cannot comprehend. The theory of evolution involves a hypothesis which precludes a sudden and unexplained bursting forth of worlds and abrupt formations of physical laws to hold them in space, a miraculous springing up of life forms to inhabit and utilize nature's forces, but aims to account for all phenomena by natural laws, as the consequence of positive forces that operate under the will of a creator, or assume forms and undergo changes as the natural result of fitness. As a theory it superseded the crude anthropomorphisms that did not recognize the growth of the universe as the unfolding of a cosmic drama, as a development under laws that bear scientific scrutiny.

In former times it was held that the universe is permanent and at rest, having neither motion nor sensible change. The static views of ancient astronomers gave way to those of Kepler, Copernicus, Galileo, Herschel, and Newton, by which a conception of the kinetic forces was recognized and the nebular hypothesis was established, which assumes to explain the commencement and motion of the planets and the sun by gradual condensation from a nebulous mist that occupied space. Geology led to a study of the earth's crust and to the belief that our sphere was once a globe of fire, which gradually contracted by cooling and caused the formation of an outer crust. The condensation of atmospheric waters gave rise to the oceans, which finally became confined to definite regions and left large tracts of projecting lands, and after successive ages rivers and mountains were formed.

That life existed during at least a large portion of the time required to form the earth's crust is demonstrated by fossil remains of animals and plants, which abound in many of the aqueous and metamorphic rocks. These rocks bear evidence that the lowest forms of life ap-

peared first, and the higher gradually succeeded them and in many cases caused the disappearance of the earlier forms. The earlier animals were the protozoa, and after them, as if from evolution, came successively the radiates, articulates, mollusks, and finally the vertebrates. The earlier mollusks were followed by fishes, then came reptiles, later amphibious animals, and lastly mammals and man.

As a whole the fossil remains indicate that early life forms were general in character and gradually developed into the special; or, in other words, the evolution proceeded from the general to the particular, from the homogeneous to the heterogeneous. The changes were not abrupt, but proceeded gradually, one distinct form existing long periods of time after another had come into life. It is evident that the reptiles succeeded the fishes, though both existed afterward contemporaneously, and the reptiles were succeeded in a similar manner by birds. In this way the different forms of animals passed into each other by slight changes, though these effected very various results after long periods of time. In the process of evolution, rudimentary or useless organs gave way, and later became either entirely lost or existed only as an evidence of the changes that had previously occurred. To illustrate, the fins of a fish were small organs, though afterward they became modified as the wings of a bird, and later the paws of a dog, and still later the arms of a man. In the life forms still existing there are evidences of rudimentary organs, such as teeth rarely found in some birds, and hind legs concealed under the skin in some species of snakes.

All that is true of animal life in the process of evolution is true of plant life. The lower forms which prevailed at first gradually extended into other species, and after successive changes multiplied into thousands of forms that exist at present. Besides, it must be borne in mind that there are fully as many extinct forms of plant as of animal life, the extinct species having been crowded out by others more nearly fitted to exist under the changed conditions of climate, and doubtless possessing greater ability to battle for place. In connection with this phenomenon may be mentioned the evolution of mind from the uncultured and crude to the alert, scrutinizing, and moral. In society mind has undergone a long line of evolution, by means of which it has acquired useful arts and has developed a higher life and a more complete civilization.

Among recent writers on the theory of evolution are Huxley, Haeckel, Darwin, and Spen-



cer. Huxley speaks of evolution as the system that "embraces in one stupendous analogy the growth of a solar system from molecular chaos, the shaping of the earth from the nebulous cubhood of its youth, through innumerable changes, and development of a living being from the shapeless mass of protoplasm we term a germ." Spencer attributes all the changes of nature to three agencies—force, matter, and motion—while Haeckel traces both the vegetable and animal kingdoms to one very low form of life, consisting of a cell, and supposes this cell to be produced by or from inorganic matter by spontaneous generation. This he asserts to be possible for the reason that some forms of animal and vegetable life are so nearly similar that it is difficult to classify them. Darwin in his "Origin of Species" intimates his belief that life may have been originally breathed by the Creator into a few forms or into one, and that the others sprang from them in successive stages. See **Darwinism**.

**EXCHANGE** (ěks-chānj'), the division of economics which treats of the interchange of articles of value, as in commerce, or the transfer of commodities between different parties. The conditions peculiar to life confine the sphere of human activity largely to a particular place, while human wants are satisfied only by the productions from many different regions. From this localization of the efforts of man and the vast extent of his needs comes the necessity of transportation and trade. To be equitable, the exchange must be mutual and voluntary between two or more parties, and the right of property must exist. These are primary conditions, since transfer without a consideration is a gift, involuntary relinquishment is robbery, and no exchange can be effected unless the parties interested possess a right to the property exchanged.

The general law of exchange requires that value be given for value. In this connection the term *value* is used in a relative sense. It is defined as the estimate of the sacrifice requisite to come in possession of a desired object, and is sometimes spoken of as the *cost of production*. Hence, prices depend upon the *supply* and *demand* of a given article, or the quantity offered for sale on the one hand and the desire to possess on the other. It is understood that the desire must be more than mere longing, and must be attended by ability to purchase.

To promote exchange is one of the prime objects of government. In order to promote commerce and bring about the most beneficent results, legislation must aim to foster international and domestic trade, provide a wholesome

monetary system, and regulate banking. It must guard against the evils which are likely to result from the monopolistic control of certain avenues of trade and transportation, as well as the limitation of certain lines of production for the purpose of controlling prices.

The term *exchange* is likewise applied to a class of transactions in commerce by which the debts of persons or corporations located in a distant city or country are canceled by a bill of exchange, as a check or draft, without the actual payment of money. This is effected by the payer depositing specie or its equivalent in a bank for the purpose of forming a basis whereby the checks or drafts issued can be redeemed. The greatest volume, both of domestic and foreign business, is transacted by this system of exchange.

**EXCISE** (ěk-sīz'), a tax levied upon commodities produced at home, as distinguished from customs or duties on imports. It is used generally in Great Britain to describe the system known as internal revenue in the United States. The excise system of England dates from 1643, when the Long Parliament levied duties to support the army against Charles I. After the restoration of the monarchy, it was continued, and subsequently it became widespread and oppressive. Sir Robert Peel headed a movement to repeal a number of the excise tax laws, and many of these duties were reduced or abolished after 1844. Excise taxes are levied in many countries upon beer, wine, tobacco, and cigars, such as are provided for by the laws of France, Germany, and the United States.

The first excise law of the United States was advocated by Alexander Hamilton and was adopted after an excited debate in 1790. It levied a tax ranging from nine to twenty-five cents per gallon upon liquors distilled within the country, and a higher rate was charged on imported liquors, but lower rates were established in 1792. Much opposition finally caused the Whisky Insurrection of Pennsylvania in 1794. The excise was abolished in the administration of Thomas Jefferson, but was revived during the War of 1812, when a tax was imposed on sugar, salt, liquors, carriages, and instruments of exchange. These duties were repealed in 1817 and no excise duty was levied until 1862, during the Civil War. This system was finally merged into the internal revenue, which continues to the present time. At the outbreak of the Spanish-American War, in 1898, the tax on tobacco and liquors was doubled and many proprietary articles were made subject to taxation. Subsequently the



excises were reduced and the war tax was discontinued in 1902. See **Tax**.

The excise duties of Canada are levied chiefly on spirits and tobacco, in addition to which the manufacturers of these products pay a nominal license. However, both the duties and the licenses are preferential in favor of those who make the products from commodities produced within the country. The distiller pays a license of \$250; the brewer, \$50; the manufacturers in bond for exportation, \$300; and the manufacturers of cigars and tobacco from Canadian products, \$50, and when cigars and tobacco are made from imported leaf tobacco, \$75. The tax per proof gallon on spirits is \$1.90; on tobacco per pound, \$0.05; on cigars made of domestic tobacco per thousand, \$3; and on malt per gallon, \$0.015.

**EXECUTIVE** (ĕgz-ĕk'ŭ-tĭv), the branch of a nation, state, municipal government, or corporation which controls the administrative functions. All free governments recognize three departments—the executive, legislative, and judicial—and no state can long exist without a distribution of its power and functions. The term *executive* is applied to the chief magistrate, whether he is a governor, president, king, or emperor, and extends more or less to the principal officers in all civil institutions. In the United States the chief executive power is vested in the President, who is assisted by a Cabinet which has advisory functions. The President is by the terms of the Constitution made ex-officio commander in chief of the army and navy of the United States and of the militia of the several states, when engaged in the actual service of the nation. The principal officer of each department of the government may be required to furnish to the President an opinion in writing on questions relative to public interest. With the advice and consent of the Senate, the President is empowered to make treaties and nominate certain civil, military, and naval officers of the United States. Besides the duties especially enumerated in the Constitution, it devolves upon the President to control the subordinate departments whose heads are known as Attorney-General, Postmaster-General, and secretaries of State, Treasury, Interior, War, Navy, Agriculture, and Commerce and Labor. The business of the government is carried on through these departments under the direction of the President, statutes are enforced, and special laws passed by Congress are put in operation.

**EXETER** (ĕks'ĕ-tĕr), a city and river port of Devonshire, England, on the Exe River, about 170 miles southwest of London. The

site is on the summit and slopes of a beautiful ridge rising 150 feet from the bank of the river. It is surrounded by an agricultural country and has many industrial enterprises. The modern utilities include steam and electric railways, stone and asphalt paving, and gas and electric lighting. Though dating from the early history of England, it has been outgrown by many newer cities. Among the manufactures are agricultural implements, machinery, clothing, paper, gloves, and Honiton lace. The buildings of interest include Saint Peter's Cathedral, Saint Michael's Church, Albert Memorial Museum, and the remains of the castle of Rougemont. A canal connects the city with the tideway and provides convenient access for ships and steamers. The city was founded before the invasion of the Romans, was captured by the Danes in 876, and was taken by William the Conqueror in 1068. A new theater building burned on Sept. 5, 1887, at which time 190 lives were lost. Population, 1907, 43,368.

**EXETER COLLEGE**, an educational institution located at Oxford, England, and formerly called Stapledon Hall. It was founded by Walter de Stapledon and received its present name at the request of Edmund Stafford, Bishop of Exeter, who added two fellowships. Exeter College is a department or college of Oxford University.

**EXETER HALL**, an assembly hall with a seating capacity for 5,000 persons, situated on the Strand in London, England. It was completed in 1831 and in 1880 was purchased at \$100,000 for the Young Men's Christian Association. Formerly it was used for religious assemblies of various kinds and for musical concerts. At present it is the headquarters of the local Y. M. C. A. and is let for religious assemblies.

**EXHIBITION** (ĕks-hĭ-bĭsh'ŭn). See **Exposition**.

**EXODUS**, the second book of the Pentateuch and of the Old Testament. It consists of two distinct parts, which include an account of the deliverance of the Israelites from Egypt and a description of the giving of the law. The book begins with the death of Joseph, recounts the oppression of the Hebrews in Egypt, the birth and call of Moses, the deliverance from Egypt, and the way to Sinai. It includes a description of the tabernacle, the wanderings in the desert, and the establishment of the Covenant with Jehovah. Tradition and evidence affirm the Mosaic authorship of the Book of Exodus, but it is questioned by a number of eminent scholars.



**EXOGEN** (ěks'ò-jěn), or **Dicotyledon**, a plant whose stem increases in thickness by successive additions on the outside of what surrounds the central pith. The structure is best seen in the bodies of trees having a central pith, which is surrounded by as many concentric layers as the tree is old in years, and the whole is inclosed by a cylindrical sheath of bark. Rays called medullary radiate from the central pith to the bark. Exogens have two seed leaves, or cotyledons, and are now generally called *dicotyledons*. The leaves, with a few exceptions, are reticulated, while the flower usually has four or five parts. In all these respects exogens differ from endogens. The greater number of the trees in tropical climates and all of those in cold regions are exogens.

**EXPANSION** (ěks-păn'shŭn), in physics, the increase in bulk which a body undergoes in consequence of a change in its temperature, so that it occupies a greater space while the weight remains the same. Heat is the most common cause of expansion. Water in cooling ceases to contract at 39.2° Fahr. and, in lowering its temperature, it expands again until frozen, when the expansion reaches about one-eleventh of its original bulk. Thus water, when at its greatest density, which is at 39.2° Fahr., presents the curious phenomenon of expanding whether heat or cold be applied. Expansion is common to all substances, though gases expand more than liquids, and liquids more than solids. It is due to this force that wagon tires are made somewhat smaller than the wheel. Hence, when heated, they may be slipped on easily, and in cooling contract sufficiently to hold the parts of the wheel securely together. Winds are caused by the air expanding under the heat of the sun, and the phenomenon of oceanic currents is due to the same cause.

**EXPLOSIVES** (ěks-plò'sivs), the substances which may cause an explosion by their sudden combustion or decomposition. The remarkable fact that explosives will not explode in vacuums was discovered early after gunpowder came into use, though the first definite experiments made in this connection were those of Priestly more than a century ago. These experiments were effected by placing gunpowder in vacuums and heating it by concentrating the sun's rays on it with a lens or burning glass. Some writers have expressed the opinion that the discovery of explosives has been, next to that of printing and the application of steam power, the most valuable. It is true that their utility in the arts of peace is very important, as otherwise the vast engineering enterprises of modern times would have been entirely

impossible or required a vast additional expenditure of time and labor.

As a matter of convenience, explosives are classed as explosive mixtures and explosive compounds. *Explosive mixtures* are those that can be separated more or less completely by mechanical means not involving chemical action. In a separate condition the ingredients, as a rule, do not possess explosive properties. *Explosive compounds* are chemical compounds or chemical combinations which possess a definite explosive molecule, and contain both the combustible and the supporter of combustion in a closely united form. Most explosive mixtures require a particular period of time for combustion, while in explosive compounds the action is much more sudden and violent. Among the list of explosives may be classed gunpowder, nitrate mixtures other than gunpowder, chlorate mixtures, compounds containing nitroglycerin, and gun cotton. To these may be added the nitro-substitution compounds, including picric powders, springel explosives, and fulminates. Aside from these are numerous compounds that may be grouped with each of the above classes, all more or less valuable in war, for mining, and for purposes which require the sudden development of a powerful force. Some of the newer explosives that have gone into use are smokeless, or are unaccompanied by a loud report at the time the explosion takes place. However, explosions in these, as in all others, is due to the sudden formation and expansion of gases, owing to chemical agencies acting upon them. See **Gunpowder**.

**EXPOSITION** (ěks-pò-zish'ŭn), a national or international exhibition of the works of art and industry for the purpose of stimulating public interest, promoting manufactures, and expanding trade. The first great industrial exposition of the world was held at Paris in 1798, and its success caused a similar display of French industries to be made in 1802. The effects of these expositions were so widespread and the results so beneficial that many other European and American nations were induced to organize similar enterprises. Great expositions of more or less importance to the industrial arts were held prior to 1850 at Berlin, Vienna, Saint Petersburg, Brussels, Moscow, Stockholm, Dublin, Lisbon, Madrid, Manchester, Philadelphia, New York, and other great centers of population. Among the noteworthy international expositions held since are several that attracted the attention of practically every civilized nation. The first British exhibition of an international character was held at Crystal Palace, London, in 1851. Soon after, in



1853, the United States made its first general effort in this direction at New York. The first universal French exposition was opened in Paris in the Champs Elysées in 1855 and contained exhibits of about 24,000 different persons and interests. A great international exposition was given in Haarlem, Holland, in 1861. The Belgians opened a similar enterprise at Brussels in the same year, and Great Britain followed with an international exhibition in 1862.

The second international exposition of France opened on the Champ de Mars in 1867. It was followed by the exposition at Philadelphia, Pa., in 1876, to commemorate the centennial of the Declaration of Independence. The main building of the Centennial Exposition alone had a floor space of twenty acres, being 460 feet wide and 1,180 long, while the other buildings were proportionally grand and extensive. France held a third international exposition at Paris in 1878, the area of its site being 140 acres, and in 1889 gave the fourth to commemorate the centenary of the French Revolution. One of the prominent features of this exposition was the famous Eiffel Tower (q. v.). The next great exposition was held at Chicago, Ill., in 1893, being designed to commemorate the 400th anniversary of the discovery of America. In many respects it may be said to have been the most successful and popular display ever made in the Western Hemisphere. However, it was closely rivaled by the Louisiana Purchase Exposition held at Saint Louis, Mo., in 1904, to commemorate the Louisiana Purchase. Both before and since the Chicago exposition numerous national or district expositions have been given, such as the Cotton States Exposition at Atlanta, Ga., the Trans-Mississippi at Omaha, Neb., the Pan-American at Buffalo, N. Y., and the Alaska-Yukon Pacific at Seattle, Wash. The most successful and greatest of European expositions was held in Paris in 1900. It attracted a large number of visitors and the most valuable exhibits ever made in the arts and sciences.

The leading expositions of the last thirty years, with the total paid and free attendance and the total receipts, including admissions and concessions, are as follows:

EXPOSITIONS.	ATTENDANCE.	RECEIPTS.
Vienna, 1872.....	7,254,687	\$ 6,917,832
Philadelphia, 1876.....	9,910,996	3,813,724
Paris, 1878.....	16,032,725	2,531,650
Paris, 1889.....	28,149,353	8,300,000
Chicago, 1893.....	27,539,521	14,117,332
Paris, 1900.....	50,120,540	24,788,360
St. Louis, 1904.....	18,741,073	10,162,380

See **World's Columbian Exposition.**

**EX POST FACTO** (ěks' pōst fāk'tō), a law which is retroactive and makes an act criminal that was not criminal when committed, or increases the severity of the punishment attached to the crime when it was committed. The United States and the several states are forbidden by the Constitution to pass such a law.

**EXPRESS** (ěks-prěs'), a system of rapid conveyance and safe delivery of merchandise and parcels. The express business of the United States is the outgrowth of the custom under which stage-coach drivers, railroad conductors, and others were intrusted with parcels for delivery, and was formally organized by William F. Harnden (1813-1845), of Boston, in 1839. He contracted with the Boston and Worcester Railroad Company for the transmission of packages. The project commended itself to business men, and soon after express lines were organized and connections established in all directions. In 1849 the Adams & Company's California Express was established; in 1852, the Wells, Fargo & Company's; and in 1855, the American-European Company's. The express business is carried on by these and similar companies under contract with the railroad companies, the latter furnishing carriage along their lines, while the express companies attend to the receipt and safe delivery of parcels.

At present the capital stock of the express companies amounts to millions of dollars, the leading organizations being the Adams Express Company, United States Express Company, American Express Company, and Wells, Fargo & Co. These and other lines have direct connections with responsible express companies in Canada, Newfoundland, and the leading countries of the world. Among the leading companies of Canada are the Dominion Express Company, the Canadian Northern Express Company, and the Canadian Express Company. The business comprises, besides delivering parcels of merchandise, the issuance of checks, collection of accounts, and in some cases the care of deposits. A system of C. O. D. business, meaning *collect on delivery*, comprises the plan of transporting goods to consumers or dealers and collecting the purchase price when delivered.

In most European countries the carrying service is performed by the post office system under the direction of the government, though in Great Britain the railroad companies themselves handle this branch of business on all lines where the parcel post has not been established. The law includes express companies with the list of common carriers, by which they are held liable for losses the same as such carriers, even though their bills of lading declare otherwise. Express



money orders are receivable at banks, and payable in nearly all civilized countries of the world on an equal basis with drafts issued by banks or government postal money orders.

**EXTENSION** (ěks-těn'shŭn), in physics, that property by virtue of which matter occupies space and possesses volume. An atom is exceedingly small, yet it has definite size; that is, it has extension, or occupies space in three dimensions—length, breadth, and thickness. Extension is necessarily possessed by molecules and masses and is, therefore, a general property of matter.

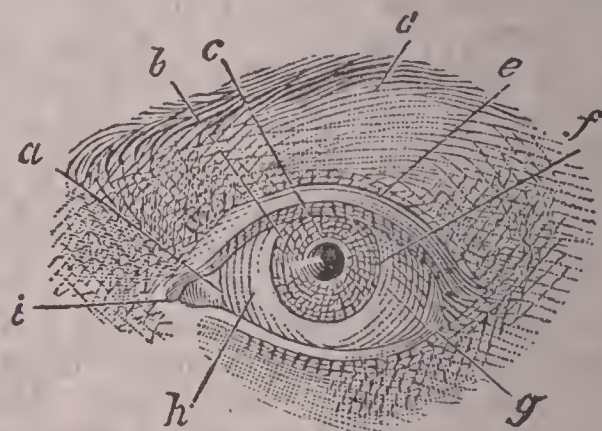
**EXTRACT** (ěks'trăkt), in pharmacy, the products obtained by evaporating solutions that contain medical principles. The substances are chiefly of vegetable origin and yield solids and liquids, the former being known as *extracts* and the latter as *fluid extracts*. Solid extracts are obtained by digesting vegetable substances with water, alcohol, ether, or acetic acid, and evaporating the products until they are reduced to a pasty or dry consistence. Liquid extracts are made by crushing the plants to obtain the juices, which are heated and evaporated. Various methods are employed, the process depending upon the kind of extract to be obtained. In some cases the juices are allowed to stand a brief time after the maceration, when they are carefully filtered, and then are evaporated or distilled a number of times to obtain the strength required.

**EXTRADITION** (ěks-tră-dĭsh'ŭn), the right to demand the delivery of a fugitive from justice from one state or nation to another. In the absence of treaties it is not the duty of a nation to turn over a fugitive criminal to the state from which he has fled, a position maintained both in England and the United States, hence extradition between nations is based upon treaties. However, extradition between the states or provinces of a particular country is usually regulated by the constitutional or national law. This is provided for by the Constitution of the United States, which requires that "a person charged in any State with treason, felony, or other crime who shall flee from justice and be found in another State, shall, on demand of the executive authority of the State from which he fled, be delivered up to and be removed to the State having jurisdiction of the crime."

The Jay Treaty of 1794 was the first treaty of the United States to provide for extradition, but it was not carried into effect by an act of Congress. The Treaty of 1842 was the first to provide for extradition between Great Britain and the United States. It is the general rule

that a criminal who has been extradited for a particular offense cannot be tried on another charge. This question arose in 1875, when the United States procured the extradition of a criminal who had committed an offense not mentioned in the treaty, being extradited on one and then tried on another, and against this Great Britain protested. Extradition treaties are in force among all the leading nations.

**EYE**, the organ of sight, consisting of a globe about an inch in diameter, situated in a bony cavity of the skull, and protected by the overhanging brow. It is formed of a tough membrane called the *sclerotic coat*, which gives form to the eye, the transparent, convex part in front forming the *cornea*. A thin, black membrane, termed the *choroid coat*, lines the sclerotic coat, which contains the blood vessels, while its black color serves to prevent the reflection of the rays of light. A very thin and



THE HUMAN EYE.

A, semilunar fold; B, iris; C, pupil; D, eye-brow; E, eyelid; F, cornea; H, sclerotic coat.

transparent membrane, called the *retina*, is inside the choroid coat and is an expansion of the optic nerve. The anterior and posterior chambers are filled with a liquid, that in the former being a thin, clear liquid called the *aqueous humor*, and that in the latter a thick, jellylike fluid termed the *vitreous humor*. These humors serve to keep the eye distended and in shape. Between the two chambers is the *crystalline lens*, which operates to bring the rays of light to a focus on the retina and is kept in place by the *ciliary process*. A curtain, called the *iris*, is hung behind the cornea, whose center is a hole called the *pupil*. The several colors observed in the eyes of different persons are merely the iris, which varies from blue to a dark brown and is seen through the pupil. The colorless effect seen in the eyes of the albino is due to the absence of color cells; the pink tint often seen in them is caused by the blood affecting the appearance of the iris on account of the absence of other coloring matter.

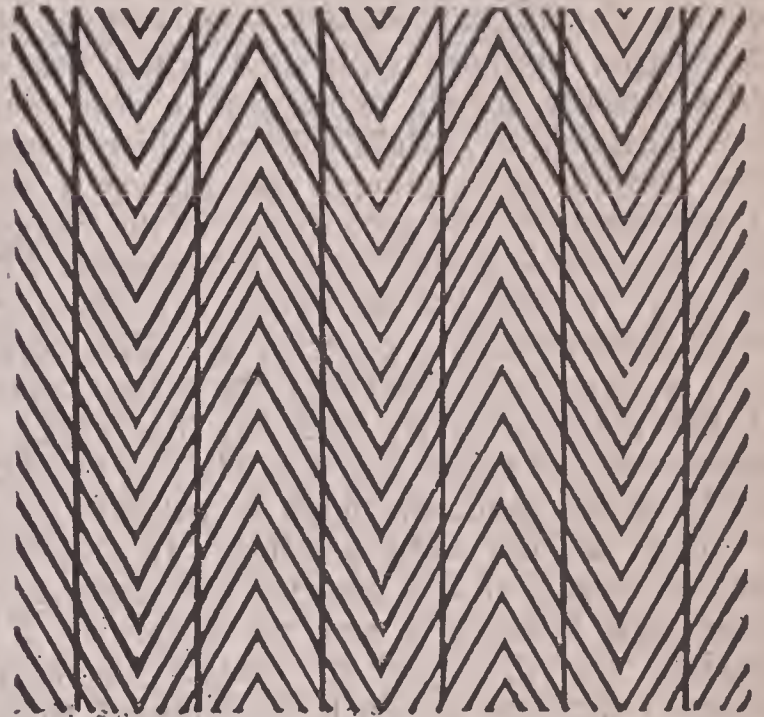


The eye is protected by close-fitting shutters called *eyelids*, and by a padding of fat situated between the eyeball and the walls of the orbit in which it is situated. A mucous membrane lines the inner side of the eyelids, and, by being exceedingly sensitive, aids in protecting the eye from irritating substances. The edges of the lids are lubricated by oil glands situated within the *eyelashes*, which prevent them from adhering to each other. Besides, the lashes guard against dust, while, with the lids, they serve to shield against a blinding light. The mucous membrane and cornea are moistened by a saltish fluid called *tears*, which is secreted by the *lachrymal glands*, two oblong bodies situated immediately above and to the outside of the eyeballs. Several ducts facilitate a flow of tears upon the inner surface at the outer edge of the upper eyelid, thus washing the eye and keeping it clean from dust, the tears passing into a little basin at the inner part of the eye near the nose, called the *lachrymal lake*, from which they are drained into the nose by the *nasal duct*. The lachrymal lake overflows upon the face in disease, old age, and when crying.

The phenomenon of sight is one of intense interest to the student of natural history. It is dependent upon a substance called *ether*, which is infinitely more subtle than air and is thought to be a thin gas filling all space. Waves of light are produced in the ether as sound waves are caused in the atmosphere. The motion waves of ether are produced by a light, for example a lamplight, pass through the pupil of the eye to the retina, and are carried by the rods and cones through the *optic nerve* to the brain, where the light is seen. The variously shaped rods and cones serving to carry the light are to the eye what bristles, otoliths, and Cortian fibers are to the ear. The optic nerve, which has its root in the brain and enters the eyeball, is itself insensible to light. There are no rods and cones at the point where it enters the eye and this is called the *blind spot*. The rays of light are bent by the convex lens so they meet at a point called the *focus*; a good example of this can be given by the use of a common burning glass, through which the focus point is heated to burning by bending the rays of the sun. When entering the eye, the rays of light are converged similarly by being brought to a focus on the retina, and are influenced somewhat in a like manner by the cornea and the humors of the eye.

Distant objects tend to diverge rays of light less than those near by, and under such conditions the crystalline lens does not need to bend so much as in seeing objects near at

hand. This property of adjusting the lens of the eye to far or near vision is called *accommodation*. The ordinary adjustment of the eye muscles when at perfect rest is of such a character that objects at all distances over twenty feet can be seen clearly. Objects at a smaller distance than twenty feet away from the eye require that the muscles adjust the lens to a more curved position. In this way it is possible for the eye to see clearly at a distance



AN OPTICAL ILLUSION.

of about five inches, while vision is best at about ten inches from the eye.

The field of view in which a person can clearly recognize objects is confined to a small space immediately in front of the eye, while only indistinct shadows seem to occupy the remainder of space near at hand. In reading not more than two or three words can be seen distinctly, but by rapid and unconscious movements of the eyes sidewise the field of view is greatly enlarged. When the eyes are directed toward an object, the sensation of sight is produced almost instantly, but the image persists about one-tenth of a second. It is due to this property that a lighted stick waved rapidly by the hands appears as a circle of fire. Exhibitors take advantage of it by throwing a succession of pictures of a moving object upon a screen at a particular rate, and thus convey to the auditors the effects of movement without interruption. If two shining lights are waved, they appear as one, and two colors revolved quickly give the effect of a mixture of two. Thus, a yellow and a blue surface placed side by side and revolved quickly before the eye appear as a single green spot. The eye is sub-



ject to many illusions, which is taken advantage of by exhibitors and in the manufacture of many toys and fireworks. The vertical lines in the illustration are perfectly parallel, but the diagonal hatching, as the result of contrast, cause them to appear tapering in alternate directions.

*Color-blindness* is due to an impairment of the nerves of the retina, leading to an inability to recognize certain colors. Since locomotive engineers and sailors are guided by differently colored signals, this defect is a serious one. The retina becomes exhausted when the eye looks steadily at an object for a long time. It is fatigued by bright-colored objects much more readily than others, and during a state of exhaustion is often confused in the recognition of colors, being made color-blind. The intensity of light has an effect upon the pupil, bright light causing a contraction. This results from a strong light exciting the reflex centers of the optic tubercles and has the effect of contracting the muscles of the iris. In the dark, on the other hand, the pupil is enlarged so as to admit all the light possible. In this way, and by means of the muscles that control the upper and lower lids and the eyebrows, it is possible for the eyes to protect themselves against a light too strong to be admitted, though the contracted muscles become easily tired and pain results. *Far-* and *nearsightedness* are caused by defects in the crystalline lens. If the lens is too convex, the rays are brought to a focus before they reach the retina; if too flat, the retina is reached before coming to a focus. In each case the sight is more or less indistinct. Another common defect is a flattened or elongated shape of the globe of the eye. *Farsightedness* results when the globe is flattened and *nearsightedness* when it is elongated. The former is overcome by convex and the latter by concave lenses.

The care of the eyes is an important matter, since the loss of vision is a source of much sorrow. Glasses should be worn when they serve to improve the sight, since straining impaired power results in even greater weakness. Fine print and reading by a dim light are harmful, while the sight is often impaired by reading on cars, for the reason that the lens becomes wearied by striving to adapt itself to continuous variations of distance. Light should never be in front when reading or working, but should come over the left shoulder. Alcohol and tobacco tend to cause dimness of vision by weakening the optic nerve. Röntgen (q. v.)

discovered a kind of light produced by electricity, in 1895, which penetrates flesh, wood, and other substances. By means of this light it is possible to determine by sight the forms of different organs of the body, to examine the bones in the living body, and to locate many substances foreign to the system. Several valuable discoveries relative to the eye have been made by means of it.

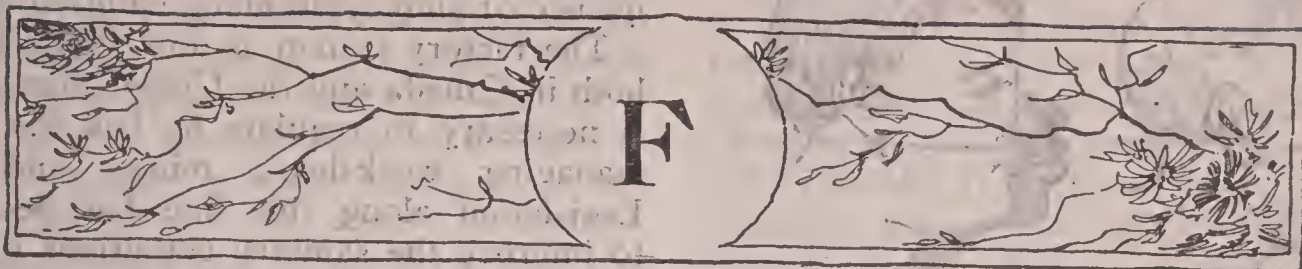
The eyes of fishes, reptiles, birds, and quadrupeds are essentially the same as in man. In insects the eyes are immovable and have a dome shape. Thousands of smaller eyes like honeycomb make up each of the two eyes. At the bottom of the cavity is a nerve to which each little eye may conduct light by means of a lens. As the scale of animal life descends, there is a marked decrease in the power of vision. For instance, in the leech the nerves of sight end in a spot of dark coloring matter of the skin by means of which it is able to receive some idea of its surroundings. Still lower in the scale we find life forms that are barely able to recognize the difference between light and darkness, while those that live wholly in the dark lose the use of this organ, as, for instance, the fish found in the Mammoth Cave of Kentucky.

**EYELIDS.** See **Eye**; **Lachrymal Glands.**

**EYLAU** (i'lou), a town in Germany, 22 miles south of Königsberg, on the Pasmur River. It was the scene of an indecisive battle on Feb. 8, 1807, between Napoleon and the allied forces of the Prussians and Russians under Count Levin Bennigsen (1745-1826). The army under Napoleon consisted of about 80,000 men, while the allied forces were smaller, but the latter possessed more artillery. A brisk struggle continued during the day, and as night approached the troops of Napoleon were driven before the allies. In the night the French army retreated. The loss on each side is estimated at about 18,000 men. The town has a population of 3,600 and is connected by railway with Königsberg.

**EYRE** (âr), one of the largest lakes in Australia, in the State of South Australia, at an altitude of 80 feet. It has an area of 3,708 square miles. Its name is from Edward John Eyre, who discovered it in 1840. The water is highly salty and in dry seasons evaporates largely, leaving a great salt marsh. The waters of the Macumba, Cooper, and Warburton rivers flow into it, but it has no outlet to the sea. A railway extends from Lake Eyre to Spencer Gulf.





## F

**F**, the sixth letter and fourth consonant of the Latin and English alphabets. It is formed by the passage of breath between the upper front teeth and the lower lip, is classed with V as a labio-dental, and belongs to the class of consonants called *aspirates*. The figure of F corresponds to the *digamma* of the Greek and resembles it closely in power. F, in music, is the fourth note of the natural diatonic scale of C. F major, as a key, has one flat at its signature, namely, B flat. The tone F is called *fā* in Italy, France, and some other countries.

**FABLE** (fā'b'l), a feigned story or tale intended to enforce some moral precept. In modern literature the fable is confined to short stories, either in prose or poetry, in which inanimate things and animals are represented with human interests and passions. By the novelty and utter impossibility of the representation, the interest of the hearer or reader is excited, and thus its symbolic meaning and moral become apparent to him, at least if the fable is well contrived. The ancient fabulists were simple, clear, and earnest, and seem to have sprung up in the East. Among the more celebrated are Bidpai, or Pilpai, and the Arabian Lokman, who lived at the time of King David. Among the Greeks the greatest fabulist is Aesop. Phaedrus, the most celebrated Roman fabulist, cleverly imitated Aesop, but with considerable modification, thus giving force to his writings. In later times Gay among the English, Lessing and Gellert among the Germans, and Krylov among the Russians are celebrated. La Fontaine, a French writer of fable, for delicate sarcasm, sagacity, and felicity of expression takes high rank.

**FAÇADE** (fā-sād'), the exterior face or front of a building. This term is applied chiefly to classic architecture and buildings of some magnitude. The façade contains the principal entrance. The term is used with a qualifying

## FACIAL ANGLE

adjective when it refers to other faces of a building, as *court façade*, *rear façade*, and *lateral façade*. Many mediæval churches have *false façades*, which are different in outline than the buildings themselves.

**FACE**, the front part of the human head, extending from the chin to the line of the hair on the forehead. It includes the nose, eyes, chin, mouth, cheeks, and forehead. The bony foundation is composed of fourteen bones, twelve of which occur in pairs. The single bones are the *vomer*, which separates the nostrils, and the bone of the lower jaw, or *inferior maxillary*, which is the only one that is movable. The *superior maxillary*, or upper jaw bone, contains the upper teeth. Two *malar* bones form the cheeks; two *palate* bones, the palate; and two *turbinated* bones, the outer walls of the nostrils. Between the eye socket and the nose are two *lachrymal* bones. The bridge of the nose is formed by two *nasal* bones. All of the bones of the face are irregular in form. Beneath the *frontal* bones, which belong to the cranium, are two deep quadrangular cavities, called the *orbis*, which contain the eyeballs, the tear apparatus, and the protective organs of the eye. In the depressions and small cavities are located glands, nerves, and blood vessels. Projecting jaws and a receding forehead are prominent features in the face of brutes.

**FACIAL ANGLE** (fā'shal ān'g'l), an angle formed by two imaginary lines—one drawn from the most prominent part of the forehead to a point opposite the incisor teeth; the other from the external ear to the same point, the object being to measure the elevation of the forehead. This angle was made the basis for classifying the races by the Dutch anatomist, Pieter Camper, and is sometimes called *Camper's Angle*. While it has served a useful purpose in ethnology, it is not an infallible criterion of the intellectual capacity of an individual.



The general facial angle of anthropoid apes is  $40^\circ$ , of the African Negro  $70^\circ$ , and of the Europeans  $80^\circ$ . Since angles almost as varied can



FACIAL ANGLES.

be found in a single large community, the Camper method has been superseded by those of Blumenbach, Cuvier, etc.

**FACTORY** (făk'tō-rĭ), a name derived from the word *factor*, which, in Great Britain, has reference to an agent who sells goods for another. In America it is more common to call such an agent a commission merchant, since his compensation is based on a commission or a percentage upon the goods he buys or sells. On the other hand, the word *factory* has reference to the place or house where such agents transact business.

Within recent years the term factory has come to be applied to an establishment devoted to the manufacture of various articles of commerce. In this sense it includes the machinery and buildings necessary to such manufacture. The establishment of great factories is comparatively recent and resulted from the invention of useful machinery, the extensive subdivision of labor, and the construction of vast avenues of commerce that facilitate the transportation of manufactured commodities to distant consumers. Doubtless material advantages have sprung up from the factory system. They include the increased productiveness resulting from the division of labor; greater mechanical accuracy and a lessening of the cost of production, two results of bringing together different laborers with varied capacity; and the wholesome effects that follow coöperation and co-partnership among the masses of the workingmen. Trades unions and the various forms of organization that have sprung into existence are the direct result of the concentration of laborers in manufacturing centers.

It is probable that the good which springs from the factory system is counterbalanced to a large extent by the curtailment of independent intelligence, which follows the minutely subdivided operations resulting from the piecework of each individual workman. Other disadvantages urged against the factory system

are the evil influences upon the health of the workmen, brought about by being crowded into small rooms; the contract system, by which large colonies of foreign laborers are imported; and a reduction of wages as a natural consequence of employing many children and women.

The factory system as now found in America, both in Canada and the United States, has made it necessary to regulate by law the manner of managing workshops, mines, and factories. Legislation along this line has been intended to improve the sanitary conditions of all places where large numbers of workmen are employed by making them subject to public inspection, and establishing rigid rules under which vast enterprises may be managed efficiently. Among the primary objects of legislation are the protection of life and health of the workmen, prevention against spreading infectious diseases and vermin by reason of the manufactured product, and protection of the laborers and operators against strikes, disorders, and general disorganization of institutions. Legislation has been directed more commonly with respect to the number of hours the workmen may be employed daily and the improvement of the conditions of factory work. Other objects have been to limit the labor of women and minors and to regulate the manner of and time for which laborers shall receive compensation.

Statutory provisions in some cases forbid the employment of minors under certain ages, while in others it is necessary for children to be able to read and write, or to have attended school for a certain period, before being admitted to the factory. These safeguards are intended to prevent the corruption of morals among children and vouchsafe to them conditions under which they may secure a suitable education. The supreme courts in a number of states, among them Ohio, Pennsylvania, Missouri, West Virginia, and Illinois, have decided that laws which require the payment of laborers in money are unconstitutional, though others have held them sound and operative. Among the many questions of general concern, in which a large number of people are interested, those relating to the rights and privileges of both the employer and employee take high rank. However, the legislation which may tend to secure the best business conditions, which will operate to the highest interest of both the capital and labor employed in the factory system, is yet awaiting solution by statesmen and legislators.

**FACULTY** (făk'ül-tĭ), the term employed to designate collectively the teachers and professors of an institute, college, or university, or



the instructors in any department of such an institution, as the faculty of law, of theology, of arts, or of medicine. It is applied collectively to the members of the learned professions, as the faculty of advocates, the medical faculty.

**FACULTY**, in mental science, a natural power of the mind by which it acts uniformly and with facility in some specific way. Hewett defines faculty as a power under the control of the will, having a specific work to do, and as examples enumerates memory, seeing, love, and judgment. Crabb holds that faculty is a power derived from nature, and differs from ability in that the latter is derived either from circumstances or otherwise.

**FAÏENCE** (fâ-ê-âns'), a term applied generally to all classes of porcelain and glazed earthenware. The name was derived from the town of Faenza, Italy, where *majolica*, a fine grade of pottery, was manufactured in the 14th century. The faïence manufactured at present was invented in the 16th century as an imitation of majolica and obtained its name in France. However, the faïence of the market is made of a ruddy earth, covered with an enamel, and is frequently painted in rich colors.

**FAINTING** (fânt'ing), or **Syncope**, a sudden loss of consciousness, with pallor and feeble respiration and heart action. The morbid condition generally continues from a few seconds to a minute, but in some cases lasts for hours and even days. It is produced by loss or sight of blood, pain, or impure air generated in overcrowded public buildings. Fright and sudden joy or grief may cause fainting in some persons. It rarely ends in death and more commonly affects women than men. Recovery is most rapid when the body is in a recumbent position. Fresh, cool air, cold water sprinkled on the face, and the loosening of any tight articles of dress contribute to a speedy close of the syncope.

**FAIR**, a stated or regular market where buyers and sellers gather to transact either a particular or general class of business. Fairs of this character originated on account of the convenience resulting from the buyers and sellers of agricultural products common to a region coming together. The fairs held in the Middle Ages were chartered by public officials, who announced them by proclamation. This class never obtained a wide foothold in America, though there are fairs at which an exhibit of agricultural products, manufactures, and other articles of value are exhibited for public inspection and study. The term is applied in a general sense to bazaars where fancy articles are offered for sale either at special times or

permanently, and to the agricultural and industrial exhibitions held under the direction of counties, states, or nations. In Europe it is quite common to hold fairs at which buyers and sellers are brought together. Among the great periodical fairs are those held at Novgorod, Russia; Lyons, France; Leipzig and Frankfurt-on-Main, Germany; the Donnybrook Fair, Ireland; the Glasgow Fair, Scotland; and the Greenwich Fair, England.

**FAIRFIELD**, a city of Iowa, county seat of Jefferson County, 48 miles northwest of Burlington, on the Chicago, Burlington and Quincy and the Chicago, Rock Island and Pacific railroads. It has a fine county courthouse and is the seat of Parsons College. The manufactures include wagons, clothing, machinery, tile, and farming implements. It has electric lights, waterworks, and a considerable trade in produce and merchandise. The first settlement in the vicinity was made in 1839 and it was incorporated in 1847. Population, 1905, 5,009.

**FAIRHAVEN**. See **Bellingham**.

**FAIRIES** (fâr'iz), the name applied to imaginary beings, ordinarily small and of graceful human form, but capable of assuming any shape and working good or evil to mankind. A belief in fairies has been among the superstitions of many peoples. Some other names for these imaginary creatures are *elves*, *brownies*, *goblins*, *dwarfs*, *pixies*, *kelpies*, and *gnomes*. It is difficult to give any scientific definition of the nature of fairy superstitions, because they followed no regular law, human or divine, but obeyed the impulse of their own caprice. Hence, every fairy tale differs from others in some respects. In the parts of the world where there are mountains, mists, cataracts, and stormy oceans all superstitions are naturally exaggerated, while in flat and well-cultivated countries the fairies are simple and homely, and connect themselves with matters of domestic routine, such as sweeping the floor, skimming milk, preserving butter, and other household duties. In Scandinavian countries the fairy people are connected with storms and convulsions. They are represented in the act of betraying people into dangerous places, flying away with them into cloudland, or as leading them through endless caverns within the earth. They have been spoken of in Ireland as a wandering remnant of fallen angels.

The tales of some nations divide fairies into three classes—those that dwell in the upper air, those within the interior of the earth, and a third class that frequent the waters. The last mentioned are known as *mermaids* and *sirens*. Fairy stories were introduced into France and



Germany as early as the 12th century. They became generally popular in the latter part of the 17th century, the Italians taking the most extended interest in them. Literature in all countries abounds more or less with fairy tales. Among the best collections of later times are those of the Grimm brothers in Germany, Knightley's and Craker's in English, and Hans Andersen's in Danish. Many fairy tales and legends have been translated into modern languages and in this way became the common property of all. The translations have been devised suitably for home and school reading. Many of the eminent teachers, among them Herbart, Froebel, and Pestalozzi, have recommended them as of special value in child culture during the formative period. Their use for that purpose in American and European schools is very extensive.

It is quite probable that fairy tales and legends are the outgrowth of mythology and folklore. Since primitive peoples are unable to express ideas in the abstract, their customary forms gave rise to the use of familiar and concrete terms. The mystery of storms, zephyrs, caves, ocean waves, mountain echoes, passage of clouds, and the strangeness of life and death all had more or less influence to impress them with awe and to inspire and amaze. The early history passed from generation to generation, not in written story, but as a living tale, and later became perverted in mythology, folklore, and fairy tales. To their own legends were added those of near or distant peoples, by which the tales they told grew into vast numbers and took on diversified and complicated forms. The giant stories of the Orient, the one-eyed Cyclops tales of Asia Minor, and the mysteries of the Greek and Roman gods were capable of almost indefinite expansion and contraction, especially when brought in contact with the northern heroes and the tales of the *Nibelungenlied*. In pondering the early peoples it is not difficult to comprehend how the folklore, mythology, and hero worship became prolific sources for the growth of numerous and diversified tales, and, associated with the romance of the ages, gave rise to a vast number of stories that have come down to us. Many of the fairy tales remain highly interesting and fruitful objects of study.

**FAIRMOUNT** (fâr'mount), a city in West Virginia, county seat of Marion County, on the Monongahela River, 75 miles southeast of Wheeling. It is on the Baltimore and Ohio and other railroads. The surrounding country is a farming and coal-producing region. Among the noteworthy features are the county court-

house, the high school, and a State normal school. The manufactures include earthenware, flour, cigars, machinery, and furniture. It has systems of electric lighting, sewerage, and water-works. Population, 1910, 9,711.

**FAIR OAKS**, a railroad station in Virginia, near the Chickahominy River, in Henrico County, six miles east of Richmond. It was the scene of a battle between the Confederates under General Johnston, numbering 38,000 men, and a detachment of General McClellan's army under Gen. Silas Casey (1807-1882) and General Keyes, including about 11,000 troops. The engagement at Fair Oaks took place on May 31, 1862, after General Johnston had retreated from Williamsburg toward Richmond, and was the first important encounter between the army of the Potomac and the army of northern Virginia. General Longstreet drove the Federals back toward the Chickahominy and at nightfall the victory seemed to rest with the Confederates. However, the following day the Federals were reënforced and the battle continued at Seven Pines, about a mile east of Fair Oaks, when the Confederates were repulsed and withdrew to the immediate vicinity of Richmond. The loss on the Union side in both engagements was 5,031 and on the Confederate side, 6,134 men. General Lee succeeded General Johnston while the battle was in progress and General McClellan likewise succeeded General Casey. The battle ground may be reached by an electric railway. A national cemetery is maintained at Seven Pines.

**FAIRWEATHER**, a mountain on the western coast of North America, in Alaska, between Glacier Bay and the Alsek River. Southeast of it are a number of elevated peaks, including Mount Crillon. It is 15,292 feet above the sea, is covered perpetually with snow, and is the source of several glaciers.

**FAITH CURE**, the treatment of diseases without the use of drugs, usually practiced by making an appeal to the hope or belief of the patient. It differs from hypnotism and healing by mental science in that its methods require the exercise of religious faith, but the term *faith cure* is applied in a broader sense by some who believe in treating diseases without employing material means, and when applied in this form it includes every method of treatment in which the patient is to rely upon hope and faith. The practice of using home remedies and patent medicine is sometimes designated as a form of faith cure and some include Christian Science, but the latter term is not admitted to be similar by those who believe in it.



Faith cure is not of modern origin, but, instead, dates from the most ancient times. That prayer is of utility in effecting cures has been taught by the Christian Church from its origin, and many eminent divines have preached that prayer is potent in the cure of bodily ills as well as in the forgiveness of sin. Some have gone so far as to teach that the atonement includes the healing of the body, since, as they believe, God would be dishonored if it were claimed he could not do more than preserve the soul. To this class belongs A. B. Simpson, of New York, who anointed with oil and practiced the apostolic methods. John Alexander Dowie, first apostle of the Christian Catholic Church, taught that diseases may be cured by prayer and the laying on of the hands. In the chapel of that church at Zion City are many canes, crutches, and trusses that are claimed to have been left there by people who came diseased and crippled and went away healed. Many others could be named who practiced the art and professed to effect cures. Those who believe in some form of faith cure have multiplied greatly within the last few decades.

While the cure of diseases and the treatment of patients must necessarily involve the use of material means and the employment of drugs, it is admitted on every hand that hope and expectation are mental states of great utility in those who suffer pain and disease. Digestion is favored by happiness, emotions stimulate action of the bladder, and sorrow causes secretion of tears in the lachrymal glands. There is no difference between those who practice medicine and those who believe strictly in faith cure so far as the favorable influence of hope and expectation is concerned, but the disagreement lies in the fact that one employs drugs and other material means, while those who hold distinctly to faith cure rely exclusively upon some mental or psychological influence, or place reliance wholly in the efficacy of prayer. No doubt, many forms of nervous diseases can be remedied by faith-cure methods. However, their efficiency in the treatment of other ailments likely depends largely upon improved conditions of living and a change to better conduct and habits. It is undoubtedly natural for those who become converted to a new teaching, or a different plan of living than that they formerly embraced, to have mental changes which influence, more or less. In some diseases, such as consumption, cancer, and diphtheria, few if any cures are reported, though conditions are frequently improved.

**FAKIR** (fā'kēr), a Mohammedan religious

mendicant who wanders from place to place. A fakir is regarded by the common classes of Mohammedans as a character of sanctity, though fakirs are of the lowest priesthood. The term is applied by some writers to the Anglo-Indian and the Hindu mendicants, but the latter are more properly called *Gosavee*. In some regions of the Mohammedan countries they live in communities, but usually the life is solitary. Their attire is coarse and generally black or brown, while the headwear consists of a black turban, over which is tied a red handkerchief. To gain the veneration of the lower classes, they often mutilate their persons and practice absurd penance.

**FALCON** (fā'k'n), a long-winged, high-couraged, raptorial bird, which takes its prey as it moves in the air. Technically, in falconry, the female alone is termed a falcon, the male, which is smaller and less courageous, being known as a *tiercel* or *tiercelet*. Naturalists generally apply the name falcon to various birds of prey, which they separate into distinct groups, including the *peregrine falcon*, *northern falcon*, *desert falcon*, *merlin*, and *hobby*. For symmetry, strength, and power of flight the falcon is the most perfect of the feathered race. The beak is strong and short-hooked at the point, the upper mandible having a notch or tooth on its cutting edge. In all species the legs are heavy and stout, the claws are sharp and long, and the wings are powerful. The average length of falcons is about two feet. The peregrine is most commonly used in falconry and is exceedingly swift, its flight being fully 65 miles per hour.



NORTHERN FALCON.

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**FALCONRY** (fă'k'n-rĭ), or **Hawking**, the pursuit of game by means of falcons or hawks. In ancient times the sport was called hawking, when the hawk was employed, but later the



HOODED FALCON.  
(ready for use)

peregrine and other falcons became popular. The history of this pastime has been traced back to a period prior to the Christian era. At one time, in Germany, even kings and nobles devoted the greater portion of the hunting season to it. After the Norman Conquest, England indulged in the sport until the rank of the individual was indicated by the particular species of hawk carried on his gloved hand or wrist. Later it went largely out of fashion, but at present an attempt is being made to restore this sport, which is attended with growing success. The training of hawks is a matter requiring much care and patience. They are usually taken while young and hooded with a piece of leather, leaving an aperture for the beak, and are trained to sit on the hand and to eat from the lure. The lure is a device made of a piece of wood or leather covered with the wings and feathers of a bird and attached to a cord, to which a piece of meat is fastened. The falconer swings the baited lure round and round his head, accompanying the action by some call. When the falcon has been taught to obey the lure, it is trained to catch live birds, and soon learns to seize the game. The hood is kept on the falcon during hunting excursions, until the bird is wanted to fly.

**FALKLAND ISLANDS** (făk'lănd), a group of islands belonging to Great Britain, situated in the South Atlantic Ocean, about 295 miles east of the Strait of Magellan. The total number of islands is about one hundred, with an area of 6,490 square miles, of which the two larger are East Falkland and West Falkland,

containing respectively 3,000 and 2,300 square miles. The surface is hilly, with bogs extending from various points on the shore toward the interior region. Forest trees are entirely absent, but many grasses abound, on which herds of cattle and sheep are reared with much success, this constituting the principal industry. Many penguins and other sea fowls are native to the islands. The fisheries are valuable. The climate is healthful and well adapted to the production of cereals found in temperate climates.

The Falkland Islands were discovered by John Davis (1550-1605), Aug. 14, 1592, and were named by Captain Strong while cruising in 1689, in honor of Lord Falkland. Permanent settlements were first made by the French and later immigration followed by the Spaniards and English, the last mentioned securing permanent control in 1833. The principal exports are wool, hides, skins, and tallow. Machinery, wearing apparel, and building material are the chief imports. Local government is administered by direct appointees of the crown, and education is supported by government grants and local taxation. Stanley, on East Falkland, with a population of 916, is the capital. Population, 1906, 2,065.

**FALLACY** (făl'lă-sĭ), in logic, an invalid process of reasoning, which leads to an erroneous conclusion. Since fallacy is a violation of some logical law, many rules have been devised to govern sound reasoning and when one of these is violated the result is a logical fallacy. No agreement has been reached as to the proper classification, though the subject has been one for extended discussion from remote antiquity. Writers usually divide fallacies into three classes, assumptions, sophisms, and aberrancies.

*An assumption* is that which is taken as true without evidence. It may be true or false; but, resting on no basis of evidence, it is, in both cases, invalid, not because it is known to be false, but because it is not known to be true. To assume an assumption false, because of its lack of evidence, would be a procedure as invalid as to assume it true. Assumptions arise from want of attention, superstition, prejudice, hasty generalization, and preconceived opinions.

*A sophism* is an invalid argument, and may be said to constitute a fallacy that is designed to deceive. It originated from the Sophists of ancient Greece, who doubtless cared little for truth or morality, and merely professed to teach how to make the worse appear the better reason. Sophistry is a fallacious reasoning which is sound in appearance only and puzzles the inquirer after truth.



An *aberrancy* is a wandering from the conclusion warranted by the premises and drawing another which is unwarranted. One who infers the reasoning valid because the conclusion is true is misled by an aberrant fallacy, since it does not follow, because the conclusion is true, that the argument is valid. Many unsound arguments have escaped detection, because the conclusion of the speaker coincided with the opinions of the hearers. Again, one who infers that the conclusion is false because the premises are false, or the reasoning is illogical, is misled, since the proper inference is not that the conclusion is false, but that it is not proven.

**FALLING BODIES**, a term used in physics when demonstrating the force of gravity. All terrestrial bodies, if unsupported, fall or move toward the earth's center by this force. That the acceleration due to gravity is the same for all masses was proved by Galileo. His experiments consisted in dropping unequal balls of iron from the top of the leaning tower of Pisa. He discovered that, whatever their masses, the balls reached the ground at the same instant. Using balls of iron and wax, he found that the iron balls struck the ground first. From this phenomenon he concluded that bodies less dense are similarly influenced by gravity, but that the unequal velocities are due to the resistance of the air acting on different extents of surface. It was later demonstrated by Newton that all bodies in a vacuum fall with the same velocity, which proves that the effect of gravitation on bodies is proportional to their masses, but the resistance of the air causes the apparent exception to the law.

In a body falling freely from a state of rest, the velocity at the end of the first second is equal to about 32.16 feet per second. At the end of the next second it is 32.16 times two, and equals 64.32 feet per second; at the end of the third second it is 144.72 feet, etc. If the time is known, the distance through which a falling body passes may be found by multiplying the square of the time in seconds by 16.08. Thus, in two seconds,  $2 \times 2 \times 16.08 = 64.32$ . The acceleration varies in different parts of the earth's surface, being least at the Equator and increasing slightly with the latitude to a maximum at the poles.

The distances fallen by an unsupported body in successive seconds increase at the odd numbers. Thus, a body falling from a state of rest passes through 16.08 feet during the first second, and attains a velocity of 32.16 feet. During the next second it falls through  $3 \times 16.08$  feet, or 48.24 feet, and the third second,  $5 \times 16.08$

feet, or 80.40 feet. The total distance in feet through which a body falls in a given time is proportional to the square of the time, and is equal to the square of the time in seconds multiplied by 16.08. Thus, a falling body passes four times as far in two seconds as in one second and nine times as far in three seconds as in one second. In the first second a body falls 16.08 feet, and in the next second it falls 48.24 feet. At the end of the second second it has fallen through a total distance of  $48.24 + 16.08 = 64.32$  feet. Thus, 64.32 feet is four times 16.08 feet, or  $2 \times 2 \times 16.08$ , as per the statement above.

**FALLOW DEER** (fāl'lō), a species of deer native to Europe and Northern Africa. In a wild state it is found chiefly in the mountainous regions of the southern part of Europe, but it is very common in the parks and forest reservations. The male or buck has palmated antlers, about 25 inches long, and is somewhat larger than the female or doe, which is without horns. It has a brownish color, characterized by pale spots, and the hair is smooth and fine. The young fawn is mottled and accompanies the mother at an early age. Fallow deer go in herds under a master, an old buck, who keeps an outlook for danger and appears to command the herd. The flesh is highly esteemed for food.

**FALLOW LAND**, the name applied to ground which is left untilled in crops, but is plowed in the summer, as a means to regain productiveness after continuous cultivation. Such plowing is usually called summer fallow. All land, no matter how productive, if used continually for a number of seasons, becomes partly exhausted, and this method is employed to allow it to rest and recover its fertility. In other instances various forms of fertilizing are used for the same purpose. Strictly speaking, the land should remain idle the entire year, but the term is likewise applied to various modes of treatment, such as plowing the ground immediately after the removal of a spring crop, known as bastard fallow; or planting the ground with some crop that can be planted in rows, as corn or potatoes, which admits of the intermediate spaces being cleaned, stirred, and pulverized during the growth. The latter is known as green-crop fallow.

**FALL RIVER**, a city of Massachusetts, in Bristol County, on the Taunton River and Mount Hope Bay, an arm of Narragansett Bay, about fifty miles southwest of Boston. It is on the New York, New Haven and Hartford Railroad and many electric railway lines. The site is at the head of deep-water navigation, forming the terminus of steamships from New York and other ports. It is the greatest cotton goods



manufacturing city in America, employing about 3,200,000 spindles. The products include calico, yarn, gingham, and thread. Calico printing and the dyeing of cotton goods are extensive enterprises. Other manufactures include nails, boots and shoes, soap, rope, carriages, and granite quarry products.

Fall River is a modern and regularly platted city. The streets are well graded, lighted, and paved with stone and macadam. Among the public buildings are the city hall, the United States customhouse and post office building, the State armory, and the public library. Other buildings of note include the Mount Hope School, the Fall River Conservatory of Music, the Notre Dame College, the Union Hospital, and the Boys' Club. In 1887 the Durfee high school building was donated to the city. It is a fine structure of granite and is well equipped with apparatus for teaching the sciences. Fall River was a part of Freetown until 1803, when it was incorporated under its present name. In 1804 it was named Troy, but the present name was restored in 1834. The growth of the city is due largely to an abundance of water power obtained from Fall River, the outlet of Watappa Lake, which is located on the eastern border of the corporation. Population, 1905, 105,697; in 1910, 119,295.

**FALSE IMPRISONMENT**, the unlawful restraint of one's liberty by detention without authority of law. The false imprisonment of a person is a crime, whether the detention is in a prison, police station, or a private house, even if confined without bars or bolts, and a person guilty of the offense is liable to prosecution as well as reparation to the party injured. However, several exceptions are made, such as detaining a madman or persons who are known to have committed a crime. Other exceptions are those made in favor of parents, guardians, and teachers, who restrain children under their authority within reasonable limits.

**FALSE PRETENSES**, in law, the willful misrepresentations of fact to obtain money or other property of value. Any person who is guilty of obtaining a valuable consideration in this way may be punished by fine or imprisonment or both. However, the pretenses must relate to a fact or state of facts which are represented as existing at the time or already passed. Representation or promises as to what a party will do or what facts will occur in the future, no matter how false or groundless, are not considered misdemeanors. Besides, the party claiming to be defrauded by a false pretense must have relied upon the representations as true.

**FALSETTO** (fal-sět'tō), in music, the artificial tone of the voice. The voice contains three registers—chest voice, head voice, and a third, which is not natural, and is called falsetto or false voice. It is usually blended, by practice, with the chest voice so as to make no perceivable break.

**FAMILY COMPACT**, the name of an alliance concluded between France and Spain in 1761. It was designed to unite all the branches of the house of Bourbon as a counterpoise to the maritime ascendancy of England. By its terms the American colonies secured the aid of Charles III. of Spain, and Pitt proposed to declare war against that country, but he was outvoted and resigned.

**FAMINE** (fām'īn), a widespread and distressing scarcity of food, usually resulting from drought, war, flood, or insects. Tropical climates subject to irregular rainfalls are most commonly affected by famines, though defective economic systems, such as the absence of articles of food and imperfect means of transportation, are prolific causes. In the Middle Ages famines were more numerous than at present for the reason that modern communication and transportation makes it possible to supply quite successfully the districts in want with the necessary means of sustenance. The most widespread famines of recent times have been experienced in Asiatic countries, particularly in India and China. The great famine visiting northwestern India in 1837-38 caused 800,000 persons to perish, and the one occurring in Bengal and Orissa in 1865-66 resulted in about a million deaths. In 1847 a famine visited Bengal, but it was not excessively destructive of human life for the reason that supplies were transported rapidly to the afflicted districts, though nearly a half million died during the great famine in 1877, which visited Bombay, Mysore, and Madras. It is estimated that 9,000,000 persons perished at the time of the great famine in China in 1877-78, while the one in 1888-89, caused by the overflow of the Yellow River, was equally destructive. One of the most remarkable famines of India occurred in 1897, which was followed by a very destructive and widespread dearth of food in 1900. The most destructive famine of recent times visited China in 1902, when about a million people died of starvation.

**FAN**, an instrument for agitating the air by the movement of a flat surface, especially for cooling the face or causing the movement of air in a room. Devices for cooling the face by agitating the air were in use among the Greeks and Romans, and were introduced into western European countries shortly after the



Roman invasion of Gaul and Germany. Those generally used are made of palm leaves, feathers, thin skin, wood, paper, or ivory, and are of various construction. Ventilating fans are propelled by steam or electric power. Those of the latter class have a simple motor with alternating electric currents, a fifty-volt transformer current usually being sufficient to propel the fan. These ventilating fans are frequently seen in department stores, offices, and dining rooms, where currents of air are put in motion for the cooling effects. In mining, for winnowing grain, urging combustion, cooling fluids, and other purposes contrivances of flat disks or waves are utilized, which, when propelled by machinery, revolve rapidly and induce strong currents, the force of the current depending upon the velocity at which the fan moves. See **Blowing Machine**.

**FANATICISM** (fā-năt'ī-sīz'm), the term used to designate intemperate zeal or ferocious enthusiasm. The spirit of fanaticism has frequently characterized political and religious movements, in which advocates of reforms were unduly enthusiastic, and often resorted to radical measures in endeavoring to further their ends.

**FANCY** (făn'sy), in psychology, a term used in connection with imagination, of which it is a form. When the imagination combines the subjects it uses in such a way as to give a result that is pleasing, light, and playful, but still shows nothing of high purpose or of noble and cultivated taste, it is called fancy. Images of the fancy are dealt with by many of the poets and orators. The comparison made by Longfellow, in which the moon is likened to the paper kite of a school boy, is a mere fancy. In early life the imagination inclines more commonly to the fanciful. This is evidenced by the productions of great writers, particularly of Shakespeare, whose early writings partake more of the fancy than do his later productions.

**FANDANGO** (făn-dăn'gō), a famous dance of the Spanish people, dating from the Moorish occupation of Andalusia, though it is rarely danced, except at theaters and in parties given by the lower classes. It is said to have come into favor on account of the ecclesiastical authorities in Spain threatening to prohibit dancing. Accordingly, two parties were brought before the judges of a court, in which the fandango dance was given, and this resulted in its approval. In this form of dancing the parties never touch each other, but retreat, approach, and pursue each other in varied movements, voluptuousness being indicated by the movements.

**FAN PALM**. See **Palms**.

**FARALLONES** (fär-räl-lōnz'), an island group off the coast of California, situated thirty miles west of the Bay of San Francisco. It belongs to the State of California. The group consists of six islands, on the largest and most southern of which is a lighthouse with a flash light of the first order, at an elevation of 360 feet above sea level. Great numbers of gulls and murrets breed on these islands and furnish vast quantities of eggs, which are gathered for the market of San Francisco. Many sea lions and several species of seals frequent the group.

**FARCE**. See **Drama**.

**FAR EASTERN QUESTION**, the problem of international politics which at present is receiving attention from the leading nations of the world. In respect to territory it refers to Farther Asia, which in this sense includes all of the eastern portion of that grand division. It may be said that this issue of international politics dates from the time Prince Henry the Navigator explored an eastward route to the Indies, since which time the leading European powers have sought to control both the territory and commerce of the Orient. However, the beginning of the 20th century intensified interest in Far Eastern politics, particularly since the means of navigation have been improved and railroad building has become greatly extended, by which changed conditions western people have been enabled to compete more successfully in the Asiatic market.

The rise of Japan as a political power is a potent factor in the Far Eastern Question, and the war between Japan and China in 1894-95 is the beginning of an important epoch. The United States became more directly interested by annexing the Philippines in 1898, though it had already established itself as a factor by the annexation of the Hawaiian Islands. The policy of the United States has been to advocate the preservation of the integrity of China, and it has insisted that all nations, irrespective of spheres of influence, be granted equal rights of trade in the Chinese Empire. Russia has long sought preponderance in Manchuria, principally because the control of that region is an essential in securing a broad outlet to the Pacific for the great Siberian railway system. However, Russian influence became greatly lessened through the fortunes of war with Japan, and the latter country is not only a claimant to consideration, but is destined to exercise a wide influence in forming the future policy in regard to China and its industrial development. Germany, Great Britain, and France are the other three powers most concerned, since each has a foothold on the eastern shore of Asia. The



trade of Shan-tung and the fertile valley of the Yellow River are largely in the hands of Germany, while Great Britain is strengthening her position in the Yangtze valley, and France is endeavoring to cross China with a railway line from French Indo-China to connect with the Trans-Siberian Railway in Russian or Japanese territory.

In 1900 occurred the Boxer outbreak against foreigners, which was designed to preserve China for the Chinese. The promoters of this movement look upon railroad building as particularly favorable to the nations that advocate establishing spheres of influence until all of China is controlled by the commercial nations of Europe and America. No doubt the whole question will turn upon railroad building, and already transcontinental lines have been projected both north and south. When completed these lines will carry a vast trade and furnish the means which will bring Europe into control, as well as open and maintain a wide market for the manufactures produced by modern methods.

**FARGO** (fär'gō), a city of North Dakota, county seat of Cass County, on the Red River of the North, opposite Moorhead, Minnesota. It is on the Great Northern, the Northern Pacific, and the Chicago, Milwaukee and Saint Paul railroads. The surrounding country is a fertile region, producing large quantities of hay, wheat, flax, oats, and other cereals. Among the noteworthy buildings are the post office, the county courthouse, the public library, the public high school, and the Protestant Episcopal and Roman Catholic cathedrals. It is the seat of Fargo College (Congregational) and of the State Agricultural College. Island and Woodland parks are public resorts. The chief manufactures include flour, clothing, brick, and machinery. It has a large retail and jobbing trade in merchandise. Electric lights, sewerage, pavements, and public waterworks are among the improvements. It was settled in 1871 and incorporated in 1875. Population, 1905, 12,512.

**FARIBAULT** (fâr'î-bō), county seat of Rice County, Minnesota, at the confluence of the Cannon and Straight rivers, 52 miles south of Saint Paul. It is on the Rock Island, the Chicago Great Western, the Chicago, Milwaukee and Saint Paul, and other railroads. The surrounding country is fertile and contains many productive farms and dairying establishments. Among the manufactures are woolen goods, clothing, machinery, and cigars. The noteworthy buildings include the county courthouse, the high school, the State institutions for the deaf, dumb, and feeble-minded, the Bethlehem Acad-

emy for girls, the Seabury Divinity College, the Shattuck School for boys, and Saint Mary's School for girls. It has electric lights, pavements, waterworks, and street railways. The principal manufactures are flour, woolen goods, musical instruments, clothing and machinery. It was settled in 1850 and incorporated in 1877. Population, 1905, 8,279.

**FARMERS' INSTITUTE** (în'stî-tût), the organization maintained for the purpose of providing opportunities for discussion and advancement of agriculturists and stock raisers. The plans under which farmers' institutes are organized differ somewhat. In some instances they are conducted under the direction of officials appointed by a board of agriculture, while in others the state or government makes an annual appropriation, by means of which institute meetings may be organized and maintained throughout the agricultural districts. The course of study pursued includes topics relating to improved methods of cultivation, fertilization, care of machinery, stock raising, wool, mutton, and pork productions, transportation to market, beautifying of farm life, and many other kindred subjects. It is usually customary to have experienced professors of agriculture and mechanic arts give a series of lectures in order to bring the practical experience of the central stations in direct contact with the practical cultivators of the soil, the rearers of domestic animals, the workers in dairy establishments, horticulturists, etc. In some instances the institutes are in session for several weeks consecutively, while in others local meetings are held at various points in the county or district, thereby facilitating the attendance of a larger per cent. of the industrial classes.

In some instances, as in Michigan and several other states, the institutes are under the control of a board of agriculture. The state appropriation to defray the expenses of the institutes in New York aggregates annually about \$15,000, while in Iowa the appropriation to each county may not exceed \$50 per annum. Other states have plans whereby the same object may be attained, though the methods are very much diversified. Similar provisions have been made in Canada. The institute movement has progressed most successfully in the states of the north and northwest and in Ontario and the western provinces of Canada.

**FARMERS' ORGANIZATIONS** (ôr-gan-î-zā'shŭns), the societies or parties organized by farmers for the purpose of bettering the condition of agriculturists, and influencing legislation favorable to the various lines of agriculture, horticulture, floriculture, stock raising,



and dairying. Among the first organizations of this kind was the Patrons of Husbandry, organized by William Saunders, Aug. 5, 1867. This was formed on the plan of fraternal societies, under which certain degrees were given to members. The subordinate lodges or granges organized under the system were governed by the National Grange and numbered about 26,000 in 1890. Later other organizations were formed, having a more or less political significance, among them the National Agricultural Wheel, the National Farmers' Alliance, and the National Farmers' Political League. In 1892 a convention of delegates from the various farmers' organizations, together with delegates of the Knights of Labor and the People's party, was held in Omaha, Neb. A platform declaring their principles was adopted on the Fourth of July. Among the tenets declared were those of a graduated income tax, free coinage of gold and silver, government ownership of telephones and telegraph lines, reclamation of lands from aliens, and the eight-hour labor law. Gen. J. B. Weaver, of Iowa, was nominated for President and Gen. James Field, of Virginia, for Vice President. The party organized in this way received 1,055,424 of the popular and 22 of the electoral votes.

**FARNE ISLANDS** (färn), or **Fern Isles**, a group of islands in the North Sea, off the east coast of England, opposite Northumberland. The group includes seventeen islets of rocky formation. Navigation in the vicinity is very dangerous. They were the scene of the heroic deeds of Grace Darling in 1838, when the *Forfarshire* was lost. A tower built to the memory of Saint Cuthbert is on one of the islands. They belong to Great Britain.

**FAROE ISLANDS** (färö), a group of 25 islands situated in the North Atlantic, between Iceland and the Shetland Islands. The coast lines are largely rugged cliffs, rising abruptly to a height of 500 to 2,000 feet, while the mountains of the interior contain extensive tablelands, none of which exceeds 3,000 feet above the sea level. These islands belong to Denmark. They are governed by resident representatives appointed under the direction of the king. The inhabitants are descendants of Scandinavian people who settled here largely in the 9th century. Strömö is the largest island and contains the capital, Thorshavn, which has a population of about 1,000. The islands are treeless, but have valuable deposits of peat and coal. Building material and machinery are imported largely from Norway. The chief industries of the people consist of fishing, hunting, and sheep culture. Only seventeen of the islands are inhabited. The religion is exclusively Lutheran.

Numerous schools are supported by government grants. Population, 1906, 15,821.

**FARTHING** (fär'thĭng), a coin of Great Britain, the fourth part of a penny. It was first coined by the Saxons, but the copper farthing did not come into use until 1665. A farthing is equal to about one-half a cent in the money of Canada and the United States.

**FASCINATION** (fäs-sĭ-nā'shŭn), any irresistible influence which captures or controls the will or intellect. That human beings are fascinated more or less easily by certain natural influences is admitted on every hand, but some go so far as to seek to revive widespread belief in the evil eye, an influence that the superstitious thought existed, and by which individuals could be compelled to act contrary to their wishes. Some naturalists think that certain snakes and other animals have this power over mice, squirrels, and birds, but it has been neither satisfactorily explained nor demonstrated. However, some think that serpents emit narcotic fluids whereby the weaker animals become stupefied, while others regard the force or influence analogous to hypnotism.

**FASHION** (fäsh'ŭn), the prevailing style of usages, ornaments, and dress which is adopted by society and accepted by its members in accord with a general law of interest. The fashions change from time to time. They are supposed to take form in line with the most serviceable in practice and the most elegant and decorous in design. When the various fashions of past ages are examined, it is found that the changes were rapid and marked, and that caprice was more often the cause than utilitarian motives. However, the desire to dress *in fashion*, to have every part of the apparel agree with the accepted style, is noticeable throughout the period of history.

**FASHODA** (fä-shō'dä), a town of the Egyptian Sudan, on the White Nile. It was occupied by the French under Captain Marchand in 1898. The British demanded its evacuation, but the French refused to comply with this demand until they themselves received commercial concessions in the region of the upper Nile and an approval to the extension of their possessions in the Central Sudan. Fashoda was founded by the government of Egypt in 1867 and is situated in an unhealthy region. It has considerable trade in produce and merchandise.

**FAST** (fäst), the voluntary abstention from food, a practice which originated as a religious discipline. It may be either a total abstinence for a brief time from all food, or only from certain kinds, as meat or leavened bread. The origin of the practice is very obscure, but it



probably did not at first occupy nearly so prominent a place in Christian rituals as that to which it afterward attained. Among the ancient Egyptians fasting seems to have been associated with many religious festivals, notably that of Isis, but it was not compulsory. Among the Jews fasts were numerous, but the day of atonement was the only fasting day enjoined by the law of Moses. Mishna speaks of four others commemorating, respectively, the storming of Jerusalem by Nebuchadnezzar, the burning of the temple by Titus, the sacking of Jerusalem by Nebuchadnezzar, and the reception of the news of the destruction of Jerusalem by Ezekiel and other captives. Other fasts were proclaimed by royal or other authority on special occasions.

The New Testament enjoins no stated fasts, but several came into vogue subsequently, the fast of Lent taking the lead. In the 3rd century the Latins fasted on the seventh day. The Council of Mentz, in 813 A. D., ordered a fast the first week in March, the second week in June, the third week in September, and the last full week preceding Christmas. In the Roman Catholic Church there is a distinction between the days of fasting and of abstinence. The principal fast days of that church are the forty days of Lent, All Saints, the Immaculate Conception, Rogation Days, Assumption of the Virgin, Whitsuntide, and the eves or vigils before certain festivals, as before Christmas day. To these are to be added the Ember Days, these being the Wednesday, Friday, and Saturday after the first Sunday in Lent, Whitsuntide, the 14th of September, and the 13th of December. Abstinence is practiced on every Friday.

The Greek Church observes as fast days Wednesdays and Fridays; Easter, 48 days; Christmas, 39 days; and several others. The Episcopal and Anglican churches recognize the fast as being praiseworthy, but give no directions concerning it. Their fasting days are every Friday, except Christmas day; the 40 days of Lent; the three rogation days before Holy Thursday; and the Ember Days at four seasons. The Protestant churches in general do not observe fast days, but uniformly require moderation in eating and drinking wholesome food. However, some denominations, as the Adventists, abstain from certain foods, such as the flesh of swine.

**FAT**, an animal substance of a more or less oily character deposited in vesicles in the adipose tissue. It is a compound of oxygen, hydrogen, and carbon, and occurs mainly under the skin and on the surface of muscles, but also collects in considerable quantities around cer-

tain organs, as the heart and kidneys. Fat surrounds the joints and is found in large quantities in the marrow of the bones. Being light, soft and elastic, it forms an excellent packing material in the body, giving a rounded contour and smooth surface to the frame. Its chief use is for the purpose of nutrition, but, not being a good conductor of heat, it enables the body to retain a reasonable uniformity in temperature. In extremely cold climates fat is the principal food of man; for instance, the Eskimos subsist almost wholly on the fat of bears, seals, and whales during the season of extreme cold. *Fatty degeneration* is an abnormal condition brought on by defective nutrition or excessive use of alcohol, on account of which fatty granules take the place of healthy protoplasm in the heart, kidneys, muscles, and arteries. The sufferer retains the appearance of health, but is impaired by want of energy and muscular weakness.

**FATALISM** (fā'tal-iz'm), the doctrine of an unchangeable destiny, according to which all things are preëstablished by the Creator, or by the fixed laws of nature. It has given rise in theory to doctrines or predestination, and, in moral science, to such systems as those of Hegel and Spencer. The ancient Greeks held to the belief in fate so strongly that they regarded it the controlling power of even the gods, while in modern times the Mohammedans regard all things predestined or decreed by fate, and consider the occurrence of an accident an impossibility.

**FATA MORGANA** (fä'tä môr-gä'nä), a peculiar kind of mirage seen in Italy, especially between the coasts of Calabria and Sicily. It occurs in still mornings, when the waters are unruffled by breezes or currents, and the rising sun shines down upon the smooth surface at an angle of 45°. Objects upon the opposite shore of Sicily, upon the dark background of the mountains of Messina, are seen refracted and reflected upon the water in mid-channel, representing large and duplicated images. Gigantic figures of men and horses move over the picture, interspersed with trees, castles, and palaces. Anciently it was supposed that the phenomenon is due to the fairy Morgana, hence the name.

**FATIGUE**, the weariness which follows a long sustained application of the body or mind. It is a lassitude or exhaustion of strength which is due to continued bodily labor or mental exertion. A reasonable amount of fatigue is beneficial to both the body and mind, since it operates to increase the power of the muscular and nervous tissues, thus giving a larger measure of strength and providing for greater future



capability. However, the young and those who have a weak constitution need to exercise care in practicing sustained exertion, since it may have the effect of overtaxing certain muscles or nerves. Excessive muscular fatigue is followed by a loss of the contractile power of the muscle. In the nerves and brain it causes shrinkage of the nerves and a loss of sensibility and mental power.

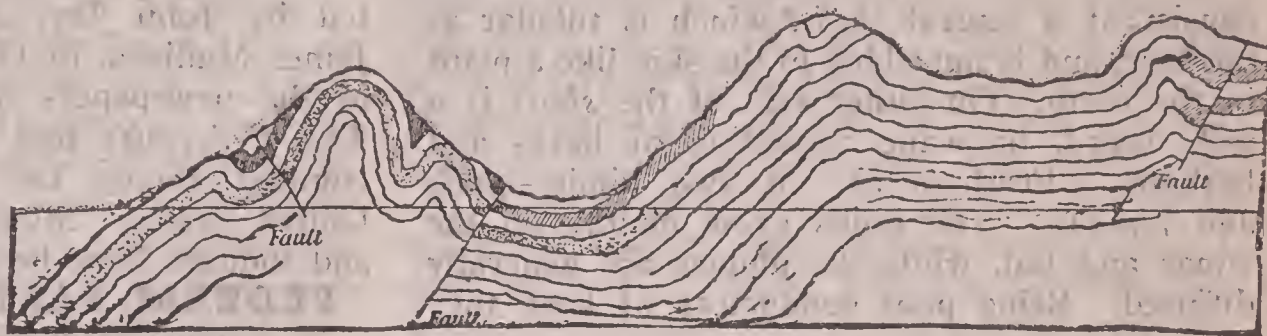
The term *fatigue of materials* is applied to the injury which results from stresses that exceed the elastic limit of materials. If a bar of wrought iron has an ultimate strength of 55,000 pounds per square inch, in which the elastic limit is 25,000 pounds, a single application of a load will not cause a rupture until the ultimate limit of strength is reached. However, when the application exceeds 25,000 pounds per square inch, the molecular structure is altered, causing the iron to become brittle, and a rupture may occur under a stress much less than its ultimate strength, perhaps at 35,000 pounds per square inch. Engineers have formulated elaborate rules governing the fatigue of materials and make allowance for repeated stresses by means of definite formulas. See **Strength of Materials**.

**FATIMITES** (făt'ī-mīts), the descendants of Fatima, the daughter of Mohammed. They constituted a powerful dynasty which ruled Egypt and Syria for more than two centuries, at the time the Abbasside caliphs reigned at Bagdad. They claimed as their founder Ismael, one of the imams who descended from Ali and Fatima, and attained the throne under Adu Mohammed Obeidallah, who became the ruler in 909 A. D. The dynasty was extinguished in 1171, on the death of Adhed, the fourteenth caliph. It was succeeded by a new dynasty established by Saladin the Great.

**FATTY DEGENERATION** (dê-jěn-ēr-ā'-shūn), in pathology, a term which signifies a gradual displacement of the healthy protoplasm by fat globules. These globules have no element essential in life, hence are destructive to the living tissues. They are liable to affect any of the tissues, especially the cellular and muscular, and are a frequent cause of diseases of the heart and liver. Fatty degeneration of the kidneys occurs in many cases of Bright's disease. It is more common in old age, likely due to defective nutrition, and requires careful medical treatment.

**FAUBOURG** (fō-bōor'), the name applied in France to the suburb of a city, or to a district recently annexed to the municipality. Saint Germaine, a fashionable quarter of Paris, is a faubourg of that city.

**FAULT**, in geology, a displacement of strata of rocks along a plane of fracture. Faults are frequently met with in working beds of coal, the miner coming unexpectedly against an abrupt wall of other strata. The angle this makes in a plane of the bed he is working indicates whether he must look up or down for



FAULTS IN STRATA OF ROCKS.

its continuation on the other side of the dislocation. Beds are thus heaved from a few feet to several hundred or even a thousand feet.

**FAYAL** (fī-āl'), an island of the Azores, belonging to Portugal. It has an area of seventy square miles. A part of the surface is mountainous, rising to a height of 3,290 feet. The soil is fertile and the climate is favorable to Europeans. Among the chief products are live stock, cereals, fruits, and miscellaneous manufactures. Horta, situated on an eminence 3,000 feet above sea level, is the principal town. Population, 1908, 27,045.

**FAYETTEVILLE** (fā'ēt-vil), county seat of Cumberland County, North Carolina, at the head of navigation on the Cape Fear River. It is on the Atlantic Coast Line Railroad and has communication by steamship lines. The noteworthy buildings include the county courthouse, the Donaldson-Davidson Academy, and the State normal school for colored students. Among the manufactures are cotton goods, vehicles, ice, woodenware, and tobacco products. It has a large trade in lumber, cotton, flour, and naval stores. The municipal facilities include waterworks, sewerage, and electric lights. It was settled in 1762 and incorporated as a city in 1893. It suffered severe losses during the Civil War, especially in 1865, when it was occupied by General Sherman. Population, 1900, 4,670.

**FEATHER GRASS** (fěth'ēr), a genus of grasses distinguished by their elegant and featherlike awns. The common feather grass is native to the southern part of Europe, where it is found on the dry hills. It grows in closely



matted tufts, having numerous tall flower stalks with small florets, and the leaves have a dark green color. The tufts, if gathered before the seeds are ripe, retain their beauty throughout the winter. The esparto grass somewhat resembles feather grass. A species known as rush-leaved feather grass is native to the western part of North America.

**FEATHERS**, the dermal growths forming the external covering or plumage of birds. Though chemically similar to the hair on the skin of mammals, they differ widely from it in form and color. As a general rule, feathers consist of a central shaft, which is tubular at the base, and is imbedded in the skin like a plant in the earth. On either side of the *shaft* is a web, beard, or wane consisting of barbs and barbules. Feathers are of two kinds—*quills* and *plumes*. The quills grow mainly on the wings and tail, while the plumes are generally diffused. Being poor conductors of heat, they



FEATHERS.

Marabou Pheasant Toucon Bird of Paradise Ostrich

are useful in preserving the temperature of the bird. They are renewed once or twice a year, which renewal is called *molting*. Some feathers are known as *down* and are the first feathers of the birds. Most birds are provided with an oil gland at the base of the tail, whose secretion the animal distributes at various times over the feathers by means of the bill. Feathers form an extensive article of commerce and are used for ornaments, plumes, bedding, pens, and many other useful purposes.

**FEBRUARY** (fěb'ru-ā-rŷ), the second month in our present calendar. It has 28 days, except in a leap year, when it has 29 days. It was first placed after January by the decemvirs of Rome in 252 B. C. Originally it had 29 days, but, when the seventh month was named after Augustus, a day was taken from it and added to August, making the latter month the same length as July.

**FEDERAL HALL** (fěd'ēr-əl), the name of the building used as the capitol in New York

City, in which Congress met when that city was the seat of government. It was originally erected as a city hall, located on Wall and Nassau streets, and was rebuilt and placed at the disposal of Congress. However, New York retained the national capitol only a short time, as it was removed to Philadelphia in 1790, whence it was removed to the District of Columbia in 1801. Federal Hall was torn down in 1836 and its site is now occupied by a subtreasury.

**FEDERALIST, The**, a series of essays published in favor of adopting the Federal Constitution of the United States. They were written by John Jay, Alexander Hamilton, and James Madison, in 1787 and 1788, and appeared in the newspapers over the signature *Junius*. *The Federalist* had a wide influence and is counted among the political classics of the United States. Many editions with comments and indexes have been published.

**FEDERAL PARTY**, the first political party which had control of the government in the United States after the adoption of the Constitution. When the Constitution had been framed and sent by Congress to the states, in 1787, for ratification or rejection, those favoring acceptance were called Federalists and those opposing it were known as Anti-federalists. The Federal party was led by Washington, Pickering, Adams, Ames, Jay, Hamilton, and Morris. By it the machinery of the new government was established, but in this enterprise the prominent leaders of the Anti-federalists were consulted. The district, circuit,

and supreme courts were organized by the Federalists; the departments of State, Attorney-General, Treasury, and War were established; the debt created by the Continental Congress was funded; the debts of the states caused by the Revolution were assumed and funded; plans to repay money borrowed from Holland, France, and Spain were made, and, in 1791, the first national bank of the United States was chartered. A strong opposition to some of these measures was conducted by the Anti-federal party under the leadership of Jefferson, Monroe, Randolph, Madison, Gallatin, Gerry, and others, who afterward became leaders of the Democratic-Republican party. In order to secure the consent of the southern and agricultural states, it was necessary for the Federalists to consent that the national capital be located on the banks of the Potomac River.

The second measure of importance was the founding of the Bank of the United States under the leadership of Hamilton. In 1789 the



system of levying duties on imports was commenced. Each of these measures was carried out by a strict sectional vote, and the agricultural sections of the north and the south began to oppose the tariff system, which gave Jefferson and Madison a source of strength in organizing the new party. Later the Federalists endeavored to bring the country into war with France, this being prevented only by the policy of Adams, but it tended to divide the party. In 1798 the passage of the alien and sedition laws forever destroyed its popularity. The party succeeded in the election of Washington and Adams, the latter being defeated by Jefferson, in 1800, for reelection by a decisive vote. As an opposition party the Federalists took a strict-constructionist ground, while some of its leaders engaged in projects for the disruption of the Union. The policy pursued by the party during the War of 1812, and its general distrust of the people, caused its strength to wane and ultimately destroyed all hopes of permanent success.

**FEEBLE-MINDED** (fē'b'l mīnd'ēd), the state of being weak in intellectual power, or being mentally infirm, vacillating, or irresolute. It is a form of imbecility and differs from insanity in that it is less violent, being a form of feebleness rather than mental derangement or unsoundness. Little was done to build up a system of education which would aim at a suitable treatment of those subject to feeble-mindedness until 1848, when Samuel G. Howe, superintendent of the Perkins Institute for the Blind at Boston, Mass., elaborated a plan of education for the feeble-minded. Formerly they were looked upon as idiotic and either treated in hospitals for the insane, or given such care as was possible in public schools or private institutions.

Massachusetts established a State institution for the feeble-minded in 1851, the first State institution in America founded exclusively for these unfortunates, and subsequently many of the states established such schools. The education of the feeble-minded is now considered a necessary and important part of the system of public schools, since it provides training for those unfitted to take up the regular work of instruction, and who are not sufficiently infirm to be taken to hospitals for the insane, since their training must be of a kind which will strengthen them mentally and tend to develop them to the highest degree of efficiency under a system of training which must begin at an early period in life.

Institutions for the feeble-minded are generally located on a large tract of land within

easy reach of some town or city. In this way the inmates are removed from harmful influences common to a populous section, and they are brought in contact with the things of nature and the influence of their teachers under more wholesome environments than those associated with the city. These institutions are in fact a home for the idiotic and the imbecile, who remain there permanently or until such a time as their mental condition will permit them to return home, or to fill some function in life safely and independently. The purpose is to keep the inmates occupied in pleasant and agreeable work, and at the same time teach them the rudiments of an education. The educational work is largely in the form of kindergarten exercises, but those capable of mental progress learn to read, write, and sing. The male adults are taught to do work in the garden or orchard, while the females learn to knit, crochet, mend, and embroider. Much patience and diligence is required on the part of the teacher, who has charge of a small number of inmates, and the latter are graded as nearly as possible according to their age and state of mental development.

**FEELING**, in psychology, the power of the mind by which it is capable of experiencing or perceiving a mental act connected with some need or activity arising through the physical or the psychological nature. *Psychical feelings* have a purely mental source and arise from some conception or mental state. They are connected with some desire or activity, are accompanied by pleasure or pain, and ordinarily are preceded by knowledge, leading to volition. The feelings are the source of all joy and sorrow, and furnish the motives in view of which we choose to act or do. At first thought it may appear that knowledge alone leads to volition, but the influence exercised by desire and aversion is too apparent to be left out of account. Feelings are classified as *emotions*, *affections*, and *desires*. The simple feelings, as of joy and comfort, are emotions; those that go out toward an object, as of love, are affections; and those in which a wish to possess is manifested, as to possess food or clothing, are desires. See **Touch**.

**FELDSPAR** (fēld'spär). See **Felspar**.

**FÉLEGYHÁZA** (fā'lēd-y'-hā-sō), a city of Hungary, 65 miles southeast of Budapest, with which it is connected by railway. It is surrounded by a fertile farming country and has a considerable market in fruit, wine, grain, and cattle. The manufactures include pottery, clothing, cigars, and machinery. It has electric and gas lighting, waterworks, and paved



and macadamized streets. Population, 1906, 35,403.

**FELLAH** (fě'l'la), an Arabic word meaning peasant or farmer, applied to a laboring and agricultural class in Egypt. They form the bulk of the population and are descendants of the ancient Egyptians, intermingled with Arabs, Syrians, and other races of Africa and Eurasia. In social position they are inferior to the Bedouins. The men are of medium height, have a dark color, a large head with a facial angle of about 90°, thick lips, and small hands and feet. The women tattoo themselves and marry at an early age. Fellahs exhibit the moral qualities of the ancient Egyptians, being intelligent, grave, and sober on the one hand; but idle, jealous, licentious, and of unbending obstinacy on the other. A few are Copts, but Mohammedanism is the chief religion.

**FELLOWSHIP** (fě'l'lo-shĭp), the name of a position provided in many of the institutions of higher learning, both in America and Europe. The holder of such a position is called a *fellow*, who is appointed to the place for eminent scholarship, the object being to make it possible for him to pursue advanced studies. In some institutions the appointment is for a year only, while in others the period ranges from five to seven years, and the holder of a fellowship receives an annual stipend and other valuable perquisites. The ranks of the faculties are frequently recruited from the fellows. In England many fellowships are tenable for life, though in some institutions, such as Cambridge, they are for a definite term of years. However, the income in England is larger than in America, since the fellows receive from \$500 to \$2,500 annually. The trustees in some institutions of the United States are called fellows.

**FELSPAR** (fě'l'spär), or **Feldspar**, a group of minerals which embraces many species. In some form, it is the principal constituent of granite, gneiss, greenstone, and many other rocks, while clays seem to have resulted very generally from its decomposition. The minerals of this group occur in crystals and crystalline masses, are vitreous in luster, and break rather easily in two directions at right angles to each other. The colors are usually white, flesh-red, bluish, or greenish. All kinds of feldspar are so hard that they cannot easily be scratched with a knife. They are fused with difficulty, but are quite soluble in acids. Several species are of a fine grade, including those known as potash feldspar, lime feldspar, and soda feldspar. A nearly colorless variety, known as *moonstone*, is often cut into ornaments and

is prized almost as a gem. Another species with golden-yellow specks, called *sunstone*, is very rare and beautiful and commands high prices. *Labradorite*, obtained chiefly in Labrador, and *Amazon stone*, found in the Ural Mountains, are esteemed as precious stones. In decomposition feldspar not only yields clay, but also the mineral *kaolin*, both of which are essential elements in the manufacture of fine pottery and porcelain. Feldspar of commercial value is obtained in Greenland, in the Adirondack region of New York, in the Rocky Mountains of British Columbia and Colorado, and in other sections.

**FELT**, a kind of cloth made without weaving by taking advantage of the natural tendency of the fibers of hair and wool to interlace with and cling to each other. The materials are carded more or less perfectly, steamed or moistened with hot water, and passed between beaters and rollers which press them into compact cloth or felt. This class of material is used extensively for carpeting and in padding coats, caps, cloaks, and other garments. It is valuable in making table covers, carriage-linings, upholstery work, and piano hammers, and for sheathing boilers and hot-water reservoirs. When saturated with pitch, coal tar, or asphalt, it is used for covering sheds and similar buildings. Beaver hats are made in the same manner of the fur of beavers, rabbits, raccoons, and other animals.

**FEMUR** (fě'mür). See **Skeleton**.

**FEN** (fě'n), a tract of low land which is subject to overflow, or is partially or wholly covered with water. The name is used extensively in England, where it has reference to the Fens, or Fen District, which consists of a moor or boggy land that produces coarse grasses. These regions have a peculiarly rich soil and are frequently redeemed by drainage and the construction of dykes.

**FENCE**, an inclosure constructed of posts set in the ground, having fastened to them wire, rails, or boards. The posts are usually of wood, though iron is used for that purpose to some extent, and in regions having a large supply of rocks some fences are constructed of stone. Fences that inclose a yard are commonly made of boards or woven wire, while the larger fields and ranches are fenced with barbed wires. In some sections many fences are made by planting shrubs together closely in rows, such as willow or osage orange, but these are not as common now as formerly, since they require considerable care and to some extent interfere with the growth of crops near the fence line. Barbed wire used for fencing is usually twisted



of two strands, and the main wire has barbs from three to four inches apart. It is the chief material in constructing fences, though its use is not permitted in the cities and along the roads in some states, where smooth wire is used instead. See **Wire**.

**FENCING**, the art or practice of attack and defense with the sword or rapier. The instrument used chiefly is a small sword made to taper gradually from the hilt to the point, and the size depends upon the rules governing the practice. The rapier is a straight sword with a narrow and finely pointed blade, and is used only for thrusting. A blunt weapon called a *foil* is used chiefly in gymnasiums. It resembles a small sword in the main, but is usually lighter and has a button at the point to prevent accidents in practice. Fencing became popular among the noble and knightly class at the close of the 15th century, when it consisted chiefly of rapier and dagger play, and those engaged in the practice were covered with armor or carried a shield. It took first rank as a favorite form of exercise in the schools and gymnasiums of European countries, where it is still practiced quite extensively, but in America it never rose to a place of considerable importance as a school practice. The Amateur Fencers' League of America, which is associated with the Amateur Athletic Union, is the most important fencing organization in the United States. It has four competitive contests each year, the most important being with dueling swords and sabers, while the others are with foils. Fencing teams are maintained by the principal colleges and universities and these hold intercollegiate contests. New York, Philadelphia, Boston, and Montreal are classed as the leading fencing centers of America.

**FENIANS** (fē'nī-āns), the name derived from a class of ancient Irish warriors, the *Fianna* or *Fionna*, founded as home guards in the 3d century. In modern times it was made the name of a political association that has for its aim the forcible liberation of Ireland from British sovereignty. The Fenian movement of the last century dates from 1857, when John O'Mahoney, James Stephen, O'Donovan Rossa, and other prominent leaders established a brotherhood in America. The object was to make the United States the base for operations in Ireland and Canada against the English, the central headquarters being in New York City.

In 1863 large sums of money were collected to organize for aggressive hostilities, and a convention was held at Chicago for the purpose of formulating plans. An attempt to invade Canada was made in 1866, but the object was

frustrated by a capture of the stores of arms and provisions by United States authorities. About the same time an uprising in Ireland was suppressed by seizing the *Irish People*, a Fenian publication at Dublin, and arresting a number of leaders. Another effort was made to invade Canada in 1871, which likewise proved unsuccessful. An attempt to destroy British ships and prevent shipbuilding by the use of dynamite was designed in 1883, though the enterprise met with little success, the principal promoters being apprehended and sentenced to penal servitude for a term of years. Within recent years the brotherhood, although having many sympathizers in Europe and America, has not pursued active operations, but organizations are still maintained.

**FENNEC** (fě'nĕk), a small animal of Africa, resembling a small fox. The tail is nearly as long as the body, which has a length of a foot, and the ears are three inches in length. It has a yellowish color, except the tip of the tail, which is black and bushy. The fennec is native to the Sahara Desert and is called Sahara fox by some writers. It burrows in the ground, where it spends most of the day, and at night comes out in search of food. It subsists on insects, birds, mice, lizards, and the tender parts of plants.

**FENNEL** (fě'nĕl), a fragrant umbelliferous plant cultivated in gardens to a considerable extent for its aromatic qualities. The flowers are small and yellow or white, and the leaves, sometimes used in cookery, are finely divided. Among the common species are the giant fennel, common fennel, sweet fennel, and Indian fennel. The seeds are carminative and are used in medicine.

**FERGUS FALLS** (fēr'gūs fāls), a city in Minnesota, county seat of Ottertail County, on the Otter Tail River, 186 miles northwest of Minneapolis. It is on the Northern Pacific and the Great Northern railroads. The noteworthy buildings include the county courthouse, the high school, the public library, the Park Region Lutheran College, and a State hospital for the insane. It has manufactures of flour, ironware, clothing, cigars, and machinery. The Otter Tail River supplies an abundance of water power, by which various manufactories, an electric light plant, and several mills are operated. It was settled about 1861 and incorporated as a city in 1863. Population, 1905, 6,692.

**FERMENTATION** (fēr-mĕn-tā'shŭn), a change which takes place in most animal and vegetable substances when they are exposed to air and moisture at ordinary temperatures. It is a chemical decomposition of an organic com-



pound induced by chemical agents or by living organisms. In the former, called *unorganized* or *chemical* ferments, the enzyme causes a structural change without losing its identity, as in digestion; while in the latter, called *organized* ferments, the action is due to the growth of the ferment, as in the formation of acetic acid from alcohol by the action of the vinegar plant. The various organisms which produce fermentation apparently derive their nourishment from the original compound, and yield products that are poisonous to the ferment. It is for this reason that chemical decomposition ceases when fermentation products are in excess, or the nutrient is exhausted. It is arrested by certain substances, such as salt and alcohol, called *antiseptics*, as well as by heat and cold.

Several kinds of fermentation are recognized, the name depending upon the specific product obtained. In *alcoholic* fermentation the sugar contained in liquids is converted into carbonic acid, alcohol, and glycerin; in *acetic*, the spirituous liquors become acid and produce acetic acid; and in *putrid* fermentation, organic substances are altered in various ways, the alteration depending upon the nature of the substance, and poisonous gases are generally set free. Besides these are *ammoniacal*, yielding ammonia; *benzoic*, yielding benzoic acid; *amylic*, yielding amylic alcohol; *viscous*, yielding a gummy mass; *lactic*, yielding lactic acid; and *butyric*, yielding butyric acid.

The various kinds of fermentation may be effected at different degrees of temperature, varying from about 24° to 104° Fahr. In digestion the ferments of the pancreas act on fibrin at 90°. Viscous fermentation, in which wine is made thick and viscous so it forms threads when poured, occurs at a temperature of from 60° to 104°. Alcoholic fermentation under certain condition takes place readily at 24° to 30°. The ferments employed to excite fermentation are mostly organic, though there are many of an inorganic nature. Among the most common fermented liquors containing alcohol and used as beverages are wine, made from the juice of grapes; mead, from honey; cider, from apples; ale or beer, from an infusion of malt; and chicha, from maize. The last mentioned is made in large quantities in South America. See **Beer**.

**FERNANDINA** (fēr-nān-dē'nā), a city of Florida, county seat of Nassau County, on Amelia Island, 35 miles northeast of Jacksonville. It is on the Florida Central and Peninsular Railroad and has a good harbor on the Amelia River, which separates the island from the continent. The city has a large trade, both

inland and foreign, in lumber, cotton, phosphates, and merchandise. A fine shell road extends to Amelia Beach. Cumberland Island, located near the city, was the home of Gen. Nathaniel Greene and is the burial place of Light Horse Harry Lee. Fernandina was settled by the Spaniards in 1632, and was incorporated in 1859. Population, 1900, 3,245.

**FERNANDO PO** (fēr-nān'dō pō'), an island belonging to Spain, located in the Bight of Biafra, about 20 miles off the west coast of Africa. It is 42 miles long and 20 miles wide, and has an area of 768 square miles. The surface is mountainous, but the soil is fertile and well watered. Clarence Peak, the highest summit, has an altitude of 11,025 feet. The climate is hot and unhealthful. Among the chief products are rice, bananas, corn, yams, and live stock. The Portuguese discovered the island in 1471, but it became a part of Spain in 1787. Santa Isabel, the chief town, has a population of 1,500. The island is inhabited chiefly by native Negroes and Portuguese. Population, 1908, 21,346.

**FERNS**, a class of leafy but flowerless plants, springing from a rhizome, which creeps on the surface of the ground, or rises in the air like the trunk of a tree. This trunk does not taper, but is of equal diameter at both ends. The reproductive organs consist of spore cases and are attached to the veins at the under surface of the leaves, or at their margins. Most ferns are comparatively small, while some tree ferns



FERN-TREE. a. SPORE CASES.

reach sixty feet in height. Seventy-five genera and about 4,000 species are known. Some ferns yield products useful for food, while other species contain properties which are of value in medicine for expelling tapeworms. The fronds of ferns, or their impressions, are frequently



met with in a good state of preservation as early as the middle of the Silurian period.

**FERRARA** (fĕr-ră'rá), a city in Italy, capital of a province of the same name, situated on the Po River, about 26 miles northeast of Bologna. The site is low and unhealthful, but the streets are broad and well paved. It is an ancient city and has many towers and bastions. Among the most beautiful of ancient buildings are the old ducal palace and several cathedrals. A number of fine monuments are in the public places, one being dedicated to Savonarola, who was born here. The public library contains 100,000 volumes. It has modern municipal facilities, while railroad and telephone connections are well established. Among the manufactures are pottery, clothing, utensils, and machinery. Ferrara was an important city in ancient times, when it had 100,000 inhabitants, and its university dates from 1264. It was long held as a fief of the popes, came under the rule of the house of Este, and in 1797 was united with the Cisalpine Republic. In 1814 it was restored to the popes, but has been a part of Italy since 1859. Population, 1906, 88,064.

**FERRET** (fĕr'rĕt), a carnivorous animal of the weasel family, but closely allied to the polecat. In form and size it approaches the common mink. It is native to Africa and cannot



FERRET.

endure excessive cold. The representative species are about fourteen inches long and of a yellowish color. Ferrets are much used, both in America and Europe, for destroying rats and

for driving rabbits out of their places of seclusion. Several species are carefully bred in captivity, in which state they subsist on bread, raw meat, and milk. The *black-footed ferret*, found in the western plains of North America, is a species of the weasel. It is about two feet long, has a pale brown color, and the feet and tip of the tail are black. This animal is seen in the towns of prairie dogs, upon which it feeds.

**FERRIS WHEEL**, an immense structure designed and invented by G. W. G. Ferris, and constructed in Chicago in 1893 as a popular feature in the Midway Plaisance at the Columbian Exposition. This great wheel, the largest ever built, contained two wheels of the same size that were securely connected by struts and rods. An axle thirty-one inches in diameter and forty-five feet long was at the center, while the spokes were iron rods two and a half inches in diameter, placed in pairs thirteen feet apart at the crown connection. Thirty-six cars were hung on the periphery, each having a convenient seating capacity for forty passengers. The weight of the wheel and passengers was 1,200 tons, this immense burden being supported by substantial mechanical devices and a solid concrete foundation. The circumference of the wheel was 825 feet; diameter, 250 feet; and elevation above the ground, fifteen feet, making a total height of 265 feet. It was lighted throughout the exposition season by 3,000 electric lights. The total cost of construction aggregated \$300,000, while the number of passengers carried during the period of operation was 1,454,013. It was taken down at the close of the exposition and erected near Lincoln Park, Chicago, and in 1904 was removed to the exposition in Saint Louis.

**FÉROL** (fĕr-ról'), a city of Spain, in the province of Coruña, on the Bay of Betanzos, twelve miles northeast of Coruña. It has a fine harbor and is strongly fortified. The manufactures include hardware, leather, chocolate, cutlery, and firearms. Among the chief buildings are those of the government, a number of churches, and several schools. The streets are wide and regular and are beautified by several squares and promenades. Electric lights and street railways are among the public utilities. Ferrol was made a naval station by Charles III., and still has the largest shipbuilding interests in Spain. The French captured it in 1809 and in 1823. Population, 1907, 26,875.

**FERRY** (fĕr'rĭ), a passage by boat across a small body or stream of water. Ferryboats ply back and forth across water to carry passengers, horses, vehicles, or any other form of traffic.



Any mode of power may be used to propel the boat, which is usually fastened to a cable stretched from bank to bank. Sometimes a pulley is placed over the cable and the action of the water in a running stream carries it across. Large ferries are propelled by steam and furnish transportation for several thousand passengers, as those operated in New York City across the Hudson and the East rivers. In some cases entire trains are transported by steam ferry, as across Hampton Roads, the Columbia River, and the Straits of Mackinac.

**FERTILIZERS** (fēr'tī-lī-zērz), the general name of substances that are used to enrich the soil and promote the growth of plants. It is common to distinguish between homemade and commercial fertilizers, the former being known as *manure* and the latter as *fertilizers*. In a restricted sense the latter applies only to the materials that pass through some process of manufacture before being utilized in farming or gardening. They include such inorganic materials as nitrate of soda, sulphate and chloride of potash, and variously prepared forms of sulphatic rock. Another class embraces such organic substances as guano, bone dust, and the refuse from slaughterhouses. Desiccated and ground sheep manure is a kind of commercial fertilizer.

Stable manures are usually spread on the ground and plowed under, while commercial fertilizers are drilled into the soil in connection with wheat, corn, rye, and other grains, and in this way the plant food comes in direct contact with the roots of the growing plants. The manufacture of commercial fertilizers is regulated by law in many states and provinces, requiring in most countries supervision under the state or government, and the different classes are tested and graduated on the basis of their utility as plant food. This is quite necessary, since the agricultural classes otherwise would be unprotected against the use of worthless or harmful materials. See **Manure**.

**FESTIVALS** (fēs'tī-vālz), or **Feasts**, a period of one or more days consecrated to commemorate some important event or the observance of some religious rite. Festivals were held by most ancient nations and have continued to be observed throughout the modern centuries, though in a modified form. At the time Homer wrote the "Iliad" it was customary among the Greeks to keep two principal festivals—those of the harvest and the vintage—in which the deities were borne through the assemblages, animals were sacrificed, and the sounds of music rent the air. The six sacred festivals of the Jews are enumerated in Leviticus xxiii. The ancient

Greeks celebrated the festivals of Dionysia and Eleusinia and the Pythian, Olympic, Nemean, and Isthmian games, the four last mentioned constituting their great national games. Many festivals were celebrated in ancient Rome, but the Cerealia, Lupercalia, and Saturnalia constituted the more important. Many of the civil festivals of the Romans and Greeks were similar in that they constituted warlike games and exercises.

The festivals kept by the Christians give distinct reference to Christ and other personages held important in the history of the church. Formerly each festival was known as a *holy day*, hence the name *holiday*. The observance of Sunday is of most frequent occurrence. Other festivals designated in the Christian calendar have reference to events in the life of Christ, such as Christmas, Annunciation, Purification, Easter, Ascension, Corpus Christi, Epiphany, Transfiguration, and Trinity. Numerous festivals are set apart to commemorate saints, apostles, and angels, though in most of the churches every day of the year is dedicated to some personage or event. The term *holiday* at present has particular reference to the days set apart by the government to commemorate some important personage or event. See **Holiday**.

**FETICH** (fē'tīsh), or **Fetish**, a word introduced by Charles de Brosses (1709-1777) in 1760 in his publication, "Du Culte des Dieux Fetiches." It was derived from the Portuguese word *feitiço*, meaning *magic*, a term which expresses the idea held by the Portuguese concerning the religion of the natives found in Western Africa. The name was applied by Comte in a general way to the primitive theories of religion, but Sir John Lubbock assigns it as the second stage in the evolution of religious thought, rather than as a form of religion. He takes this view for the reason that the idea of worship is not necessarily involved, since the Negro believes that his deities can be compelled to comply with his desires by means of his fetich. Fetichism is a form of superstition which supposes the earth, feathers, trees, mountains, plants, serpents, and other animate or inanimate objects to have a spirit, and that the person having possession of the object can utilize that spirit as a servant. If the spirit does not attend to all the possessor requests, he beats the object as if to inflict pain as punishment. The most extensive forms of fetich worship prevail in Guinea and other portions of Western Africa.

**FEUDAL SYSTEM** (fū'dəl), an economic system or condition in force throughout Europe



for many centuries. It was distinguished by the political and social ranks which were based on the tenure of feuds and fiefs, given as compensation for military service rendered by chiefs. Under these owners the land was sublet by allotment to their subordinates and vassals in consideration of like service to be rendered. According to the feudal system, the king was the owner of all the land in his dominion, while noblemen held certain tracts under grants from him at his pleasure, but usually on condition of military service. When the Teutonic conquerors of the Roman Empire acquired paramount power, the feudal system made it possible for them to hold possession under the influence of noblemen, who were personally benefited. It had spread over all of France and Germany by the time William the Conqueror led his expedition into England, and soon after all the land was seized and a feudal system was established. It prevailed in England in a widespread form until the restoration of Charles II. However, traces of it are still abundant, but the conditions are greatly modified.

The people of England, who had acquired absolute possession under the Angles and Saxons, universally opposed the establishment of feudal ownership. Here the lands were said to be *allodial* to distinguish them from the *feudal* lands. Later both classes of ownership were recognized, the allodial estates being held by the noble and ordinary freemen and the feudal by those who were bound to serve some superior lord. The latter system possessed some advantage in that it furnished greater security of life and property, hence it came to predominate as a matter of necessity. Even the minor nobles who owned estates voluntarily placed themselves for protection under some more powerful earl or duke, which gradually gave rise to the powerful principalities of Germany and the whole continent.

The feudal system began to crumble with the rise of learning. Other causes of its decline include the spread of civilization, a wider knowledge of the rights of citizens, the rise of cities, and a change in the modes of warfare. Traces more or less prominent are still found in some countries, such as landowners holding title only as tenants from lords or titled nobles. On the banks of the Rhine and in many regions of Germanic and Romanic countries are remains of the system, such as castles formerly occupied by feudal barons and numerous villages in which dependents were grouped for religious worship and educational instruction.

**FEVER** (fē'vēr), a disease or group of diseases characterized by an accelerated pulse and

increased heat of the skin. Fevers usually commence with chills, loss of appetite, feeling of lassitude, pains in the back and limbs and nausea. They are classified into *continued* fevers, such as typhus or typhoid; *intermittent*, occurring at regular periods; *remittent*, such as yellow fever; and *eruptive* fevers, as smallpox, measles, and scarlet fever. Fevers are commonly named from the ailments with which they are associated, as *lung fever*, which is connected with inflammation of the lungs. The temperature in a low fever usually ranges from 100° to 102°, which is not considered much above the normal, but in high fevers it frequently reaches 103° or even 105°. When the temperature excels 105°, it is considered dangerous and may prove fatal.

**FEVERFEW**, the common name of a perennial plant native to America and Europe, found near hedges and in waste places. It is allied to the wild chamomile, but has flat leaves and smaller flowers. The stem has many branches, is about two feet high, and has a strong aromatic smell. It was so named from its use as a medicine in treating ague and fever and is still used as a tonic and stimulant. A double flowering species is cultivated in gardens, and a related plant yields the Persian insect powder.

**FEZ**, the largest city in Morocco, capital of the province of Fez and the principal seat of government in Morocco. It is situated in a valley of the Atlas Mountains about 100 miles east of the Atlantic and 85 south of the Mediterranean. The valley is fertile and is drained by the Fez River, on which the city is located. Ancient walls surround the principal part and the city consists largely of inconvenient houses. It has angular streets and extremely poor sanitary regulations. Among the public buildings are numerous mosques, one of which is the largest in Northern Africa. The palace of the Sultan is an ancient structure, but it is in a state of good preservation. Many of the edifices have fine porticos and are beautified by trees and gardens. The university, founded in 1859, is important as a seat of Moorish learning. It has a large library, botanical gardens, and about 850 students. Among the municipal utilities are a number of public parks and some modern facilities, such as telephones, sewerage, and tramways.

The commercial importance of Fez dates from times far remote, although domestic commerce is still carried on largely by caravans from and to the interior. The trade with Europe is extensive, the exports consisting largely of grain, live stock, fruit, and local manufactures. Among the manufactured products are leather,



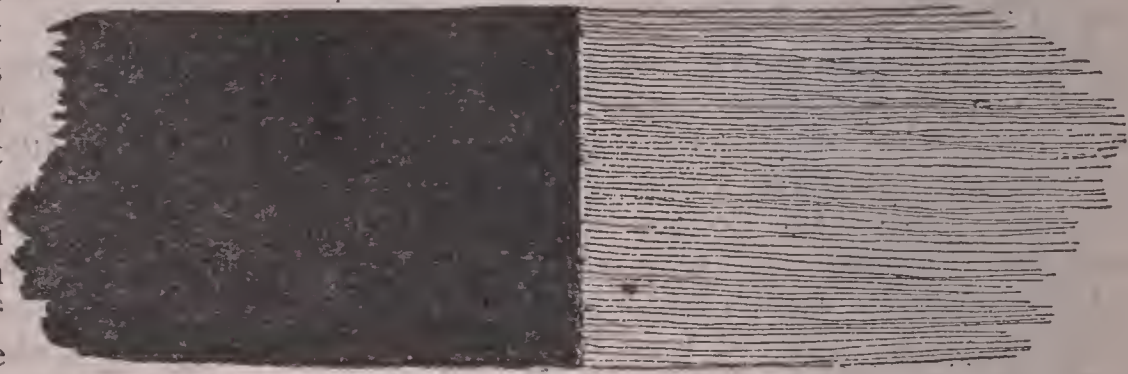
silk, woolen cloaks, fez caps, handkerchiefs, pottery, and utensils. Fez was founded in 793 A. D., by Edris II. It was the capital of an independent state from 1202 until 1548, during which period it attained widespread prosperity, and was long famous as a seat of Arabian learning. The inhabitants consist mostly of Moors, Arabs, Jews, Berbers, and Negroes. Population, 1908, 141,385.

**FEZ**, a kind of brimless hat made of fine red wool, so named from Fez, Morocco, where it was first manufactured. It fits the head closely, has a blue or black tassel upon the crown, and is worn extensively by the Turks. The name *tarbush* is applied to it in Africa.

**FEZZAN** (fěz-zän'), a state in Northern Africa, situated south of Tripoli and attached to it for governmental purposes. The length from east to west is 380 miles; width, 300 miles; and area, 110,000 square miles. The surface is hilly and is traversed by the Jebel-es-Soda or Black Mountains, which trend east and west 170 miles and are not elevated above 3,000 feet. Much of the interior is made up of small oases, but the northwestern part is a waterless plateau and the southern section is a desert. It is largely unproductive, owing to an excessively hot climate and the absence of sufficient rainfall. The domestic animals consist largely of goats, sheep, camels, and cattle. Among the chief agricultural products are cotton, barley, wheat, millet, tobacco, vegetables, and fruits. The government is administered by a lieutenant governor under the pashalic of Tripoli, hence it is a dependency of Turkey. Murzuk is the principal town, having a population of 7,250. The inhabitants consist chiefly of Tuaregs, Moors, Arabs, Berbers, and Negroes. Little advancement has been made in the industries and arts, many of the people being unable to read and write. Arabic is the chief language and Mohammedanism of the Sunnite sect is the prevailing religion. The Romans conquered the region in 19 B. C., when it was known as Phazania, and the people became Christians in the 6th century. In the 7th century it was conquered by the Arabs. Population, 1906, 72,380.

**FIBER** (fī'bēr), or **Fibre**, a small thread, string, or filament of which the tissues of animals and plants are constituted. Asbestos is the only mineral fiber known. The utility of fibers in the arts and manufactures depends upon the length, structure, strength, and ability

to retain colors in dyeing. Among the more common animal fibers in use are wool, silk, and furs (q. v.). Vegetable fibers are employed extensively in the arts and are obtained from different parts of a large number of useful plants. Cotton fibers surround the seed of the cotton plant. Jute, hemp, and flax fibers are obtained from the bark of plants. The husk of the coconut and the leaves of various palms are used for making rope and matting. In recent years the fiber of the sisal hemp has come into ex-



FIBER OF HEMP.

The light part shows the fibers after the pulp has been scraped off by a knife or stripping machine.

tensive use for binding twine and rope. Ramie, or China grass, corn husks, Esparto grass, broom corn, Spanish moss, and vegetable sponge furnish fibers for manufacturing purposes. A majority of the finer textile fibers are obtained in the Temperate zones, but the larger number of fibers come from the warmer countries. See **Cotton, Linen, Paper**.

**FIBRIN** (fī'brīn), a white proteid compound obtained when blood is coagulated, as by stirring fresh blood with a bundle of twigs. The fibrin, adhering in fibrous layers, is washed with water to remove the coloring matter. It is insoluble in water, but dissolves in an aqueous solution of nitrate of potassium, when heated to 40° Fahr. Normal human blood contains 2.55 per cent. of fibrin. Vegetable fibrin is a nitrogenous substance resembling animal fibrin, and is separated from the seeds of cereals and other plants.

**FICHTELGEBIRGE** (fik'tel-gē-bēr-gē), a mountain range of Germany, on the northern frontier of Bavaria, about midway between the Bohmer Wald and the Erzgebirge. It has a general elevation of 3,000 feet, but Schneeberg, the highest peak, is 3,415 feet above the sea. This range of mountains separates the affluents of the German Ocean and the Black Sea, being the source of the Naab, the Main, the Saale, and the Eger. Much of the surface is covered with firs and pine. Copper, lead, and iron ores are mined extensively.

**FIELD GLASS**, a small binocular, portable, terrestrial telescope for determining the exact



distance of an object from the observer. It is used largely in armies to ascertain the distance of the enemy, and to range the guns on the basis of observations made by means of it. The common field glass resembles the telescope made by Galileo, having a large object glass to secure a brilliant image and a negative, or concave, eyeglass. An achromatic telescope, having from three to eight joints, being from fifteen to thirty inches long, is designated by the same name.

**FIELD OF THE CLOTH OF GOLD**, the name of the place where Francis I. of France and Henry VIII. of England met from June 7 until 20, 1520, for an interview. The locality of the meeting is on a plain between Arde and Guisnes in the département of Pas-de-Calais. It was so named from the splendor of the banquets and the gorgeous trappings and apparel used by the participants. The meeting occurred because Francis I. sought the friendship of Henry VIII. against Charles V. of Germany, but in this he was not successful. Interviews took place shortly after at Calais and Gravelines between Henry VIII. and Charles V. Shakespeare gives a graphic description of the meeting on the Field of the Cloth of Gold in his "Henry VIII."

**FIERY CROSS** (fī'ēr-ŷ), a cross made by the Highlanders of Scotland, who called it the *Crantara*. It was constructed of light, dry wood and the extremities were burned to a char, after which the fire was extinguished by dipping in the blood of a goat. The Fiery Cross was carried from place to place as a signal for men to hasten to arms in defense of their country.

**FIFE** (fif), a small, shrill-toned, martial instrument, either of wood or metal, in the form of a tube, having fingerholes and a blow-hole or mouthpiece. It is variously pitched, usually from D on the fourth line of the treble staff upward, and the compass is two octaves. The notes are shrill and somewhat harsh. Fifes and drums have been a source of much inspiration in the army during long marches and are still held in high esteem.

**FIFTEEN DECISIVE BATTLES.** See **Battle**.

**FIG**, a small fruit tree native to Asia Minor, but now cultivated in all the countries adjacent to the Mediterranean. About 300 known species are recognized, most of which are characterized by large leaves. Some are trailing vines and others are great trees. The average height of the fig tree grown for its fruit is about twenty feet. In favorable climates it produces two crops of figs yearly, in the spring and autumn.

The fruit is a fleshy receptacle of a conical form. It is attached to the twig by the narrow end. At the larger end is a small opening as in a pear, the flower and seeds lining the interior. The fig is used as food and is employed in medicine as a demulcent and laxative. In a fresh state for table use it can be transported only a short distance, hence it is dried extensively



FIG.

A, Female Flower; B, Section of Fruit.

and packed in boxes for the market. Dried figs form an important article of commerce, the best grade being imported from Turkey and the Levant. However, the culture of the fig has been extended very largely the past few decades, especially in Australia and California, where the quality of the fruit is thought to be equal to that of Smyrna.

**FIGARO** (fê-gâ-rô'), the name of a journal issued in Paris, France, celebrated for publishing contributions from Jules Janin, Jules Sandeau, George Sand, and a number of other able writers. It was so named from the comedies of Beaumarchais entitled "The Marriage of Figaro" and "The Barber of Seville." The name was afterward adapted by Mozart and Rosini, by the former in his "Marriage of Figaro" and by the latter in his "Barber of Seville."

**FIGHTING FISH**, a small fish allied to the perch family, so named because it is used in captivity for fighting purposes. It is a small fish and is kept in glass globes. The color is dull, when the fish is quiet, but assumes a metallic luster when it becomes excited. Fight-



ing fishes are native to the southeastern part of Asia, where they are used for gambling purposes. They attack each other immediately on coming in contact, hence much money is spent in betting on the result of the contest.

**FIGURES OF SPEECH**, the variations of the literal or ordinary form of expression, the intention being to make the thought more attractive or more striking. The principal figures of speech include the simile, metaphor, allegory, personification, antithesis, synecdoche, apostrophe, hyperbole, climax, and irony. They are usually divided into figures of rhetoric, figures of etymology, and figures of syntax. Figures of *rhetoric* are used extensively in poetical composition, being figures of thought rather than of grammatical form. Figures of *etymology* refer to the forms of words, as in the use of *o'er* instead of *over*, while figures of *syntax* have reference to variations in the construction of sentences.

*Simile* is an expression of resemblance between two different things, as in the sentence, "Religion is to the soul what life is to nature." *Metaphor* is another figure which is founded upon the resemblance of one thing to another, but it differs from simile in that the expression is implied instead of being formally expressed. "Life is like an isthmus between two eternities" is a simile, while "Life is an isthmus between two eternities" is a metaphor. *Allegory* is founded upon resemblance, but the comparison is more extended than in simile and metaphor. It is designed to teach some abstract truth by the use of symbolic language, hence is in the nature of a short fable or parable. *Personification* consists in attributing life to inanimate things, as in the sentence, "The hungry flames swept onward." *Antithesis* is founded upon unlikeness, in which things are contrasted or opposed to each other. The expression "Science is deep as eternity; speech is shallow as time," is antithetical. *Apostrophe* is direct address to the dead as if they were living, or to the absent as if they were present. A figure of *synecdoche* consists in putting a part for the whole, or the whole for a part, as in the example, "Give us this day our daily bread." *Hyperbole* is an exaggeration, as in saying "I am tired to death." *Climax* is an ascending series of thoughts or statements which gradually increase in importance, as in "Liberty was lost,—all was lost!" *Irony* is disguised satire. We make use of this figure when we praise a thing and really mean to ridicule it.

**FIJI ISLANDS** (fĕ'jĕ), an island group in the South Pacific Ocean, consisting of about 250 distinct islands, of which one-third are in-

habited. They are situated 7,450 miles from San Francisco, east of the New Hebrides, and have an area of 8,050 square miles. The two largest are Vanua Levu and Viti Levu, the former having an area of 2,600 square miles and the latter, 4,250 square miles. Most of the islands are of volcanic origin, but the group contains many atolls and coral reefs. Volcanic action and earthquakes are not infrequent. The climate is healthful, the soil is productive, and the natives have become largely educated and Christianized. Among the principal products are live stock, maize, cotton, copra, sugar, peanuts, tobacco, pearl shells, and fruits. The government maintains two public schools and an industrial institute, at which about 200 pupils attend. The Wesleyan missionaries direct almost entirely the educational affairs, their schools numbering 2,075, at which 35,500 pupils attend. Besides these, there are 145 schools of the Roman Catholic mission, at which 2,150 pupils are enrolled.

The Fiji Islands present one of the most favorable examples of effective Christianizing, fully 110,000 of the inhabitants being Christians, while not more than 75 years ago the natives ranked as the fiercest of cannibals. Abel J. Tasman (1602-1659), a Dutch navigator, discovered them in 1643, and Captain Cook cruised among them in 1773. An influx of European settlers began in 1866, principally from Australia and New Zealand, and soon after the commercial interests of the Fijis grew to importance. Since 1874 they have been formally governed by Great Britain as the Fiji Colony. Suva, on the south coast of Viti Levu, is the seat of government. The inhabitants consist chiefly of Fijians, Indians, Rotumans, and Europeans, the last mentioned numbering 2,459. Population, 1906, 125,085.

**FILE**, a steel instrument for abrading or smoothing surfaces, having raised cutting surfaces or teeth made by indentations of a chisel. Files are of various shapes, sizes, and fineness of cut. Those in common use are either flat or triangular in form. They are said to *taper* when they are thinner toward the point; to be *parallel*, when they are of the same dimension throughout; and *blunt*, when they grade between a taper and a parallel. Some types are square, round, or half-round. They are either single-cut, having but one row of teeth, or double-cut, having two sets of teeth crossing each other obliquely. A *rasp* is a similar instrument, but has coarser teeth and is used on soft materials, such as wood and the hoofs of horses. The file is one of the most ancient instruments, and is mentioned as early as 109



B. C. Only high grade steel is used in manufacturing files. The cutting and tempering involve much skill and the use of complicated machinery.

**FILEFISH** (fil'fish), a class of small fishes native to the tropical and temperate waters, so named because the stout dorsal spine is armed with two rows of barbs, giving the appearance of a file. Both jaws are furnished with teeth, each having eight teeth in a row, and the body is covered with hard rhomboidal scales. The *barnacle eater*, a species of filefish, occurs in the Atlantic off New England and Newfoundland. It attains a length of eighteen inches, has a tawny color, and is frequently seen in aquariums. A species native to the Mediterranean is about two feet long. The filefish is allied to the trigger fishes.

**FILIBUSTER** (fil'ĩ-büs-tēr), a name applied originally to the pirates of the West Indies. The word is of Spanish origin, in which language it designates a fast-sailing vessel or flyboat. It came to be the name of the adventurers who organized expeditions in the United States to gain control of West Indian and Central American regions with the hope of having them annexed to the United States, and thus to extend the slave territory. Gen. William Walker, who was captured, court-martialed, and shot Sept. 12, 1860, was the most noted of the filibusters. The term *filibuster* has been introduced recently to designate the members of the minority of a legislative body, who seek to delay or defeat the adoption of measures obnoxious to them by raising questions of parliamentary law, making motions to adjourn, or calling for yeas and nays.

**FILTRATION** (fil-trā'shūn), a process by which solid particles are separated from a liquid by causing the latter to pass through porous substances, which retain the solid particles or impurities. In constructing a filter it is necessary to use materials that contain interstices or pores through which the liquid may pass, but they must be sufficiently fine to retain the solid particles. Ordinary plans for filtering may be illustrated in a device utilized in constructing cisterns, in which the water is passed through a porous substance, such as sandstone, brick, charcoal, silicated carbon, wood, gravel, powdered glass, or others by which the solid particles may be retained. The most serviceable plan is to conduct the water through a pipe to the filter, which is commonly made of various layers, such as sand, gravel, charcoal, and other substances alternated, and, after passing through them, it is dropped into the cistern or tank beneath. A partition wall of brick, through which the water

passes, is not an uncommon form, the water being dropped in on one side of the wall and drawn out for use at the other side.

In order to preserve a good sanitary condition it is necessary to have the filter constructed in such a way that it may be removed and cleansed or replaced by other substances at least once or twice a year, otherwise the pores become clogged, or the mass solidifies by the particles retained, and thereby it becomes inoperative or impure. In filtering oils, syrups, ale, beer, and other similar substances it is customary to use horsehair, cloth, felt, skins, cane, clay, wool, capillary threads etc., this depending upon the character of the liquid to be purified. Charcoal made of bones is much more serviceable than wood charcoal, since it removes both the solid matter and many gases, and is utilized to reduce the color of alcoholic beverages and to whiten sugar. Mechanical devices are now used extensively to clean the water in tanks and cisterns. They are placed in the water and, by manipulating a valve, the entire body is forced through a small filtering cylinder, by means of which the particles become separated and are thrown out. However, it must be borne in mind that filtration removes only substances suspended mechanically in the liquid, while impurities or foreign substances existing in a dissolved state can be removed only by distillation. See **Distillation**.

**FINCH**, the popular name of various small birds, many of them having fine plumage and a beautiful song. They are usually called *hard-billed* song birds to distinguish them from the warblers or *soft-billed* songsters. Not less than 550 species have been described, of which 135 are found in Canada and the United States. Various species of the finches inhabit nearly all parts of the globe, except Australia, but they are most abundant in the Northern Hemisphere. They are variously known as bullfinch, chaffinch, hawfinch, and pinefinch. These birds may be distinguished by their strongly formed bill, suitable for crushing seed, which is their favorite food.

**FINDLAY** (find'lā), a city in Ohio; county seat of Hancock County, on the Blanchard River, about 42 miles south of Toledo. It is on the Big Four, the Cincinnati, Hamilton and Dayton, the Lake Erie and Western, and other railroads. The surrounding country has extensive deposits of petroleum, natural gas, and fire and potter's clay. Among the noteworthy buildings are the county courthouse, the city hall, the public library, and the high school. It is the seat of Findlay College (Church of God) and has a hospital and an orphans' home. Among the manufactures are vehicles, machin-



ery, ironware, earthenware, clothing, glass, baskets, flour, pottery, and stoves. It is the focus of several electric interurban railways. The city has waterworks, pavements, sewerage, and a public park. It was incorporated in 1837. Population, 1900, 17,613.

**FINE ARTS.** See **Art; Architecture; Sculpture**, etc.

**FINGAL'S CAVE** (fīn'gals kāv), a celebrated natural cavern on the island of Staffa, off the western shore of Scotland. The basaltic columns consist of immense dikes with diversified though symmetrical forms, and are joined to the rocks with much beauty. At the entrance it is 42 feet wide and at the end it has a width of 22 feet. It is 227 feet long. The height of the arched roof is 65 feet. The cave can be entered by small boats, since the low-water mark in the cave is about 20 feet. This cavern presents one of the most picturesque of the many nonvolcanic igneous eruptions found in the earth's crust.

**FINLAND** (fīn'land), a grand duchy of Russia, in the northwestern part of Europe, with an area of 144,550 square miles. It is bounded on the north by Norway, east by the governments of Archangel and Olonetz, south by the Gulf of Finland, and west by Sweden and the Gulf of Bothnia. The region includes many lakes and marshes, the largest of the lakes being Kalla, Enare, Tornea, Saima, Päjänne, and Ladoga. Many of these lakes are connected by canals, whereby commercial enterprise has been greatly facilitated. The railroads, with a total of 2,090 miles, are under government control and furnish connection with all the important commercial centers. The rivers are unimportant, and no great mountain elevations exist. It has vast forests of conifers and oaks, which cover about one-third of the land surface, though coal and extensive fossils do not abound. Granite, copper, and iron ore are the chief minerals. Among the chief agricultural products are wheat, oats, rye, and barley. The climate is affected by the adjacent water surface, rendering it suitable for the production of pears, apples, cherries, and small fruits, but the larger species thrive only in the southern portions. Many of the lakes and streams abound with salmon, trout, perch, pike, and other food fish. All the domestic animals common to Europe are reared with profit, especially cattle, horses, sheep, and swine. The principal exports are fish, meat, leather, textile fabrics, lumber, and grains. Coal, raw cotton, and foodstuffs are imported. The largest share of trade is with Sweden, Russia, and Germany.

**GOVERNMENT.** The executive authority is vested in the Czar of Russia, who is the Grand Duke of Finland. A new constitution went into force in 1907, under which the legislative function is exercised by a diet of 200 members, who are elected by universal suffrage without distinction of sex. The state of education, like that of the Scandinavian countries, is on a high plane of efficiency, and greatly excels that of any other portion of Russia. Nearly the entire population is able to read and write, the result of compulsory attendance laws and a free school system for both sexes. Helsingfors is the seat of literary life and impulse. A university supported by government grants is maintained at Helsingfors, which has an attendance of 2,350 students.

**INHABITANTS.** The people consist mostly of Finns, whose language, the Finnish, is generally spoken, but the higher classes generally speak Swedish. Lutheran, the established religion, is the faith of practically the entire population; only 48,500 belong to the Greek Church. Only a small per cent. of the inhabitants are Russians, but the country has a considerable number of Swedes, Lapps, and Germans. Helsingfors is the capital and chief city. Other cities include Abo, Tammerfors, and Wiborg. Population, 1905, 2,982,088.

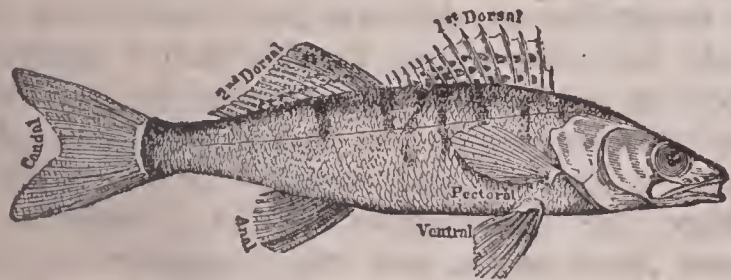
**LANGUAGE.** The Finns are allied to the Magyars of Hungary and the Laplanders, and differ in language and habits from the Russians and Swedes. The language is classed with the northern division of the Turanian or Uralo-Altaic family, which is spoken by the people of Lapland, Olonetz, and Archangel. Their literature is valuable on account of the richness and beauty of its poetry, and the language is not only agreeable, but has a wealth of vowels and diphthongs, and is uncommonly flexible. Within recent years several lexicons and treatises on their history, language, and literature have been published, while their tongue is taught in many of the higher educational institutions.

**HISTORY.** The Finns had independent chiefs up to the 12th century and were a warlike people. They were conquered by the Swedes about 1150 and their conversion to Christianity followed soon after. Peter the Great of Russia secured a portion of their territory by treaty in 1721, and Russia conquered the remainder from the Swedes in 1809; since which time it has belonged to that country. In 1903 the privilege of autonomy was removed, but it was restored in 1905, at the time of the general strike in Russia. At the same time woman suffrage was established and social and financial reforms were inaugurated.



**FINLAND, Gulf of**, an extensive arm of the Baltic Sea, extending to the east between Finland on the north and the Russian governments of Saint Petersburg and Esthonia on the south. The width is from 10 to 75 miles and the length is 250 miles. It receives the outflow from Lakes Ladoga and Onega. Within the gulf are numerous islands, sandbanks, and shoals. The Russian government maintains several forts on the gulf. The shores are rocky and precipitous and the waters only slightly salty. It has a number of fine harbors, including those of Wiborg, Kronstadt, Reval, and Helsingfors.

**FINS**, the organs of fish which serve to propel, balance, or steer them in the water. They



FISH, SHOWING FINS.

usually consist of rays of bones covered with an elastic membrane. The *pectoral* or breast fins, a short distance behind the gills, are modifications of the anterior limbs in other vertebrate animals, and the *anal* fins, near the anus, correspond to the hind limbs. The *dorsal* or back fins are from one to four in number, depending upon the species, and the *ventral* or belly fin usually is a modification of the skin. The tail is known as the *caudal* fin. Fins are usually divided into *paired* and *unpaired*, the former including the pectoral and sometimes the anal and the dorsal. The term *fin* is often applied to the paddles of a whale, but never to the hind feet of seals or the webbed feet of birds.

**FIORD** (fyôrd), or **Fjord**, a name first used by the Scandinavians in describing a narrow bay that penetrates inland, and which is characterized by steep, rocky walls. Inlets of this kind are very common in Norway, and are thought to have originated from the combined action of glaciers and waves. Sogne Fiord, the most notable fiord of Norway, extends inland about 100 miles, and for this entire distance has very high and precipitous walls of rock. Similar inlets occur on the coasts of Nova Scotia and New England, and they prevail more or less in British Columbia, Greenland, Patagonia, and New Zealand. The lochs and firths of Great Britain are in many respects similar to fiords.

**FIR** (fēr), a name once used coextensively with the widest sense of the word *pine*, but

now restricted by botanists to the one genus *Abies*, which includes the spruce fir, silver fir, Norway spruce, and other species. The trees of this genus belong to the family *Coniferae*. They are distinguished from the pines by the flat, rounded apex of the scales of their cones, and by leaves not in clusters of definite number. Fir trees are found in many parts of Eurasia and America, where they occur in fine forests, and the lumber and other products derived from them are important articles of commerce. From the *Norway spruce* is obtained lamp-black, tar, turpentine, resin, and Burgundy pitch. The bark is used in tanning and for making baskets, the roots yield fibers for cordage, and the wood is employed for fuel, house-building, and making masts and spars of ships. In the market the wood of the Norway spruce is known as Christiania deal and Dantzic deal. The *white spruce*, or *white fir*, which ranges from Lower California to British Columbia, is one of the finest trees of that region and attains a height of 300 feet. *Hemlock* forms dense forests in the northern part of the United States and Canada, extending as far as Hudson Bay. The bark is valued for tanning, while the wood is used for construction purposes. In the northwestern part of North America is found the *Douglas fir*, often growing 250 feet high. Spruce beer is made from



BALSAM FIR.

small branches of the *black spruce*, and Canada balsam is obtained from the *balm of Gilead fir*.

**FIRE** (fīr), the evolved heat and light produced by ignition or combustion. The vividly perceptible ascending stream or current exhibited in the combustion of gases is called a *flame*. In ancient times it was regarded one of the



four primary elements of which all things were thought to be composed, the other three being earth, air, and water. Among the ancients and even within comparatively recent times many superstitions regarding fire were common, such as led to fervid and devoted fire worship. Many uses of fire were known very early, though some of the common methods of producing and controlling it are quite recent. The newer methods include its production by inflammable matches and its extinction by chemical compounds, as by a mixture of dried ferrocyanide of potassium, chlorate of potassa, and sugar set in action by sulphuric acid, or by mechanical agencies.

**FIRE ALARM** (ä-lärm'), an apparatus for communicating warning of a fire, either electrical or mechanical. An automatic arrangement is now in use which depends for its action upon the increased temperature of the air in the vicinity of the fire, or of the burning away of certain connecting cords which are stretched in exposed situations. In large cities there are stations where any person discovering a fire may turn in an alarm by touching an electric button, which immediately gives the street and number of the house on fire, at the central station, whence relief may be speedily despatched.

**FIREARMS.** See **Cannon**; **Gun**; **Rifle**, etc.

**FIREBALL.** See **Meteors**.

**FIRE CLAY**, a variety of clay found in a stratum below the coal formations and sometimes elsewhere. It is used in the manufacture of brick, tile, gas retorts, and other vessels suitable to withstand high temperatures. The principal constituents of fire clay are silica and alumina, accompanied by small proportions of iron, lime, magnesia, water, and organic matter. Fire clay is found extensively in Canada and the United States and occurs in all the continents.

**FIRECRACKERS.** See **Fireworks**.

**FIRE DAMP**, an explosive coal-gas generated in coal mines, consisting chiefly of light carburetted hydrogen. When fire damp is mixed with from five to fourteen per cent. its volume of atmospheric air, it is explosive. It is very dangerous to miners, the principal protection being the safety lamp, though in most cases danger can be avoided by a good system of ventilation. Edison invented an electrical safety lamp which gives a strong light for several hours at a very trivial expense and, when any accident occurs to break the globe, the light instantly becomes extinguished.

**FIRE DEPARTMENT** (dê-pärt'ment), an organization maintained in towns and cities as a means of protection against fires. This de-

partment of a municipal government is supported by general taxation and may be either paid or voluntary. A *paid fire department* is one in which the chief and his assistants are employed regularly on a salary, while a *volunteer department* is made up of members who serve only when called by a fire alarm, and they are paid only for the time they actually attend fires. Some cities maintain both classes of organizations, as a means of security during large conflagrations, and the volunteers are paid only for the actual time of service.

Paid fire departments are maintained in practically all towns and cities that have a population of more than 9,000, and those in charge as employees of the city give their entire time, both day and night, to the duties incumbent upon them. The smaller cities have a single fire station, while the more populous places have a central and several branch stations, where the fire engines, ladders, chemical engines, hose carts, and other supplies are kept ready for use. One or more teams of well-trained horses are kept ready for call in the stalls at the station. When an alarm is given by electrical devices, they take their places under the harnesses which are suspended in position before the engine or fire wagon, and the men, who promptly slide down poles from the room above, clasp the harnesses and are ready to start for the scene of the fire without delay. Hose are attached to the hydrant of the waterworks, which supplies the necessary pressure, or, where an engine is used, the pressure is obtained through it, and the water is pumped direct from the hydrant. In many instances chemical engines are used and in some cases the work is supplemented by a hook and ladder company.

**FIRE ENGINE** (ěn'jĭn), a machine designed to throw water for the purpose of extinguishing fires. Mechanical devices for saving buildings and cities from destruction by fire were used more or less for many centuries, though it is only within recent years that they have been brought to a high state of efficiency. They are mentioned in Roman history by Pliny, and appear to have formed a part of the municipal facilities of Athens, Carthage, and Alexandria. Several mechanical devices for throwing water to considerable heights were used extensively in Europe in the 16th century, the most successful of which were built in Augsburg, Germany. Similar machines were constructed at Nuremberg in 1657 and at London in 1730. They came into use in the cities of Canada and the United States about 1731. At present some form of fire engine is a part of



the necessary equipment for municipal protection, not only in every city, but in all the towns and hamlets.

Fire engines are a class of force pumps by which the water is subjected to a pressure sufficient to raise it to the necessary height, and are now generally worked by steam. In the smaller engines a cistern holds the supply of water, though in the larger a direct connection with the city water supply furnishes the necessary quantity to be rapidly thrown to great heights on burning structures. Steam fire engines have either rotary or piston pumps constructed on a single or double plan, with either tubular flue or coil boilers. The larger weigh about five tons, though engines weighing about three tons are preferred on account of greater facility in moving them hastily to the point of danger. The capacity of these engines is from 200 to 900 gallons per minute, the flow of water being controlled by an automatic relief valve.

Fire engines are commonly drawn by horse power, though steam is employed in the larger cities, with good results. The first fire engine to be propelled by steam was used successfully in New York City in 1873. Many seaports have fire engines that are mounted on fire boats. In smaller cities and villages chemical fire engines are used with good results. By these a stream of water from one fourth to three fourths of an inch may be thrown 200 feet by means of a chemical mixture with water, which produces carbonic acid gas and supplies the pressure necessary. A hose cart is used in connection with fire engines. It consists of a four-wheeled vehicle, supplied with about 1,000 feet of hose, and is moved along with the fire engine to the place of danger, but in many of the newer chemical engines the hose is carried on the engine itself. The hose is made of cotton fabric. It is usually lined within and covered without by rubber, though there are several varieties manufactured for the trade.

**FIRE ESCAPE** (ēs-kāp'), a device for enabling persons to escape from the upper parts of high buildings. Most tall, modern constructions are provided with iron ladders extending from the top of the building to the ground on the outside of the brick or stone work. They are put up as the masonry is built. Ladders capable of being drawn out like a telescope are preferred in some classes of buildings. Rope ladders with hooks at one end are a part of the equipment of many of the more important hotels and of some travelers. In many cases large nets of stout sailcloth or slender ropes are utilized for lowering persons to the ground,

or for them to jump into while held from the ground by the firemen. Persons weighing 200 pounds can safely jump one hundred feet into these nets. Some cities are provided with a cannon that shoots a projectile with a cable or rope attached over the building in which the danger occurs, and it is then fastened to form a means of escape. The construction and use of fire escapes are regulated by law in most countries.

**FIRE EXTINGUISHERS** (ěks-tīn'gwīsh-ērz); the chemical agents utilized in extinguishing fires. Various compounds are recommended for the purpose, the most common being a mixture of chlorate of potassa, sugar, dried ferrocyanide of potassium, and water, and, when sulphuric acid is brought in contact with it, gases are liberated and the whole is directed to quench the flame. All rooms in first-class hotels, passenger cars, and passenger compartments in steamboats are supplied with bottles of chemical fire extinguishers, by means of which conflagrations may be averted by prompt action.

**FIREFLY**, the name commonly applied to all winged luminous insects. They abound in all the warmer latitudes, especially near wet and marshy grounds. Some have a steady



GLOW WORMS.

Male winged.

Female wingless.

glow, but most species, as they fly, emit and conceal their light with much regularity at intervals of three or four seconds. In most of these insects the light proceeds from the last three segments of the abdomen. An adult firefly is shown in the accompanying figure, together with a larva and a glow worm (q. v.). In most species of elaters the larva is more or less luminous. The common firefly or lightning bug is not much over half an inch long. Some species found in the West Indies are larger and emit light so powerful that small print may be read by means of it, while a fair light may be secured by confining a number in a glass



vessel. Several species native to the West Indies emit light from two eyelike tubercles on the thorax.

**FIREPROOFING**, a term used to describe the construction of buildings, treatment of portions of buildings, or apparatus by which they become partly or wholly invulnerable to damage by fire. The safeguards adopted early in the history of constructive building consisted of using brick or stone, and later iron entered into doors, lintels, and stairways. These and other methods are now in common use, while in large cities every building must be constructed according to certain specified conditions provided by the city authorities. Wood treated with silicate of soda is made largely proof against fire, since the application of strong heat fuses it into a kind of glass that forms a shield of protection. Cloth or wood does not blaze, if impregnated with certain saline substances, such as phosphate of soda or ammonia, borax, alum, and many other chemicals. Cloth may be treated with graphite in a bath and then placed in an electro-metallic bath apparatus by which the cloth is coated with metal. Woolen and ordinary fabrics are rendered fireproof by being treated with borax, alum, or soluble glass.

Papers and valuable documents are preserved in fireproof safes, which are constructed with double walls, having the intervening space filled with a nonconductor of heat. In the tall buildings of cities marked precaution is taken in the construction of all portions exposed to view, and, as a further safeguard, metal shutters are used to protect the outside windows against the entrance of fire from a neighboring building while burning. Besides, water pipes extend from the basement to the upper story, these being connected with pumps below, and there are water buckets, hand grenades, and mechanical extinguishers for protection against incipient damage by fire. In many structures are stairways and openings by which entrance and passage of firemen to all parts of the building are facilitated. By these and similar means it is possible to protect and guard the larger centers of commerce against widespread fires, such as have destroyed portions of London, New York, Philadelphia, Chicago, and other cities at different times.

**FIREWORKS**, the common name of preparations containing combustibles and explosives, such as charcoal, niter, and sulphur, with chemicals producing colored lights or scintillations in burning, and used to make displays at festivals, expositions, or at times of public rejoicing. Many forms are made, according to the effects desired, such as crackers, rockets,

squibs, Roman candles, torpedoes, balloons, wheels, and other arranged pieces. Some are contrived with ingenuity and skill, and, when ignited, represent various pictures and devices. The powder utilized in fireworks is made according to the same principle as gunpowder, but with it are used charcoal, niter, sulphur, and other substances to influence the explosive properties and give tint or coloring. Filings of zinc impart a bluish color, iron or steel filings increase brightness, while a greenish tint is secured by copper filings. Besides this class, such chemicals as salt, lampblack, amber, and resin are used.

The Chinese and Hindus manufactured fireworks many centuries before they became known to the Europeans, largely for the reason that they knew of gunpowder much earlier than western peoples. They utilized them at festivals and celebrations. Many of the different devices employed in producing noise and illuminations at night are of Chinese manufacture, though within recent years large establishments have been built in Europe and America at which all classes of fireworks are manufactured. The largest establishment of this character is located in New Jersey. Firecrackers are among the most popular devices used at celebrations. They consist of a tube made of strawboard, are from two to fifteen inches in length, and have a diameter equal to about one-tenth of the length. The newer process of manufacture has made it possible for one person to make about 2,500 tubes per day. These tubes are plugged with pasteboard wad, cord, or pith at one end and at the other with clay or wood pulp, and in the latter a fuse is placed. The explosive is on the interior and with it the fuse articulates. When finished, the firecrackers are covered with an artistic red paper, dried, and packed ready for the market.

**FIRE WORSHIP.** See Parsees.

**FISH**, a group of vertebrate animals which live in water and breathe by gills. They are



SKELETON OF FISH.

distinguished by having paired fins and by not breathing by lungs in any stage of life. Their form is well adapted to permit them to move



easily and rapidly through the water, tapering toward the extremities, but exceptions are numerous. The typical character of the skeleton is evidently homologous with those of quadrupeds and man. The four limbs belonging to the usual structure of vertebrate animals assume the forms of fins. Fins, gills, and, most generally, scales are distinguishing features of fish. The heart contains only one auricle and one ventricle, receiving venous blood only, and sending it to the gills, where it is oxygenated and passed by the dorsal vessel into the greater and only circulation. Fish, with few exceptions, are cold-blooded animals; that is, they have a temperature little above that of the water in which they live. When taken from the water, they die in consequence of the drying up of the fine fringes of the gills.

In most fish the gills are situated at the back part of the sides of the head, usually four on each side, and consist of folds of membrane attached to the surface of the gill cavities, or a multitude of vascular membranous plates, generally in double fringelike rows fixed by the base. The gill orifices are covered by a bony plate whose motion expels the water, which is taken in by the mouth to supply the gills with air. Fishes possess nerves and organs of all the senses, although the senses of touch and taste are dull compared with those of many other animals. Some fish are destitute of sight, while most species have large eyes and a very acute vision. Others have no teeth, but many species have a large number. The air bladder, an organ aiding them to maintain an equilibrium in the water, is found in many kinds.

Fishes reproduce by means of *spawn*, or *eggs*, which, in some species, are fertilized in the body of the female and in others fecundation takes place at the time or after they have been extruded. The eggs are usually deposited in sand or gravel where the water is shallow. Many species leave the depths of the ocean and pass into fresh water for this purpose. A single codfish is said to lay nine million eggs. As a rule, they show no parental care either for their eggs or young, but some species build nests and watch over them. Fish, being cold-blooded, need no covering for warmth; hence, the scales serve for protection or as a defensive armor. While the skin of cartilaginous fish yields shagreen and the bladder of some fishes isinglass, by far their most important use consists in supplying man with food.

Many species known as *deep-sea fish* are very peculiar and formerly were not known to exist. Many of them have no eyes, for the reason

that sunlight is absent from the depths at which they thrive. Their peculiar structure enables them to withstand the low temperature and enormous pressure that are common at great depths. They live almost, if not entirely, upon animal life, as plants do not grow without the influence of sunlight. Many of the species have extended mouths and dilatable stomachs, which enable them to swallow and digest bodies much larger than themselves, or strain out material from sediment that settles down from above. The fins and tail are long and delicate, because of the perfect calm at such depths. See **Fins**.

**FISH CULTURE** (kŭl'tŭr), the industry embracing the education and labor devoted to the growth and propagation of fish. The ancient Egyptians and Chinese were highly skilled in pisciculture and gave it marked attention, for the reason that the subsistence of large masses depended to a vast extent upon the food-producing qualities of their interior and adjacent waters. Since then the art may be traced through successive centuries. It is not difficult to realize the vast benefit that the industry yields to the people of Western Europe, and its wholesome influence upon the commercial aspects of America. Since the large fish feed upon the smaller, and the latter upon the eggs, it is apparent that these influences, in connection with the fishing industry, tend to greatly limit and ultimately depopulate the waters of the finny tribe.

The discoveries made by Stephen Ludwig Jacobi, of Westphalia, Germany, in 1748, led to the art of increasing fish by stripping the females of their eggs and fertilizing them by the milt taken from the male fish. From this discovery and those made later by L. J. R. Agassiz it became possible to breed and rear fish more extensively than had been possible previously, and by skillful application and care preserve, feed, and fatten them. We find as a result that waters before unproductive have been populated with various species, such as the California salmon, California brook trout, char, whitefish, shad, and German carp. Many streams and lakes have been populated with fish, as the shad, which has been planted in the rivers of Georgia, and the whitefish fry has been introduced in Lake Erie. Besides, the waters of California, Canada, and many European countries have been restocked, and the more valuable kinds have been greatly increased in numbers.

Much advancement has been made in fish culture in the United States, where it is now pursued more extensively than in any other country.



The industry is under the jurisdiction of the United States Fish Commission, a bureau established by act of Congress, Feb. 9, 1871. The primary object originally was to investigate the food fish of the seacoast and inland waters of the United States. Since then the duties of the bureau have been widely extended, and the whole now constitutes one of the most important functions in the service of the government. Many valuable reports and bulletins have been distributed annually, these relating to various branches in the different phases of the industry. They have been instrumental in disseminating accurate and scientific knowledge of the art. The several states have been supplied with various kinds of fish, the annual distribution often aggregating 200,000,000 eggs and fish, of which three-fourths are infant and adult fish and about one-fourth are eggs. At colleges of agriculture and other institutions under State and Federal control, such as are now quite common, the industry has been carefully studied. Along with fish culture proper, the artificial culture of lobsters, oysters, mussels, and other crustacea is growing in importance.

**FISHERY** (fish'ēr-ȳ), the business of catching fish or other aquatic animals, but relating also to the locality where marine life and fish are found in paying quantities. The objects for which fishing is conducted include pearls, corals, sponges, whales, turtles, shellfish, seals, and many others, besides the various species of fin fish. Among the chief methods of fishing are those employing drawnets, spears, lines, and dredges. The most important of the fresh-water fisheries include those of the salmon, in which sportsmen employ fly hooks, while fishers generally use stakenets and drawnets. Other important fresh-water fish embrace the perch, eel, trout, pike, and catfish. Measured from the standpoint of profit, the oyster, cod, herring, and haddock are the most productive sea fisheries. Countries bordering on the sea naturally possess the most valuable fisheries, among which Canada and the United States take very high rank.

Disputes regarding fishery rights have taken on the form of international questions, and have occupied the attention of diplomats, especially those involving the United States and Great Britain at different times. The Bering Sea question, which occupied the attention of both governments for some time and attracted particular attention in 1896, is one of the most important. Under the fishery laws the owner of the soil and streams, or bodies of water, is entitled to the exclusive right to fish in such water. Where the owner has land adjacent to both sides of the stream, he enjoys the sole right to fish in

the entire stream lying between his property, and, where his possessions are only on one side, his right extends to the center of the stream. In streams and bodies of water belonging to the State or Federal government the right to fish is abridged or authorized by general laws. In many of the states fishing is strictly prohibited, except at certain periods of the year, even in the bodies of water belonging to private owners, while in some it is made unlawful to fish with drawnets and to use more than two or three hooks on a line. Such legislation is deemed necessary in order to protect the waters from being totally depopulated, and to preserve a fair aggregate of the different kinds of fish at all times. Besides, damaging influences, such as dams, the discharged sewage, and other unwholesome and obstructive agencies, are prohibited under suitable penalty, and it is made the duty of officers to prosecute investigation for proper protection.

Newfoundland has some of the most valuable fisheries in the world, especially in cod, herring, and haddock. The Great Lakes yield whitefish, sturgeon and Michigan herring. Salmon are caught in large numbers on the Pacific coast, especially at the mouths of the Fraser and Columbia rivers. Manitoba and Minnesota are especially noted for the fisheries in hundreds of lakes. Rapid transportation by railways has made it possible to supply many sections of the country with fresh fish, even in the summer season.

**FISH HAWK**, an eagle or other rapacious bird which preys upon fish, as the bald eagle or the osprey. This genus of birds is widely diffused, being found both in warm and cold climates, and is grouped with the family Falconidae. It is singular among the falcons in preying exclusively upon fish, and to this end its whole structure and habits are adapted. The fish hawk is about 22 inches long, and has a dark brown color variegated with gray and white. It has a short, broad, rounded bill, a long tail, expansive wings, and remarkably rough scaly, pointed toes, suitable for grasping its slippery prey. The feathers are destitute of supplementary plumes and very oily. These birds are found near the sea, lakes, or rivers, and are everywhere birds of passage, going toward the warmer zones soon after the appearance of frost. They catch their prey by diving into the water and grasping it with the talons. See illustration on following page.

**FISK UNIVERSITY**, an institution of higher education for colored persons, organized by Clinton Bowen Fisk at Nashville, Tenn., in 1865. The institution is coeducational under



the nominal jurisdiction of the Congregational Church, and maintains courses of study in medicine, theology, normal teaching, industrial arts, and advanced sciences. It has about 30 instructors, 550 students, a fine line of apparatus, and a library containing about 10,000 volumes. The annual income is about \$7,500.



OSPREY.

**FITCHBURG**, a city and one of the county seats of Worcester County, Massachusetts, on the Nookagee River, fifty miles northwest of Boston. It is on the Boston and Maine and the New York, New Haven and Hartford railroads. The public buildings include numerous churches, several high schools, a public library and art gallery, and a public hospital. Educational advancement is facilitated by a number of scientific societies. It is the seat of the Fitchburg State Normal School. Among the manufacturing establishments are iron foundries, machine shops, cotton, woolen, and flour mills, paper mills, shoe and shirt factories, and wood-turning establishments. The streets are finely paved, well lighted, and connected with suburban districts by electric car lines. It has a growing trade in merchandising and farm produce. Fitchburg was settled in 1719, was a part of Lunenburg until 1764, and was incorporated as a city in 1872. Population, 1905, 33,017; in 1910, 37,826.

**FIUME** (fê-oo'mă), a seaport city of Hungary, on the Adriatic Sea, at the mouth of the

Fiumara River. It has a fine harbor on the Gulf of Quarnero and has convenient railroad facilities. The manufactures include paper, tobacco, machinery, soap and clothing. Among the principal buildings are a municipal theater, a naval academy, the town hall, and the Church of Saint Vitus. It has a large interior and foreign trade. Fiume was a town of the Byzantine Empire. It became a possession of Austria in 1471, and since 1779 has been an imperial city of Hungary. Population, 1905, 39,603.

**FIVE FORKS**, the site of a battle fought in Dinwiddie County, Virginia, April 1, 1865. It was Grant's intention to cut General Lee off from Petersburg, and he accordingly dispatched Sheridan with cavalry and Warren with infantry to the extreme left, where Lee had stationed Pickett. Sheridan attacked the intrenchments at Five Forks held by Pickett's corps, but was driven back. On the next day he was reinforced by Warren's corps and carried the fortifications, taking 5,000 prisoners. The Union loss was 1,000 men. As a result Petersburg evacuated on April 2, and Richmond fell soon after.

**FIVE NATIONS**. See Iroquois.

**FIXED STARS**. See Stars.

**FLAG**, a banner used as a mark of distinction by a company, party, sovereign, or nation. It consists of a piece of cloth, usually square, oblong, or triangular. The material is commonly of bunting, either plain or bearing a device, and is displayed as a standard, symbol, or signal by being attached by one edge to a staff, or to a halyard, by which it may be hoisted on a pole. The Egyptians originated the idea of standards early in their history, which is verified by inscriptions on very ancient sculptures and temples. That the Greeks and Romans followed by the adoption of standards and ensigns is clearly borne out by the *gonfalon*, which was borne in the Roman army near the commander in chief during an engagement. In the Middle Ages the *pennon* was used by a knight, while the *standard* served the purpose of distinguished persons. The cross appeared in the banners of the Crusaders during their historic upheavals in mediaeval European history.

The flag of Denmark is the oldest among European standards. It is red with a white cross and dates from the 13th century. The union of the three crosses of Saint George, Saint Andrew, and Saint Patrick first designated the union of Scotland with the kingdom of Great Britain, and later it symbolized the union of this kingdom with Ireland. It is known as the *union jack*, which at present con-



stitutes the naval flag. In the British flag is a quartered field, one quarter blue, one quarter yellow, and two quarters red, which bears the insignia of Ireland, Scotland, and England.

The imperial flag of the German Empire is yellow, containing in the center the imperial arms and a gold shield. It is divided into quarters by the iron cross, three black eagles and the crown appearing on each of them. The Turkish Empire has a red flag, with eight pointed stars and a crescent moon; the latter became historic in distinction from the cross of the Crusaders. Russia has a yellow flag, on which the Russian arms are conspicuously displayed, but its naval flag is white with diagonal bars of blue. All nations and many sovereigns, states, principalities, and provinces have flags appropriate to their purpose, usually bearing a more or less decorative field in commemoration of some historic event.

Flags are borne on the masts of ships to designate the country to which they belong and to indicate the rank of the commanding officer. The regiments of an army are distinguished from each other by the flags they bear. A yellow flag borne on a vessel denotes quarantine and a red flag, that powder has been taken on board. A white flag is by the consent of all nations a flag of truce, and a vessel bearing such a flag is met by a vessel or boat under charge of a commissioned officer bearing a white flag. When a flag is lowered or hoisted to half the height of the staff on land or to half the mast of a ship, it indicates mourning. A flag is lowered or is pulled down as a mark of respect for a superior officer. To indicate distress, it is reversed. Aside from their use as emblems and to designate certain officers, flags serve an important purpose in mercantile and national navies as signals by which to communicate. They are used extensively for weather, railway, survey, and other signals.

In America the Colonies used the British flag prior to the separation from England, though several others had been proposed early in the agitation for separation. The first was one bearing the inscription "Join, or die," and, when the purposes of resistance to the British began to assert themselves more forcibly, a flag bearing a rattlesnake was designed. It bore the motto "Don't tread on me." However, Canada continues to use the imperial flag of Great Britain, but it also has a banner of its own, the Federal flag of Canada. See **Canada**.

The present national flag of the United States, called the *stars and stripes*, originated June 14, 1777, when the Continental Congress resolved that "the flag of the United States be thirteen

stripes, alternate red and white, and that the union be thirteen white stars on a blue field." Congress changed the flag to fifteen red and white stripes and fifteen stars in 1794, but in 1818 an act was passed by which the original thirteen stripes and fifteen stars were restored, as the addition of a new stripe for each additional State would make the flag unwieldy. At that time it was provided that the thirteen horizontal stripes, which represent the thirteen original states, should be continued, while a new star should be added to the number with the admission of a new State into the Union, the addition to take effect on the Fourth of July next succeeding the admission. The first flag under this law was hoisted over the Capitol of the United States in 1818. It remains unchanged, except as to the number of stars. The last addition of a star was made in 1907 after Oklahoma was admitted to the Union.

**FLAGELLANTS** (flāj'ĕl-lants), a class of Christians which originated about the year 900, who thought that flagellation is a reasonable penance. It was recommended by the abbot of Prüm, in Rhenish Prussia, about that time, but did not become popular until 1260, when it came into prominence in connection with the struggle between the Guelphs and the Ghibelines. The second outbreak occurred in 1349, when the black plague was raging in Europe, and a third movement took place in 1414, at which time many became dissatisfied with the rule of the popes. The Flagellants enrolled for a period of 34 days; that is, one day for each year Christ lived on earth. They were stripped to the waist and scourged themselves with knotted whips as they marched from place to place, carrying banners and singing songs of praise. When blood was drawn as the result of flagellation, it was thought to atone for their own and others' sins. Since they belonged to the party of the Guelphs, they were permitted to continue their practices by the Pope, but in 1349 Clement VI. issued a bull against them. Gregory VI. designated them as heretics in 1372, because they were said to consider flagellation more important than the sacraments. This sect had adherents throughout Western Europe, extending from Italy to Denmark and England.

**FLAGEOLET** (flāj'ō-lĕt), a wind instrument with a mouthpiece like a common whistle. It resembles the flute and is usually made of boxwood or ivory. Most instruments of this class are provided with a large aperture near the mouthpiece and six or more finger holes. The range is two octaves and the tone resembles that of the piccolo, but is softer in



quality. *Flageolet tones* is the name given to the harmonic notes of the violin, violoncello, and other stringed instruments, which notes are produced by lightly touching the strings with the finger, thus producing a node, the string vibrating on both sides of the finger. See **Harmonics**.

**FLAG OFFICER**, a term used to designate a naval officer of rank high enough to command a fleet, or a subdivision of a fleet. Such an officer carries at the masthead a flag instead of a pennant, and is the naval equivalent of the general officer in the military. The vessel of the flag officer is called the *flagship*.

**FLAG OF TRUCE**, a signal that one of two contending naval or military forces desires to suspend hostilities. The flag used for such a purpose is white, and indicates that the party displaying it wishes to communicate or surrender. Firing upon a flag of truce is a breach of the naval or military code, and such an offense subjects the guilty party to severe retaliation and punishment. A flag of truce is sent by the senior officer to one of like rank, but the party who is to receive it may refuse acceptance, and the party bearing it may be warned not to proceed farther by a shot fired across the bow. A failure to stop when thus warned renders the party liable to be fired upon. A flag of truce is not permitted to be used to obtain private information, but serves only as a signal that the party displaying it desires to communicate.

**FLAGSTONE**, or **Flag**, the name of any rock that splits into tubular masses or flags, suitable for curbing, sidewalks, or doorsteps. Flagstones may be obtained from a variety of rocks, such as sandstone, limestone, and brownstone. A class of sandstone of the Devonian age yields bluestone which is well adapted for paving purposes.

**FLAMBOYANT** (flām-boi'ant), in architecture, a showy style of decoration used extensively in the 15th century. It originated in France and is a form of Gothic architecture. Its realistic and pictorial treatment of decorative sculpture corresponds to the Penpendicular style used in England about the same time. The windows and panels are distinguished by flamelike tracery. The masterpieces of this style include the choir of Saint Severin in Paris and the façades of the cathedral in Rouen.

**FLAME**, **Temperature of**, the condition, with respect to heat, of a blaze rising from a burning body. A flame usually consists of sev-

eral parts which differ from each other in temperature as well as in color and illuminating power. The flame of a lighting device, such as a lamp or a gas jet, consists of an inner dark cone and a brilliant white envelope. In the center there is no combustion, hence the dark part of the flame, and the heat and the illuminating power are greatest where the combustion is most complete. The temperature of flames is a subject to which Rossetti gave much thought in 1878. After conducting careful investigations with his calorimeter, he announced the following table of results:

Locatelli lamp .....	1,688°	Fahr.
Stearin candle .....	1,724°	Fahr.
Petroleum lamp, with chimney .....	1,886°	Fahr.
Petroleum lamp, without chimney—		
Illuminating part .....	1,688°	Fahr.
Sooty envelope .....	1,436°	Fahr.
Alcohol lamp .....	2,147°	Fahr.
Bunsen burner .....	2,480°	Fahr.

The temperature of an electric arc, as determined by Violle, is about 6,332° Fahr.

**FLAMINGO** (flā-mīn'gō), a genus of migratory birds which until recently were placed among the waders, but they are now generally classed among the swimmers. However, they very seldom use their webbed feet for swimming, the web formation being designed rather for support on the soft, muddy bottoms. The body is not large, but the long neck and legs permit them to stand from three and a



FLAMINGO.

half to four feet high. In many respects the bill resembles that of a duck, but it turns suddenly downward near the middle, the mandible being furnished with small toothlike edges,



which serve to prevent the escape of crustaceans, mollusks, worms, fish, or seeds, the common food. Flamingoes are birds of powerful wings and fly either in single file or in wedge-shaped flocks like geese, a single bird leading the way for the flock. The prevailing color is pinkish or reddish. The nest is made of mud scraped into a mound with the feet and hollowed out on top, in which two or three white eggs are laid and hatched, the young reaching maturity in about a year. Flamingoes inhabit Eurasia, Africa, and America. When feeding, they keep their feet continually going to stir up the mud. Some of the older birds act as sentinels for security to the rest.

**FLAMINIAN WAY** (flā-mīn'ī-an), the chief road leading from ancient Rome to the northern provinces, so named from Caius Flaminius the Elder. It was platted to Arminium by Flaminius in 220 B. C., at the time he was censor, and subsequently branches were laid out to all the important towns in the northern part of Italy. The length of the main road was 222 miles, which distance included many large grades and substantial bridges, remains of which are still found at some places.

**FLANDERS** (flān'dērz), the former name of a region of Europe, extending along the German Ocean. It is now included in Belgium, Holland, and France, forming the provinces of East and West Flanders, in Belgium; the southern part of Zealand, in Holland; and all of Le Nord, in France. The original inhabitants were Belgic tribes, who were subdued by Caesar, and the region was added to Roman Gaul. Later it came into the possession of the Franks and was added to Neustria by the Treaty of Verdun. Philip the Bold erected the territory into a government district in the 9th century and assigned it to his son-in-law, Count Baldwin I. In 1016 the town of Valenciennes was added and Ghent and the Zealand Islands became a part of the district about the same time. Hainaut, Alost, and Tournai were added in the reign of Baldwin V., after whose death the region was divided and passed consecutively to various countries.

In the 12th century the manufactures and commerce of Flanders rose to vast importance, and in the former part of the 14th century the Flemings were able to contest successfully with France. The latter country resigned its claims to Flanders in 1526. Afterward it passed to the united houses of Austria and Spain, though Charles V. of Germany ultimately secured control of the larger portion. A part was united with the Nether-

lands by the Treaty of Westphalia, and other portions to France by the Treaty of the Pyrenees in 1659, the Treaty of Nimeguen in 1678, and the Treaty of Utrecht in 1713. The other portions then remaining independent now form the provinces of East and West Flanders in Belgium.

East Flanders has an area of 1,158 square miles and, in 1906, had a population of 1,052,970. The area of West Flanders is 1,249 square miles and the population, in 1906, was 812,962. Ghent is the capital of the former and Bruges of the latter. The soil is productive and carefully cultivated, while the manufactures of the various products, such as laces, linens, and damasks, excel in quality. Both provinces have extensive communication by canals, electric railways, and steam railroads.

**FLANNEL** (flān'nēl), a woolen fabric differing from broadcloth and cashmere in being woven of yarn which is twisted more loosely. It varies in degree of fineness, and is used very extensively for shirts and undergarments. By allowing the perspiration easy passage and not appearing cold to the body, if damp, it is cooler in summer and warmer in winter than other fabrics. A class of loosely woven fabrics made of cotton are known as *outing flannels*. They have a napped face and many of the designs are colored attractively. Another class, the *domett flannels*, are made with cotton warp and woolen filling.

**FLATFISH**, the common name of all fishes that swim on their side, such as the sole, flounder, turbot, plaice, and halibut. The body is much compressed. The side which is turned toward the bottom is generally colorless. It is called the blind side, from the absence of an eye, since both eyes are on the upper side of the head. Some flatfishes have the right and others the left side turned toward the bottom.

**FLATHEAD**, the name applied to various Indian tribes, owing to their custom of flattening the skulls of infants by pressure. This practice was common to the fish-eating Chinook Indians on the Pacific coast; to the ancient natives of Peru, both previous and subsequent to occupation by the Incas; among the Caribs of Florida and Central America; and, it is thought, among the mound builders of the Mississippi valley. The civilized Selish Indians are improperly called Flatheads, as they do not flatten the skulls of their children. They originally inhabited the valley of the Saint Mary's River, but conveyed their lands to the United States, and were removed to Idaho in 1871, where they occupied the Jocko



reservation. They always were peaceable and are now advanced in education and the industries.

**FLAX**, an annual plant with alternate linear-lanceolate leaves, many-flowered broad



FLAX.

a, Flower; b, Seed Pod.

cymes, usually yellow, blue, or white, and crenulate petals. It embraces about a hundred species, which grow more or less widely distributed in all warm and temperate climates. A large yield is reported in the United States, where, in 1907, the product was 25,862,000 bushels. More than one-half of the crop was grown in North Dakota. The States which ranked next are Minnesota and South Dakota. Other regions which produce large quantities of flax are Manitoba, Saskatchewan, Argentina, Russia, India, and Austria. However, Argentina generally takes the first rank in the production of flaxseed, while Russia is the leading flax fiber producing country in the world. Flax is grown very extensively, on account of the commercial value of the seed as well as for its fiber. In most countries the virgin soil, when first broken, produces the best yield of flax. The ground is plowed in autumn or in the spring, depending upon the locality, and the seed is sown either in drills

or broadcast, usually in April. When the crop is ripe, generally in August, it is cut with a harvester and is afterward thrashed with a machine to obtain the seed.

A large amount of labor is required to secure the fibers in the best condition. For this purpose the crop is usually pulled up by hand, roots and all, and the seeds are removed by a process called *rippling*. To obtain the *lint*, or flaxen fiber, from the *boon*, or core, of the stem, the bundles are steeped in water until the boon begins to rot, when it can be separated readily from the fiber by means of a *scutching blade* or a machine. It is next *hackled*, or combed, after which it is spun into threads and woven into cloth. Linseed oil is pressed from the seed, and the residue is a highly fattening food for hogs and cattle. Flax was cultivated extensively in ancient times, both in Egypt and Asia, and linen is spoken of in the Book of Joshua. See **Linen**, **Linseed Oil**.

**FLEA** (flē), a wingless insect, belonging to the hopping Diptera. It has two lancetlike mandibles, a sucker, and a slender, bristle-like tongue, the whole incased between two three-jointed plates. The entire body is covered with a tough integument. It is very active and can leap two hundred times its length in a single bound. The common flea thrives particularly in the nests of poultry and on the fowls themselves. Some species infest the furs of animals and often prey upon man. In favorable weather fleas hatch in five or six days, in about twelve days they inclose themselves in a cocoon, and after eleven days more come out perfect insects. They are



DOG FLEA. COMMON FLEA. a, proboscis.

most numerous in dry climates and in filthy and uncouth places.

**FLEABANE** (flē'bān), the name of several species of plants, widely distributed in all the continents. The common fleabane of England grows to a height of fifteen inches, has panicle flowers, and is used in treating diarrhoea and dysentery. A species native to California yields ingredients useful in manufacturing the Persian insect powder and is recommended



for its medicinal properties. Horsetweed, butterweed, and sweet scabious are names applied to species found in the Mississippi Valley, especially in the northeastern section.

**FLEMISH** (flēm'ish), the language spoken in a number of Belgian provinces, portions of Holland and France, and several countries adjacent to these. It is a form of Low German, or *Platt-Deutsch*, and differs but slightly from the German in pronunciation and orthography. In East and West Flanders, Limburg, Antwerp, and Brabant it is the universal tongue and gives evidence of but little change in dialect since the 8th century. The language spoken is very similar to the form of speech used by the Council of Liptines in 742, while preparing a creed in which pagans renounced idolatry when they embraced the Christian faith.

The Flemish literature is comparatively modern, and before the 19th century it was identical with the Dutch. However, some of the early writers of the literature which belongs to the Netherlands may be said to have laid a distinct foundation for the Flemish of modern times. Jakob Van Maerlant is regarded the father of Flemish poetry. He wrote several romances in which he treats the "Holy Grail," while "Reynard the Fox" and the "Mirror of History" were produced in the same period. In 1618 a translation of the Bible was made into the Flemish. It contains such elegance of expression that it is regarded the standard authority in orthography and construction. French ascendancy tended to limit the language and literature, but after the revolution of 1830 it began to revive and take on its present form. Among the noted leaders in the revival of Flemish may be named Blommaert, Conscience, Van Duyse, Snieders, DeVries, Willems, Van Rijswijk, David Bormans, Willem Bilderdijk (1756-1831), and Snellaert.

**FLENSBURG** (flēns'böörg), a city of Germany, in the province of Schleswig-Holstein, about forty miles northwest of Kiel. It is located on the Flensburg Fiord of the Baltic Sea and has railroad and electric railway facilities. The chief buildings include a courthouse, a theater, a public library, and the Marienkirche. Among the manufactures are carpets, oil, machinery, clothing, and sailing vessels. It has a large trade in coffee, grain, and live stock. Flensburg was founded in the 12th century. Population, 1905, 53,771.

**FLEUR-DE-LIS** (flēr-dē-lē'). See **Iris**.

**FLICKER** (flik'ēr), the popular name for the golden-winged woodpecker, a beautiful

bird common to the eastern part of Canada and the United States. It is about a foot in length, has an olive-brown color, with black and white markings, and the head and neck are ash-colored. It winters in the southern part of the United States, moving northward on the early approach of spring. The food consists of worms and insects, which it extracts from the trees, but it also feeds on berries and the tender parts of plants. A large number of species of the flicker have been listed, including about 35. The *red-shafted flicker* is common to the region west of the Rocky Mountains, from Mexico to Alaska. *Yellow-hammer*, *sap-sucker*, and *high-holder* are other names locally applied to birds of this class.

**FLINT**, a mineral regarded as a species of quartz, or as intermediate between quartz and opal, consisting almost entirely of silica. It has slight traces of oxide of iron, lime, and carbon, and contains some organic matter. Flint is usually gray, smoke-brown, or brownish-black, but is sometimes spotted or mottled. Dark-colored varieties are usually found imbedded in chalk and are abundant wherever chalk formations prevail. Flint, when struck with steel, produces a spark of fire, which property was formerly made use of in fire-arms and for starting fires. Knives, axes, arrowheads, and various sharp weapons and cutting instruments are among the most interesting relics of antiquity.

**FLINT**, a river of Georgia, rises in Clayton County, and flows by an irregular course to the southwest corner of the State, where it joins the Chattahoochee to form the Apalachicola River. The entire course of 300 miles is through a rich agricultural and mineral country. Light-draft steamers navigate it as far as Albany, a distance of about 140 miles from its mouth. Larger steamers reach Bainbridge, a distance of 50 miles.

**FLINT**, a city of Michigan, county seat of Genesee County, on the Flint River, about sixty miles northwest of Detroit. It is on the Père Marquette and the Grand Trunk railroads. Electric car lines, waterworks telephones, pavements, and electric lighting are among the municipal facilities. It has a fine courthouse, a public library, and a commodious high school building. It is the seat of Oak Grove Home, an institution for the feeble-minded, and of the State institution for the deaf and dumb. The principal manufactures include clothing, woolen goods, flour, machinery, cigars, vehicles, and utensils. The sur-



rounding country produces large quantities of cereals and fruits. Flint was settled in 1820 and incorporated as a city in 1855. Population, 1904, 14,884; in 1910, 38,550.

**FLINT GLASS.** See **Glass.**

**FLINT IMPLEMENTS**, the utensils formerly used in performing manual labor and as instruments of war. Specimens are found frequently in the places which were occupied by settlements in prehistoric ages. While they occur in all regions where settlements were maintained in early times, they are met with most numerous in European countries, particularly in Denmark, the Netherlands, and other regions of the northern and western parts of Europe. These implements consist of chisels, knives, daggers, saws, scrapers, arrowheads, axes, and borers, and served a useful purpose, though modern savages do not employ such tools. The American Indians made arrowheads and other instruments of flint, many specimens occurring in different sections of America, but they are more abundant in the Mississippi valley than elsewhere.

**FLINTLOCK**, a small gun originated by the Spaniards in the 17th century. It has a small piece of flint in the jaw of the hammer, which, when released, strikes a piece of steel, and the sparks ignite and explode the charge. William III. introduced flintlock muskets into England, where various forms of this class of firearms continued in use until about 1840. Arms of this kind formerly were used both in war and in sporting, but they have been superseded by modern weapons, such as breech-loading guns and rifles.

**FLOATING ISLANDS**, the formations caused in lakes and other inland waters by the aggregation of driftwood carried down by rivers, and by deposits of soil and vegetable matter, or by detachments of elevations adjacent to the banks of rivers or on shores of lakes. These islands occur more numerous in tropical countries and receive their early consistency by interlacing roots of plants, and later by the growth of shrubs and even trees. Some of the islands are large enough to furnish pasturage and are met with from fifty to a hundred miles from the mouths of the large rivers of Asia, Africa, and America.

**FLODDEN** (flōd'den), **Battle of**, a severe military contest that occurred on Flodden Hill, Scotland, Sept. 9, 1513, between the English army commanded by the Earl of Surrey and the forces of James IV. of Scotland, in which the latter were defeated. The English army

consisted of 32,000 men and the Scottish of 30,000. Both sides lost heavily. The English army lost 4,000, while the loss of the Scots was much heavier and included several earls and other officers of high rank. A description of the battle is given in Sir Walter Scott's "Marmion."

**FLOOD PLAIN**, a level tract of land on the border of a river, formed by sand and silt deposited during overflows. In many places the surface is highest near the margin of the river bank, where the greater amount of silt is deposited during an overflow, and some distance back are marshes and swamps, which are sometimes fed by springs or remain wet for want of sufficient drainage. The flood plains in the lower course of the Mississippi are very fertile. Formerly they were covered by meadows or swampy forests, but now they yield large quantities of agricultural products. Other tracts of this kind are located on the middle course of the Rhine and Danube and on the lower course of the Nile, Po, and Ganges. See **Delta.**

**FLORA** (flō'rā), the goddess of flowers, who was held in the highest esteem by the Romans. Her festival, the Floralia, was celebrated from April 28 to the first of May. The festival was one of universal merriment, in which houses, streets, and vehicles were profusely decorated with flowers. Two temples were built at Rome to this deity. She typified the season of spring, and was the reputed guardian and protectress of every blossom.

**FLORENCE** (flōr'ens), county seat of Lauderdale County, Alabama, on the Tennessee River, 126 miles southwest of Nashville, Tenn. It is on the Southern and the Louisville and Nashville railroads, at the foot of the Muscle Shoals Canal, and is surrounded by a fertile agricultural and fruit-growing country. The noteworthy buildings include the county courthouse, the public high school, a State normal school, an academy, the Synodical Female College, and the Southern University for Women. Wildwood Park is a fine public resort. Among the manufactured products are cotton goods, cigars, machinery, vehicles, and building material. Near the city is one of the largest Indian mounds in the State. Coal deposits abound in the vicinity. Florence was settled in 1819 and incorporated in 1889. Population, 1900, 6,478; in 1910, 6,689.

**FLORENCE**, a city of Italy, capital of a province of the same name, on the Arno River, about 140 miles northwest of Rome. The site



is in a beautiful valley surrounded by hills, while a number of bridges cross the Arno and join both portions. Several important railroad lines connect it with the commercial emporiums of Italy, and electric street railways, telephones, and other municipal facilities add to the convenience and comfort. Besides its commercial importance, it takes high rank in the manufacture of woolen and silk goods, porcelain, mosaic, hats, musical instruments, toys, and numerous objects in the fine arts.

The public buildings include several beautiful palaces and impressive structures, and many piazzas or squares give the city a reputation for elegance and convenience. Among the principal buildings is the cathedral founded in 1298, and dedicated with much display and impressive ceremonies in 1887. Michael Angelo found the dome of this historic structure a convenient model for Saint Peter's. In the cathedral are numerous sculptures by master artists, among them Michael Angelo. Other churches contain almost an equal wealth of master productions in sculpture and painting. The celebrated buildings include the Uffizi, Vecchio, Signoria, Pitti, Strozzi, Il Bargello, and Riccardi palaces. The cathedral of Santa Maria del Fiore is the most remarkable building in the city. Many eminent Tuscans were buried in the church of Santa Croce, which has many fine decorations and celebrated tombs, among them those of Galileo, Michael Angelo, Alfieri, and Machiavelli. Dante's monument by Piazzini is situated in the Piazzini Santa Croce. A national library of more than 200,000 volumes and 12,000 manuscripts is located in the Pitti Palace, which also contains the celebrated Florentine gallery of art. Florence has numerous literary and educational establishments, a public school system, and institutions devoted to the arts, sciences, and higher educational interests. The Florence school of art is the most important in Italy.

Florence was founded by the Romans in the 1st century B. C., and probably named from Fiesole, a beautiful mountain near its site. It came under the dominion of Pope Gregory VII. in the 11th century, and by the middle of the 13th century it rose to commercial importance, ranking for many years as one of the first cities of Italy. An independent republic was established at Florence in 1283, and about fifteen years later great strife arose between rival parties under the names of Blacks (Ghibellines) and Whites (Guelphs), which resulted in the defeat of the latter and the banishment of the

leading members, among them the poet Dante. The republic fell in the 16th century and it was placed under Charles V. of Germany, who became known as the Duke of Florence, and was a member of the Medici. This dynasty ruled until 1737, when it was succeeded by Francis of Lorraine, who afterward became Emperor of Germany. The history of Florence is merged into that of Tuscany from that time until it became united with the kingdom of Italy. From 1864 to 1871 it was the provisional capital of the kingdom, whence dates its recent prosperity. Among the great men produced by Florence are Amerigo Vespucci, Galileo, Dante, Boccaccio, Michael Angelo, Vinci, Cellini, Andrea del Sarto, Medici, Machiavelli, and Petrarch. Population, 1906, 212,308.

**FLORICULTURE** (flō'ri-kŭl-tŭr), the cultivation of flowers or ornamental plants. While this branch of the industries has been carried on in Eurasia from remote ages, it is of comparatively recent date in America, and has been pursued as a business only about a century. In 1890 the government census detailed the first general information in regard to floriculture in the United States, but much of material value was added by the census investigations of 1900. The number of floral establishments in 1908 was about 9,125, of which 580 were operated by women. Establishments of this kind are operated in all the states, over 1,000 acres of land are utilized for the purpose, and the value of the annual output is \$35,250,000. Employment is given to about 22,500 men and women. The states of New Jersey, New York, and Pennsylvania take the leading rank in floriculture. Ontario and Quebec are the leading provinces in the floriculture of Canada. Among the products are cut flowers, rose bushes, plants, and shrubs. Roses, carnations, violets, chrysanthemums, and lilies are the leading flowers sold on the market, in the order named.

**FLORIDA** (flōr'ī-dā), a southern State of the United States, popularly called the Everglade State. It is bounded on the north by Alabama and Georgia, east by the Atlantic Ocean, and south and west by the Gulf of Mexico, and west by Alabama. The larger part of the State is a peninsula, extending about 400 miles south from Georgia, the remainder being a narrow strip of land, the western point of which lies 350 miles west from the Atlantic Ocean. The western boundary is formed by the Perdido River, which enters the Gulf of Mexico at Perdido Point. About four-fifths of



the State is contained in the peninsula. The area is 58,680 square miles, including a water surface of 4,440 square miles.

**DESCRIPTION.** The southern portion is generally low and marshy, while the northern part is more elevated and somewhat broken, though no part of it rises to a greater altitude than 300 feet above the sea. At Key Biscayne is the northern extremity of the Florida Keys, which stretch toward the southwest in a curved line about 200 miles. They consist of coral reefs and include a number of habitable islands, the surface of which is about ten feet above sea level. The Dry Tortugas, Key Large, and Key West are the larger of these islands. Among the larger coast indentations are Apalachee Bay, Tampa Bay, Biscayne Bay, Charlotte Harbor, Choctawhatchee Bay, and Pensacola Bay. The Atlantic coast line is about 470 miles and the coast of the Gulf of Mexico is 675 miles long.

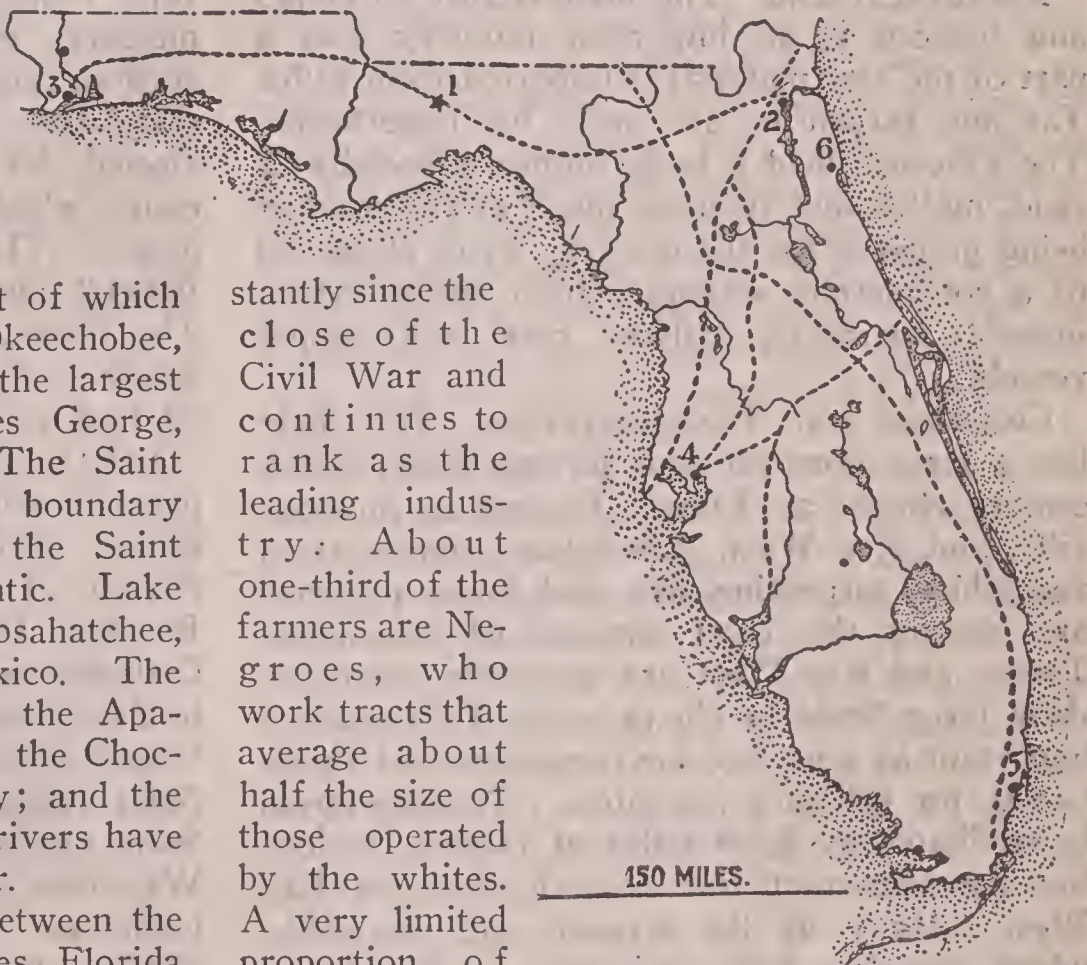
Florida has about 1,200 lakes, most of which are located in the peninsula. Lake Okeechobee, with an area of 650 square miles, is the largest of the lakes. Others include lakes George, Apopka, Harris, and Kissimmee. The Saint Mary's River forms a part of the boundary between Florida and Georgia, and the Saint John's has its outlet into the Atlantic. Lake Okeechobee is drained by the Caloosahatchee, which flows into the Gulf of Mexico. The Peace flows into Charlotte Harbor; the Apalachicola and Suwanee, into the Gulf; the Choctawhatchee, into Choctawhatchee Bay; and the Escambia, into Pensacola Bay. The rivers have about 1,000 miles of navigable water.

**CLIMATE.** Its favorable situation between the temperate and tropical regions gives Florida an equable and agreeable climate. The freezing point is rarely reached, while the wholesome influences of the gulf and oceanic waters modify the climate agreeably during the warmer parts of the year. About 43° to 90° include the limits, though the temperature sometimes falls below 32° for brief periods in the northern part. The average annual temperature at Jacksonville is 69°; at Key West, 78°; and at Pensacola, 68°. In the swamp region the climate is unhealthy, but statistics accord the other parts of the State a very high position in the record of favorable climate, which fact is utilized by many invalids of the north, who seek a genial and healthful region during the winter season. Saint Augustine, Key West, and Jacksonville are among the popular winter resorts. Copious rains fall during the winter, while the

summers are characterized by moderately dry, but agreeable and favorable, conditions. In some places the rainfall is 60 inches and at Jacksonville it is 54 inches.

**MINERALS.** Metallic mines are not worked in the State. Phosphate rock is the most important mineral product and is mined extensively for the manufacture of fertilizers. Deposits of this mineral occur most extensively between Tallahassee and Lake Okeechobee. Limited quantities of lignite coal and petroleum are obtained. Deposits of fuller's earth are worked in the vicinity of Quincy. Agate, chalcedon, and carnelian are among the precious stones.

**AGRICULTURE.** Farming has increased con-



stantly since the close of the Civil War and continues to rank as the leading industry. About one-third of the farmers are Negroes, who work tracts that average about half the size of those operated by the whites. A very limited proportion of the land in the Everglades has been brought

into a state of cultivation, but large districts are subject to reclamation and here the soil is exceeding fertile. The crops vary somewhat with location north and south. Orange culture has taken rank as an important industry and the State has about half the orange acreage of California. Corn is grown extensively in the northern part, and the last decade shows a considerable increase in the acreage of that cereal. Other crops include rice, oats, potatoes, tobacco, arrowroot, cassava, and many varieties of fruit. Several species of cotton thrive, including the sea-island cotton. Sugar cane, hay, sweet potatoes, peanuts, pepper, ginger, cloves, and pimento are other products of importance.

1, Tallahassee; 2, Jacksonville; 3, Pensacola; 4, Tampa; 5, Miami; 6, Saint Augustine. Chief railroads are shown by dotted lines.



Stock raising receives considerable attention. Cattle are grown chiefly for meat, but the dairying interests are well established. Horses, mules, swine, and sheep are grown profitably. The favorable climate causes plants to grow with vigor and rapidity, and flowers bloom in all seasons of the year. Grassy and marshy plains characterize the northern part, which has an abundance of timber, including the pine, live oak, and palmetto. Other species more or less distributed are the magnolia, persimmon, and pitch pine. Wild turkeys, ducks, geese, and partridges are abundant in the newer sections of the State.

**MANUFACTURING.** The manufacture of cigars and tobacco is an important industry, and a part of the raw material is imported from Cuba. Tar and turpentine are made for exportation. The fisheries yield a large output, especially of shad, mullet, and sponges, much of the product being prepared for the market. Fruit is canned to a considerable extent. Other manufactures include fertilizers, railway cars, and sailing vessels.

**COMMERCE AND TRANSPORTATION.** The State has a large domestic and foreign trade, which centers chiefly at Tampa, Pensacola, Jacksonville, and Key West. Phosphate, cigars, fruit, vegetables, turpentine, fish, and forest products are among the chief articles of commerce. Tampa and Key West are especially noted for their large trade in cigars, while Carrabelle is important as a market for turpentine and Punta Gorda for fish and vegetables. Transportation is facilitated by 3,500 miles of railway, including the important line recently built to Key West. Many of the streams are navigable, which, together with navigation on the Atlantic and the Gulf, afford first-class facilities.

**EDUCATION.** Educationally, Florida is making material progress, its educational institutions being well established and liberally patronized. The common schools, high schools, and State institutions maintain well-articulated courses of study. A college of agriculture is located at Lake City. The East Florida Seminary and Military Institute is at Gainesville; the South Florida Military and Educational Institute, at Bartow; the West Florida Seminary, at Tallahassee; a State normal school for whites, at De Funiak; and a State normal school for colored teachers, at Tallahassee. A number of benevolent and reformatory institutions are maintained. The leading religious and civic organizations are represented by State and local institutions. Saint Augustine has a State

institution for the blind and dumb and the State reformatory is at Marianna. School attendance has been increased materially by a process of transportation of the pupils, but the number of schools decreased somewhat.

**GOVERNMENT.** The present constitution was ratified in 1886. It vests the chief executive power in the Governor, who is elected for four years and is not eligible to succeed himself. Other State officials, including the secretary, treasurer, attorney-general, comptroller, commissioner of agriculture, and superintendent of schools, are likewise elected for four years. The senate consists of 32 members elected for four years, and the general assembly has 68 members elected for two years. Legislative sessions are held biennially and are limited to sixty days. A chief justice and two associates, elected for six years, comprise the supreme court, which is the tribunal of highest judicial power. The State is divided into circuits for judicial purposes, each having circuit judges. The towns, cities, and counties elect their respective officers, most of whom serve for terms of four years.

**INHABITANTS.** About eighty per cent. of the people reside in the country and in small towns. Fully one-half belong to the Methodist church. The remainder are divided among the Baptists, Presbyterians, Protestant Episcopal, Catholic, and other denominations. Tallahassee, in the northern part of the State, is the capital. Other cities include Jacksonville, Key West, Saint Augustine, Tampa, and Pensacola. The State has had a steady growth since the Civil War, both in wealth and in the number of inhabitants. The total population, in 1900, was 528,542; in 1910, 752,619.

**HISTORY.** The history of Florida begins with its discovery by Ponce de Leon in 1512, while he was in search of a mythical fountain whose waters would confer perpetual youth. It was discovered on Easter Sunday, the *Pascua Florida* of the Spaniards, hence the name Florida. De Soto explored it in 1539. In 1560 the French Calvinists founded a settlement, but they were shortly after massacred by the Spaniards. The region remained in possession of Spain until 1763, when it was ceded to England in exchange for Cuba, though the Spaniards regained the country in 1781. The United States purchased Florida in 1819, but the treaty was not finally ratified until 1821, when it was organized as a Territory, and it was admitted as a State in 1845. This treaty relinquished all Spanish authority over the region west of the



Rocky Mountains, claimed as belonging to the Louisiana Purchase, but not previously acknowledged by Spain. Many of the settlements were disturbed by the Seminole Indian wars in 1835-42, though these Indians were removed to Indian Territory, now Oklahoma, shortly after. In 1861 Florida seceded from the Union, but was readmitted under the reconstruction policy of President Johnson. The State played an important part in the national election of 1876, when the contest for President was decided by the Electoral Commission (q. v.).

**FLORIDA, Bay of**, the name of the narrow channel between Florida and Cuba, lying west of the Bahama Islands. It is separated from Florida Bay by the Florida Keys, and is traversed by the Gulf Stream. It is about 60 miles long at the northern extremity and 130 miles at the southern, and has a length of 225 miles.

**FLORIDA KEYS**, a group or chain of islands at the southern extremity of Florida, belonging for the purpose of government to Monroe County. It stretches in a curved line fully 200 miles from Biscayne Bay toward the southwest into the Gulf of Mexico. The group includes thousands of islands, some of coral formation, and many are low, marshy, and uninhabitable. Key Largo is the largest, but Key West is the most important. The latter contains the city of Key West and a naval station.



FLORIDA KEYS, BAY OF FLORIDA, AND KEY WEST RAILROAD.

A railroad extends from the mainland across the principal chain of islets, connecting them by massive iron and concrete bridges.

**FLORIN** (flōr'ín), a coin so named from Florence, Italy, where it was first issued in 1254. Coins of the same name and of different values have been issued in many countries. The *gulden*, originally issued in Germany, was until a comparatively recent time the monetary unit of Austria, and the *guilder* is still used in the Netherlands. A silver piece with a value of two shillings is in circulation in Great Britain, and bears the official name of *florin*, but the gold florin of England has not been issued since the Middle Ages. The English florin is worth here about 50 cents; the Dutch guilder, about 40 cents; and the German gulden about 35 cents.

**FLOTSAM** (flōt'sam), the name applied in the English law upon the goods that float upon the surface of the water after a shipwreck, or such as are thrown overboard to lighten the cargo. They belong to the crown if they are not claimed by their owner after recovery. Goods that are cast from a ship in peril are sometimes called *jetsam*, and those that are tied to wood or a cask before being cast out are designated as *ligan*. These words are now seldom used, but the term *jettison* is employed in connection with insurance.

**FLOUNDER** (floun'dēr), a genus of fishes of the flatfish family, found along the shores of almost all countries. The body is often a foot or more in length, extremely flattened at the sides, and about one-third as wide as it is long. Like other flatfish, they usually swim on the left side, but reversed specimens are common. About 150 species of the flounder have been studied, most of which occur in salt water, but several of the species thrive in lakes and other bodies of fresh water. The color varies according to the ground where the fish live. Flounders are excellent and favorite food fish.

**FLOUR**, the ground and bolted portions of cereals, though specifically applied only to the products made of wheat. When applied to the finely ground substance of any other cereal it is usually specified, as rye flour, buckwheat flour. Among the principal food products flour is of vastly greater importance than any other, and, as an edible substance, enters into manifold convenient forms, such as bread, biscuit, cake, pudding, and crackers. Rice being the favorite food of the Mongolians of Asia and entering quite largely the edible substances of other people, it is the only cereal that rivals flour as food for man. The cultivation of cereal plants is as old as the history of man, which likewise is true of the use of their seed for food.

Various relics of remote antiquity indicate



that crude devices were employed in the manufacture of flour from wheat and rye. The process consisted of crushing the grains in a cavity cut in stone by means of a conical piece of porphyry, crystal, or marble. In the later period of ancient Egypt and the early times of Rome, the pestle and mortar served for crushing grain, which were soon displaced by the ox mill and later by the water mill. In early water mills the process of grinding was effected by an upper and lower millstone. The latter had a slightly convex surface, over which the concave surface of the former fitted. The grain passing between the two in a slow but constant stream was ground to a mixed mass of flour, middlings, and bran, each of which was afterward separated from the others. Modified forms of this class of mills are still used in newly settled countries and among people who do not manufacture vast quantities of flour.

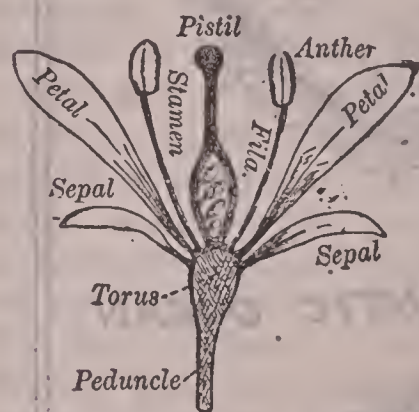
In modern flour milling it is customary to convey the wheat from railway cars, in which it is shipped from the agricultural districts, into bins. From the bins it is carried by means of elevators into storage rooms at the top of the mill building, where it is kept until needed for grinding. The machinery for manufacturing flour is located usually on the first floor, and as the grain is let down all foreign matters are separated from it. In the cleaning process all the oats, chaff, dirt, dust, cockle, and other impurities are taken out by means of blasts of air, sieves, and powerful magnets, the latter removing all particles of iron that may have mixed with the grain in threshing and in transportation. After this process of cleaning, it passes consecutively between rollers or cylinders having spiral corrugations that operate to crush it. The first of these are coarse and serve to break the wheat into particles, but they become finer and are set more closely together until the last of the series effects a very high degree of crushing.

After the wheat is crushed sufficiently, the product is carried to complicated machinery in which the *flour*, *middlings*, and *bran* are separated. This machinery has been perfected to such a high state that remaining impurities can be removed and all portions of the wheat are utilized to the best purpose. Formerly the mills were somewhat unpleasant because of the flying particles of flour. However, this has been overcome by a dust collecting machine, which creates a vacuum through the agency of a fan, causing the suspended particles to be drawn by currents of air into a chamber, from which they are removed at certain intervals. Roller mills are now employed in manufacturing flour both

from spring and winter wheat, and are propelled successfully by water, steam, or electric power, though the first named is far the most inexpensive.

About 18,500 flouring mills are operated in the United States. Those at Saint Anthony Falls, Minneapolis, are propelled by water power and are the largest in the world. Pennsylvania has the largest number of mills, though most of them are small. Canada holds the second rank in the list of North American countries as a producer of flour. The vast wheat fields of the central-western section have made this possible. Winnipeg is one of the great flour-producing cities of the world. Other centers are at Toronto, Ottawa, and Vancouver. A national association of millers is supported in the United States, which has numerous branches in the several states where milling is an important industry. With it are associated a number of mutual insurance companies. About 16,500,000 barrels of flour are exported from the United States annually, while the domestic market requires 75,500,000 barrels.

**FLOWER** (fou'ēr), the bloom or blossom of a plant, the terminal bud inclosing the organs of reproduction. The *stamens* and *pistils* are the essential parts of a flower. These are usually surrounded by floral envelopes, the *calyx* and *corolla*, but in the lily, crocus, and other endogenous plants they are not distinguishable. The leaves of the calyx are called *sepals*, and those of the corolla are known as *petals*. In flowers the stamens, or male organs of reproduction, are composed of the *filament*, *anther*, and *pollen*. The pistils, or female organs, consist of the *style*, *stigma*, *ovary*, and *ovules*. Where both stamens and pistils appear in the same flower, it is said to be



PARTS OF A FLOWER.

hermaphrodite or perfect, but, if only the stamens appear, it is unisexual or imperfect. A flower which has only the pistils is said to be barren or sterile. Sometimes both calyx and corolla are wanting, when it is said to be

naked. If both the stamens and pistils are wanting, the flower is termed neuter or empty. An assemblage of flowers on a plant is called an *inflorescence*. If there is no flower stalk, or peduncle, of which the torus is the upper part, the flower is said to be sessile.

The primary object of the flower is to fur-



nish the necessary elements of reproduction. To accomplish this essential function, the pollen must be transported from the stamen to the pistil, which may be done through the agency of insects, but in most cases is effected by the pollen falling or being blown through the air. The best results come from fertilization by pollen from a different flower of the same plant or from a different plant. Much has been done in floriculture to develop both a high degree of fertilization and showy blossoms.

**FLOWERS, Adoption of,** the selection of flowers as symbols by certain states and nations. Floral symbols came into use in very early times and mention is made of them in the early history of China and in biblical literature. The lotus, or sacred lily, was consecrated to the gods in Egypt, and afterward became the national emblem. Many nations of antiquity used a code of floral symbols in decorating the surfaces of monuments and in making inscriptions in temples, but these are not understood. Throughout history is a line of records that conveys information in regard to the extensive use of flowers in national ceremonies, but the selection of particular flowers came about rather as a matter of sentiment than by legal or national adoption. Edward I. of England wore the red rose, from which circumstance the rose became the national emblem of that country. However, the British coat-of-arms contains the English rose, the Irish shamrock and the Scotch thistle. In Canada the maple leaf has been the national emblem since 1834. It is the leaf of the sugar maple of the forest, which is renowned for the brilliant colors of its foliage in autumn. The following is a partial list of the national emblems:

Canada	Maple Leaf
England	Rose
Egypt	Lotus
France	Fleur-de-lis, or Iris
Germany	Cornflower
Greece	Blue Violet
India	Lotus
Ireland	Shamrock
Italy	White Lily
Japan	Chrysanthemum
Mexico	Prickly Pear
Persia	Rose
Scotland	Thistle
Spain	Scarlet Pomegranate
Switzerland	Rare Edelweiss
United States	Goldenrod

Many of the states of the United States adopted flowers by a vote of the public school children, and in others adoptions were made by acts of the legislatures. The following is a partial list of the State flowers:

Alabama	Sunflower
Arkansas	Apple Blossom
California	Poppy
Colorado	Columbine
Delaware	Peach Blossom
Georgia	Cherokee Rose
Idaho	Syringa
Indiana	Corn
Iowa	Wild Rose
Kansas	Sunflower
Louisiana	Magnolia
Maine	Pine Cone and Tassel
Michigan	Apple Blossom
Minnesota	Moccasin
Mississippi	Magnolia
Missouri	Goldenrod
Montana	Bitterroot
Nebraska	Goldenrod
Nevada	Sage-brush
New York	Rose
North Dakota	Goldenrod
Oklahoma	Mistletoe
Oregon	Grape
Rhode Island	Violet
Texas	Bluebonnet
Utah	Sego Lily
Vermont	Red Clover
Washington	Rhododendron
West Virginia	Rhododendron
Wyoming	Gentian

**FLOWERS, Artificial,** the product of manufacture embracing imitations of real flowers, made of various materials. The Italians were the first to bring the art of making flowers to a high state of perfection, although the early Egyptians and Romans had developed it to a considerable extent. At present the Americans, Germans, and French excel in the output. About \$250,000 worth each are exported from Germany and France annually. They are used chiefly for ornamenting ladies' and children's hats and bonnets. The materials used are various, including wax, shell, horn, whalebone, paper, rubber, ribbons, velvet, cambric, jaconet, calico, muslin, blown glass, crape, gauze, and satin.

**FLOWERS, Language of,** the method of using flowers as types to express thoughts and feelings. The art of using flowers to convey messages originated in ancient times, when the custom was better understood and more generally practiced than at present. An extensive flower language was developed in the western part of Asia at a remote period, but the Greeks and Romans conveyed to us the most authentic record of its use and application. Though nations widely remote from each other cultivated the use of such a language, it is interesting to note that they agreed in applying the same sentiment to many of the flowers. For instance, the amaranth signifies immortality; the oak leaf,



power; the moss rosebud, a confession of love; and the white rose, happy love. The following is a partial list of the more important flowers used in expressing sentiments:

Amaranth	Immortality
Anemone	Anticipation
Apple Blossom	Preference
Aspen Leaf	Fear
Brier	Insult
Buttercup	Riches
Camellia	Illness
Calla	Pride
Candytuft	Indifference
Cornflower	Heaven
Cowslip	Youthful Beauty
Cypress	Death
Daffodil	Unrequited Love
Daisy	Simplicity
Dandelion	Coquetry
Evergreen	Hope
Everlastings	Undying Affection
Fern	Forsaken
Five-leafed Clover	Bad Luck
Forget-Me-Not	True Love
Four-leafed Clover	Good Luck
Foxglove	Insincerity
Geranium	Deceit
Goldenrod	Encouragement
Heather	Loneliness
Heliotrope	Devotion
Hepatica	Anger
Honeysuckle	Fidelity
Hyacinth	Sorrow
Ivy	Trustfulness
Laurel	Fame
Lilac	Fastidiousness
Lily	Majesty, Purity
Lotus	Forgetfulness
Marigold	Contempt
Moss or a dry twig	Old Age
Myrtle	Wedded Bliss
Narcissus	Vanity
Oak Leaf	Power
Orange Blossom	Marriage
Oxalis	Pangs of Regret
Palm Leaf	Conquest
Pansy	Loving Thoughts
Poppy	A Tryst at Evening
Rosemary	Remembrance
Rue	Repentance
Scarlet Geranium	A Kiss
Snowdrop	A Friend in Need
Sting Nettle	Rudeness
Sweet William	Gallantry
Tuberose	Bereavement
Tulip	Boldness
Violet	Modesty
Yellow Rose	Jealousy

**FLUIDS** (flū'ids), the substances whose molecules change places freely by slight pressure. They include liquids and gases, as opposed to solids. Liquids possess no definite shape, but assume that of the vessel in which

they are kept, except at the upper surface, which is level. Gas inclosed in a bottle presses upward against the cork as well as against the sides and base. From this fact liquids are said to be nonelastic fluids and gases are termed elastic fluids.

**FLUKEWORM** (flūk'wôrm), or **Fluke**, the name of several kinds of worms found in the liver and biliary ducts of sheep, in which it causes the disease commonly called *rot*. The eggs, which are laid in the liver, pass to the exterior by means of the gall and the intestines and hatch on the wet grass. After undergoing a complicated process of development, they crawl about on the grass and are eaten by the sheep, and inside of the stomach undergo another form of metamorphosis. Later they bore through the animal tissue and find lodgment in the liver, where they reach sexual maturity. Other species attack birds and fishes, and a kind common to Egypt infests different organs and tissues of man.

**FLUORESCENCE** (flū-ō-rēs'sens), the property possessed by some transparent bodies which causes them to produce at their surface, or within their substance, light of a different color than that of the mass of the material. This may be demonstrated by exposing green crystals of fluor spar to light, when the reflections are blue. This is due to the property which the substance has of modifying the light striking upon it. Glass colored of a yellow tint with oxide of uranium, known as canary glass, produces fluorescence of a brilliant green tint.

**FLUORINE** (flū'ôr-in), a nonmetallic element separated from fluor spar or fluoride of calcium by the action of sulphuric acid. It is not found native and can be isolated only with great difficulty, since it combines very readily with different substances. The stems of grasses, mineral springs, sea water, and many animal substances contain fluorine. Compounds of fluorine are used in preserving food, in etching glass, and for antiseptic purposes. It has the property of corroding objects with which it comes in contact, hence must be preserved in lead or ceresin bottles.

**FLUOROSCOPE** (flū-ôr'ô-skōp), an instrument employed to transfer X-rays into light. This light enables an observer to see through several inches of wood, observe the bones of the living body, or other objects of dense construction in bodies usually opaque. The fluoroscope was invented by Thomas A. Edison, who tried over 800 different salts in experimenting to perfect a suitable instrument. The most satisfactory fluoroscope consists of a rectangular box a foot long, tapering toward the far-



ther end, at which a fluorescent screen is placed. The inside of the box is painted black. The screen is made of pasteboard, covered with white paper and then coated with collodion, on which fine crystals of calcium tungstate are sifted. In passing four amperes through a Crookes tube, and holding an object between it and the fluoroscope, the observer can see through the screen and the object, and thus study visually the phenomena discovered by Röntgen.

**FLUOR SPAR** (flū'ör spär), the fluoride of calcium, which occurs especially in deposits of cobalt, tin, silver, lead, and other beds of metals. It is usually blue, green, yellow, or pink, though it occurs also in colorless and transparent forms. Fluor spar occurs in Norway, England, and Germany. The annual American product is valued at about \$115,000, and is obtained chiefly in Kentucky and Illinois. It is used as a flux in iron smelting, and in the manufacture of opalescent glass and hydrofluoric acid.

**FLUTE** (flüt), one of the oldest wind musical instruments. It has four joints, tapers toward one end, and contains a number of holes to be covered with the fingers or by keys. Some flutes have a mouthpiece, but others are played by placing the lower lip close against the hole of the outside and blowing the air so its passage is broken against the opposite edge of the hole, causing the air inside the hole to vibrate. Its soft, pleasant tone and wide range in compass make it an important instrument in orchestral music.

**FLUX** (flūx), a substance used to promote the fusion of minerals, or to cause their decomposition. Many materials are employed for this purpose, depending upon the nature of the body to be treated and the chemical action desired. Limestone unites with the alumina and silica of iron ores, hence is the usual flux employed in the blast furnace. Borax forms fusible compounds with silica and other bases and is used very generally as a flux. Cyanide of potassium is employed both as a flux and a reducing agent and niter and litharge are good fluxes and oxidizing agents. Many substances, such as litharge, boracic acid, and red lead, are used as flux in making pottery.

**FLY**, an insect characterized by possessing but two wings, the posterior set being reduced to a pair of so-called balancing rods, or legs. The proboscis or underlip ends in two flaps, which are used for lapping. A long list of pests belongs to the order Diptera, or two-winged insects, such as gadflies, bat flies, blowflies, and the common house flies. About

40,000 species have been described, but these are thought to be only about one-eighth of the number which at present are represented by living species. To these may be added a long list of extinct and fossil flies. Not less than



1, MUSCID; 2, SYRPHUS; 1a, FLY'S FOOT.

1,500 species have been described from the fossils found in the shale beds of Florissant, Colo., and many other sources are fully as prolific.

The eggs of a fly hatch into larvae in about a day. They then pass into a quiescent pupa stage for several days more, whence they issue as full-grown insects. In warm climates flies are seen the entire year, but where the winters are cold they disappear on the approach of heavy frosts. A few survive the winter in sheltered places. These, together with some of the eggs and pupae, preserve the species. Flies are enabled to walk on smooth surfaces and ceilings with their backs downward by a hairlike cushion which serves to hold them in place, partly by a glutinous fluid secretion and partly because of their ability to remove the air from below the feet by means of suckers through the hair, the pressure of the air on the outside serving to support the insect. The muscid, or house fly, and the syrphus, or drone fly, are well-known species of these insects.

**FLYCATCHER** (flī'käch-ēr), the common name of many birds native to America, so named from their ability to catch flies and other insects. They have the habit of waiting until the insect comes very near, when they dart suddenly to secure it, after which they return to the same place. Birds of this class are seldom seen on the ground or in the act of chasing insects in the air like swallows. The *Savannah flycatcher* is common to the southern part of the United States. About 350 species are native to North America, and they are widely distributed from Panama to the northern part of Canada, but are best represented where insects are most numerous. Only four species are native to Europe, including the *spotted flycatcher* seen both in Great Britain and on the continent. The kingbird (q. v.) belongs to the family of flycatchers.

**FLYING FISH**, a name applied to all fishes which have large pectoral fins and are able to



sustain themselves in short seeming flights above the water. A large number of species belong to this class, about thirty, and two families, most of which are common to the warm zones. They swim in shoals near the



FLYING FISH.

surface and, leaving the water, often dart through the air for a distance of several hundred feet. Little, if any, force is acquired while the fish are in the air, but, instead, the strong tail seems to be the only source of motive power, the winglike pectoral fins serving rather as parachutes to support the body in the air. It does not seem true that these fishes leave the water merely to escape danger as has been asserted by some writers, but they do so as a means of exercising in the air, of which they appear to be fond. The *flying gurnard*, a spiny fish of the Gulf of Mexico and the Atlantic coast, emits a phosphorescent light in the night. Flying fish rarely rise more than four feet above the water, but when a school is met by a small boat they move in all directions and sometimes a few fall upon the deck. They are about a foot long and are held in high esteem as food.

**FLYING MACHINE**, a mechanical structure designed to navigate the air. It differs from a balloon mainly in that a flying machine is heavier than the air, while a balloon is lighter. Efforts to navigate the air by means of mechanical apparatus have been made for about five centuries and, though some degree of success was made in the last century, the successful solution of the problem has been approached only within the last decade. *Aéronauts* constitute a class who think air navigation possible only by means of balloons, while *aviators* have been multiplying in numbers, be-

lieving it possible to perfect flying machines with which movement in the air will be as safe and rapid as upon the land or the water. They have studied the structure and flight of large birds and from them have drawn lessons so valuable that the perfection of a safety flying machine is fast nearing its culmination.

In the 17th century Bernier, of Sable, France, constructed two pairs of wings, which he fastened to the shoulders and ankles with leather straps. By means of these mechanical devices he was able to guide himself in the air and fly for some distance, especially when starting by running from an elevation and thence moving over the valley beneath. In 1896 the secretary of the Smithsonian Institute, Prof. S. P. Langley, completed his *aërodrome*, a flying machine which he sent up with much success, and perfected it to such a state that it was possible to move, ascend, and return successfully. O. Chanute, of Chicago, in the same year carried on elaborate experiments with his *aëroplane*, which enabled him to fly and soar quite successfully.

The German aviator, Otto Lilienthal, up to 1901 attained the greatest success in flying. In construction his machine was very closely modeled after the characteristics of birds. The apparatus had outspreading wings, which were made in imitation of the spreading pinions of a bird, and was constructed of light wooden frames covered with cotton drilling. In flying, the legs of the operator were free, thus enabling him to start by running or from elevations much like the larger birds. The construction was such that he was suspended safely within the lower part, leaving the body and limbs quite free to move, and in this way he was permitted, at least to some extent, to direct the course to be taken. On a number of occasions he soared to heights far above the starting point and moved over considerable distances. Dr. Danilewsky, of Charkov, Russia, completed and used a flying machine in 1898, which combined with aviation the principle of a balloon, and gave rise to the newer *dirigible* balloons. In the meantime the United States appropriated \$25,000 for experiments relating to aerial navigation. The investigations were instrumental in obtaining a number of improvements, such as combining steam, electric, gas, and compressed-air motors with the machines to secure motive power. At the same time many screw and fan devices to guide and propel were invented. On July 2, 1900, Count Zeppelin, a German cavalry officer, made a





AEROPLANE FLIGHT FROM A WARSHIP.

Eugene Ely, in a Curtiss biplane, starting from the deck of the United States steamship *Birmingham*, at Hampton Roads. He reached the shore safely.

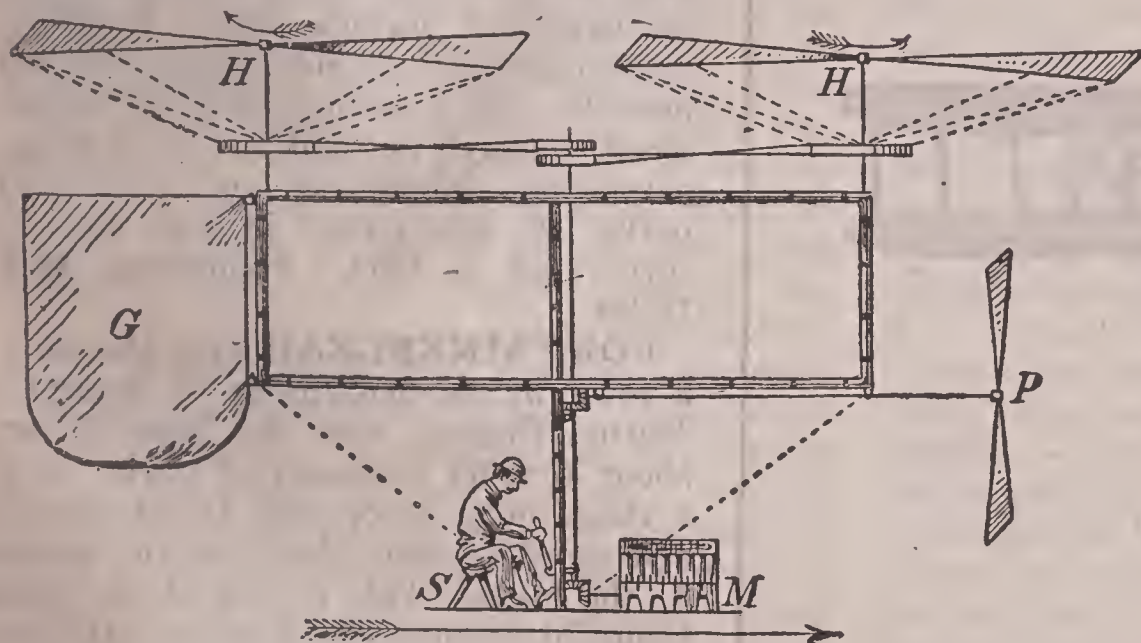






successful flights with his dirigible balloon, which combines the principles of a balloon and a flying machine. Later he improved on this form of an airship so he was able to sail with safety at the rate of forty miles per hour, which he did in 1908.

Henry Farman, the French aëronaut, won the Deutsch-Archdean prize of \$10,000 with his flying machine in 1908. It sailed at a height of about fifty feet at the rate of 25 miles an hour and was under perfect control during the entire time. This machine, like the *hélicoptère* or screw flyer of Santos-Dumont, is heavier than air and is one of the earliest types of this class. Another machine of this pattern is the air ship of M. Le Baudy, which has a record of sixty miles in two hours and 46 minutes. At the head of the list of successful inventors stand Orville and Wilbur Wright,



SANTOS-DUMONT'S HÉLICOPTÈRE.

H, H, Lifting propellers; P, Driving propeller; G, Rudder; M, Motor; S, Aëronaut's seat.

two American aëronauts, whose aëroplane, the *Bird of Prey*, demonstrated much capacity for flying in 1908 and since. This machine, together with the operator, weighs about 700 pounds. They were the first to demonstrate that a machine, when mounted on light bicycle wheels and driven along the surface of the ground, can be made to rise in the air. See illustration on following page.

**FLYING SQUIRREL**, a species of the squirrel family, about five inches long, having a fold of skin extending along each side between the fore and hind legs. The tail is about four inches long and has two horizontal rows of hair, which aid to direct its motion and support the body in the air. It does not fly, but sails through the air as a parachute, getting its momentum by springing from a tree at a considerable height, descending obliquely until very near the ground,

when it glides upward and usually alights at about one-third of the height from which it started. It has a brownish-gray color. The food consists chiefly of the young shoots of trees, nuts, insects, and small birds.

**FOG**, a thick mist at or near the earth's surface, resulting whenever the temperature of the air is reduced slightly below the dew point. The minute drops of water that form fog, though 800 times heavier than air, are prevented from settling rapidly by the resistance of the atmosphere. This is rendered possible by the minute size of the drops, which are much smaller than the relatively heavier dust particles common in the air and wafted about by the wind. Fogs disappear on the approach of warm winds. Off the banks of Newfoundland the warm, moist air of the Gulf Stream is cooled by the cold air of the Labrador ocean current, hence frequent and almost constant fogs arise.

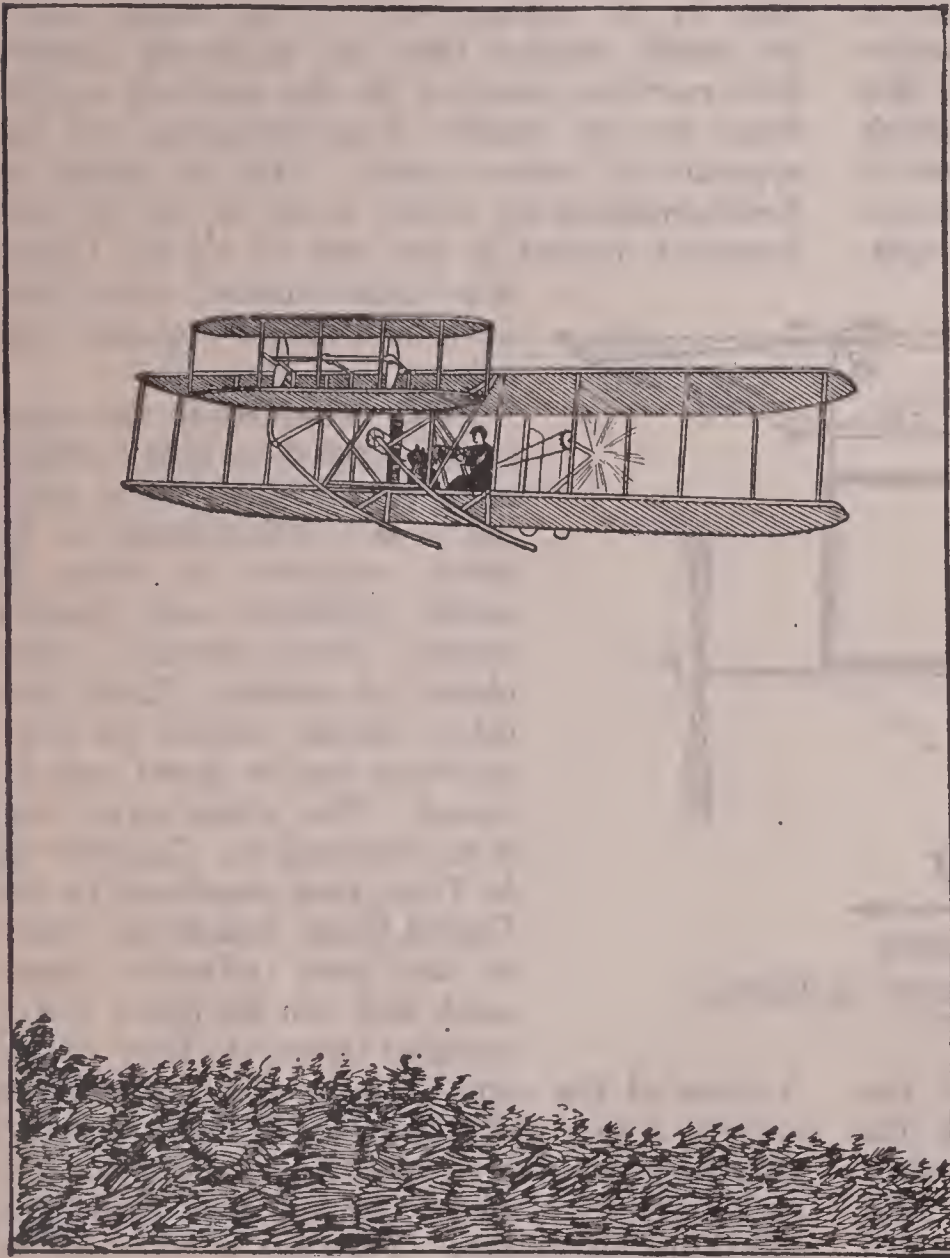
**FOG SIGNALS**, the signs communicated in foggy weather by sounding a whistle, ringing a bell, firing guns, or by other methods in order to avoid collisions and prevent vessels from running upon places of danger. Light and other signals cannot be seen, so notice can be given only by sound. The steam siren fog-horn invented by Cagnard de la Tour, now employed by the United States lighthouse board, is the most effective signal used, and can be heard a distance of twenty to thirty miles.

A class of fog signals are used on railways to indicate a safe distance at which trains may approach each other, or to indicate points of danger on the track, such as broken rails, landslides, and defective bridges. They are in the form of small torpedoes in which a detonating powder, when they are struck by the wheels of the engine, makes a loud report.

**FOLKLORE** (fōk'lōr), a term used to signify the scientific study of popular customs, tales, superstitions, and primitive belief and usages. The term was compounded from several German words employed to designate this study, such as *Volkslied* and *Volksfest*. Though many trivial matters are taken into cognizance, the study has marked value in that it throws light on the origin and development of political and religious beliefs and ceremonies, as well as different ideas regarding the relationship between



racés. It is this feature of folklore that has made it of special value to historians, sociologists, and writers on ethnology. Besides, through its study more comprehensive views have been formed. The science owes its origin to the Grimm Brothers, who began collecting stories as told by peasants, and after a research of more than twelve years published their collection. Soon after intense interest was aroused in the establishment of folklore societies, the founding of journals, and the publication of various books relative to these researches.



ORVILLE AND WILBUR WRIGHT'S AÉROPLANE.

The American Folklore Society was founded in 1888 at Cambridge, Mass., and has directed its energies largely to the publication of books and periodicals relative to the folklore of North America. Its official publication is the *Journal of American Folklore*. Such institutions as Johns Hopkins University have given their energies to the furtherance of interest in the science. North American folklore has been extended largely within recent years, and now represents an interesting fund of knowledge relative to the Indians, Aztecs, and

Eskimos. Institutions having a like object are maintained in the countries of South America and Eurasia. By means of extensive research it has been possible to add a very useful and extensive fund of knowledge to the history of primitive races.

**FOND DU LAC** (fōn dû lāk'), a city in Wisconsin, county seat of Fon du Lac County, on the Fon du Lac River, about sixty miles northwest of Milwaukee. It is on the Wisconsin Central, the Chicago and Northwestern, and the Chicago, Milwaukee and Saint Paul railroads. Being on Lake Winnebago, it has communication with the Great Lakes by the Fox River. It is surrounded by a fine farming and dairy region. Among its principal buildings are an opera house, the county courthouse, the high school, the public library, and Grafton Hall, an Episcopal school for girls. The manufactures include flour, ironware, woolen goods, furniture, machinery, and utensils. The municipal facilities include street railways, gas and electric lighting, pavements, waterworks, and several parks. It was settled in 1836 and incorporated in 1852. Population, 1905, 17,284.

**FONTAINEBLEAU** (fōn-tān-blō'), a town in the department of Seine-et-Marne, France, near the Seine River, about 37 miles southeast of Paris. It is a clean, quiet place with broad streets, and owes its fame chiefly to the palace of the kings. This is one of the most beautiful palaces in France. It was founded by Robert the Good in the 10th century and has been greatly improved by many succeeding kings. The chateau, or park, in which it is situated is a magnificent expanse of forest, in which are fountains, statues, flowers, and artificial lakes. Napoleon detained Pope Pius VII. as prisoner at Fontainebleau for two years. He signed his abdication here in 1814 and again in 1815. The town manufactures porcelain and wines and, owing to its extensive pleasure grounds, ranks as a favorite resort for visitors. Population, 1906, 14,381.

**FONTENOY** (fōnt-nwä'), a village in the province of Hainaut, Belgium, five miles southeast of Tournay. It is celebrated on account of a battle, on May 11, 1745, between the allied forces of Austrians, Dutch, and British and the army of France, each side numbering about 60,000 men. The French were commanded by Marshal Saxe and the allies by the Duke of



Cumberland. The result was a forced retreat of the allies with a loss of 7,000 on each side.

**FOOCHOW** (foō-chou'), or **Fu-Chow**, capital of the province of Fo-Kien, China, situated on the Min River, about 25 miles from its mouth. Massive walls surround the city, while its streets and buildings show more than the ordinary Asiatic progress. In 1843 it was thrown open to foreign trade, since which time it has developed large manufacturing and commercial enterprises. It has extensive dockyards and an arsenal, which are under the direction of European influences. The city is the seat of several scientific societies and numerous missionary organizations. Population, 1908, 638,250.

**FOOD**, any substance that, being taken into the body of animals or plants, serves, through organic action, to build up normal structure or replace the waste of tissue. Plants feed on the carbonic acid gas of the atmosphere and a series of chemical compounds found in the soil. The living plants change the soluble air foods into plant tissues, cells, and granules under the influence of sunlight. Certain materials fitted to become the food of man or animals are stored in various parts of the structures, notably the roots, stem, and seeds, of which such as fats, sugar, starch, and proteids constitute the most noteworthy. Animals of the higher scale do not possess the power of changing the compounds of the soil and air into animal tissues. For this reason they feed directly upon the products of plant growth, or indirectly by eating flesh of other animals, and build up the complex animal muscle, fats, starches, and proteids, which are suitable for the food of man.

Liebig classified foods into those that serve for nutrition of organized tissue, or flesh-formers, known as *nitrogenized elements* of nutrition, and those which are consumed in respiration, or heat-givers, called *nonnitrogenized elements*. These elements exist in some form of combination in almost every substance known as food, and are subservient to the function of organic action in the process of digestion. The list of diets of most peoples includes fats and oils, the vegetable oils in the warm regions and the fats in the cold and temperate. Milk contains all the necessary food elements in the best form. Nitrogenous food-stuffs are found principally in the flesh of birds, animals, and fish; in milk, cheese, and eggs; in barley, wheat, oats, corn, and flour; and in beans, peas, and vetches. They are formed exclusively in plants, and undergo but little alteration when consumed as food and stored up by animals.

Fats are derived principally from milk, the bodies of birds and animals, and the blubber of

sea animals. The oils are obtained mostly from the olive, the palm, the cocoanut, the rape, cotton seed, and fish. Corn and some other grains contain more or less oil substances and these, like most vegetable oils and fats, resemble those of animals. Starchy foods are of much importance in a normal diet. The starchy substances are derived mostly from the vegetable kingdom, and constitute the principal portion of the food of people who live in the tropical and temperate regions. The starches of the tubers, roots, grains, fruits, and milk embrace this class. These and other vegetable products contain hydrogen, oxygen, and carbon, but they differ in physiological properties from the oils. Water and salts are as essential for healthy nutrition as the proteid class, the former constituting 68 per cent. of the human body. It is one of the important constituent parts of many articles of food. Besides, there are accessory foods, such as vinegar, coffee, tea, relishes, and spices, which are used more or less habitually, though the exact nutritive value of many of them is not known definitely.

The body needs a variety of food to support the different tissues. In the economy of growth it is required that both the carbonaceous and nitrogenous elements be taken in sufficient quantities. The very instinct of man suggests the blending. Bread is eaten with butter; macaroni is prepared with cheese; rice is boiled with milk; pork is baked with beans, and other food articles are mixed similarly. Food is oxidized in each cell of the body, though only a small portion of the albumen eaten is required in their reconstruction; the remainder, and the fats and sugars, are oxidized without becoming a part of the living cells of the body.

The average man, in order to repair the waste caused by the oxidation of the cells, and to supply the requisite amount of heat and energy, must assimilate daily about four ounces of albumen, four of fat, and five of sugar or starch. To oxidize this it is necessary to breathe 24 ounces of oxygen. The weight of the body is increased by albumen being changed to fat, which occurs when more food is eaten than this amount of oxygen can oxidize. An increase in the breathing capacity enables the body to oxidize more food and lessens the bad effects of overeating. Too much food causes plethora, while depriving the body of one kind of food for a considerable time causes it to suffer. When plain food is eaten slowly, hunger and taste are the most reliable guides as to quantity.

The subject of pure food has received much attention in the leading governments of Europe and America the past decade. This movement



was brought about by widespread adulteration of medicine, beverages, and articles of food. The Federal food and drug act which went into effect on Jan. 1, 1907, is the most important legislation of this class enacted in the United States. This law made it unlawful to manufacture or sell within any territory of the Union, or to engage in the interstate or foreign commerce of any article of food or drug, which is adulterated or misbranded. This law requires that the weight marked upon a package shall be the actual weight, not an approximate weight. If drugs are imitations, they are held to be *misbranded*. Pure food laws have been enacted generally in the states of the Union and in the provinces of Canada.

**FOOLS, Feast of**, a festival celebrated for several centuries in a number of countries of Europe, especially in France and Spain. It was a season of Christian merrymaking and partook of a childish character. The festival was celebrated more or less during the entire period between Christmas and Epiphany (Jan. 6), but belonged especially to Innocent's Day (Dec. 28). It resembled the Roman Saturnalia, and the chief participants included the subdeacons and laity. In the exercises they chose a mock bishop, archbishop, or pope, who presided at the meeting in the church, and the rites of Christianity were gone over in the ceremonies. Dancing, the singing of commonplace songs, and the wearing of masks and disguises were practiced. The Protestant Reformation counteracted the extravagancies of these festivals and put an end to them in Germany and England, but they survived in France until 1644.

**FOOT**, a unit of linear measurement, containing 12 inches. A surface, each side of which is 12 inches, is a square foot, and is equal to 144 square inches. A cube whose sides are 12 inches is a cubic foot and contains 1,728 cubic inches. The foot unit was derived from the human foot. It is used extensively as a common measure, though its length varies in different countries. In music and poetry, a foot is a term used to denote a melodic figure of notes with only one accent, or a succession of accented or unaccented syllables, which, being repeated, produce rhythm. The four principal feet in England poetry are the anapest, the dactyl, the iambus, and the trochee.

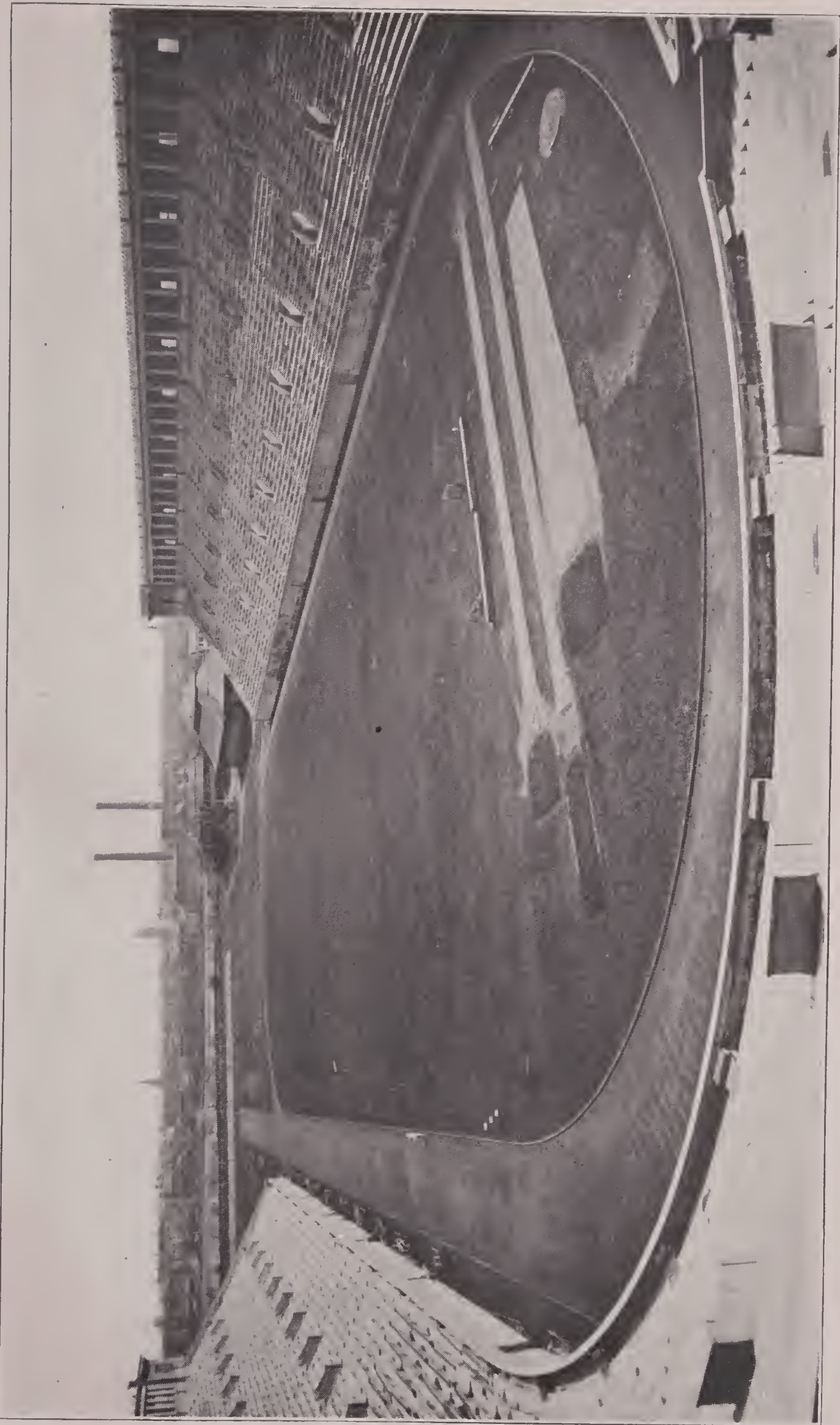
**FOOT**, the extremity of the leg below the ankle, and on which the body is supported. In man the foot is composed of seven tarsal and five metatarsal bones, so arranged and connected as to form an arch from the extremity of the heel to the ball of the toe, and the phalanges. The bones, where they articulate with

one another, are covered with a considerable layer of elastic cartilage. Between the bone at the heel and the ends of the metatarsal bones is a heavy ligament known as the *plantar ligament*, which not only holds the bones together in the form of an arch, but protects the blood vessels, nerves, and muscles that lie above it in the hollow of the foot. Another very strong, elastic ligament holds the heel bone and the central bone of the arch together. The head of the key bone, upon which the tibia sits, rests upon this ligament. The different motions of the foot are effected by five muscles. They include the *calf*, attached to the thigh and leg and below by the tendon of Achilles to the heel bone, which is the largest tendon in the body and sustains its weight in walking; the *posterior tibial*, attached at one end to the tibia and the other to the instep bone (scaphoid); the *short fibular*, attached to the fibula at one end and to the outer metatarsal bone at the other; the *anterior tibial*, which raises the toes and turns the foot outward; and the *third fibular*, whose tendons pass in front of the ankle on either side of the foot and raise the inner or outer border of the foot. The bottom of the foot is padded with fat and covered with a strong, tough skin. It forms the *sole* of the foot.

**FOOT AND MOUTH DISEASE**, an infectious disease common to domestic animals, especially swine and cattle. It occurs most frequently in Europe and Asia, but sometimes spreads to Africa and other continents. During a wide-spread attack of the contagion, it sometimes affects sheep, goats, and man, being conveyed to the last mentioned by the use of milk or meat from diseased animals. It is often fatal to young animals, but in adults it partakes of a lighter form, usually as a fever or constitutional weakness. The bacteria which causes the disease is not well understood, but it is known that the period of incubation is from three to six days, and that the virus may be destroyed by exposure to sunlight or antiseptics, such as formaldehyde and carbolic acid. Animals affected have symptoms like those of pneumonia and bronchitis and their feet, mouth, and other parts are subject to eruptions from which virus exudes. The treatment recommended is that affected animals be separated from others and quarantined, and the affected parts may be treated with antiseptic solutions.

**FOOTBALL** (fōot'bāl), a popular game played by pupils in the higher grades of the public schools and by students of colleges and universities, especially during the colder season of the year. It is an ancient game, having been popular during the prosperous eras of ancient





STADIUM OF HARVARD UNIVERSITY.

Here, in 1910, 40,000 people witnessed the Yale-Harvard football game.







Greece and Rome. The northern countries of continental Europe adopted it about the time of the Roman invasions, while the Danes popularized it in England where it became famous as a Shrove Tuesday sport as early as the 12th century. Though popular for centuries, it has taken a wider hold on the world of sport within recent years and is played with an ever-increasing fervor. Among the numerous and widely known associations are those called Rugby Association, Australian, and American Intercollegiate. Each of these and many others have definite rules, under which the members practice in the art of playing, and at specified times engage in competitive games with other associations. The associations organized at Harvard, Princeton, Yale, and the University of Pennsylvania have been known as the *Big Four*, while similar association ties have been accorded to the Western, Canadian, Indian, and other groups of organizations.

The game is played by teams of from 11 to 22 players, upon a level field. Scoring is possible in the field of the opposing side, either by getting the ball through or over a goal, or by passing it over a certain line. Each side, therefore, with the view of scoring, sends the ball in the direction of the opponents' end of the field. This may be done in two ways—by kicking and running, or by advancing it in any way except by running. The field is usually 160x330 feet, and the ball is made of leather, having a large ellipsoidal form. Among the officials are two linemen, an umpire, and a referee. The losses and advances on either side are watched by the linemen, fouling is prevented by the umpire, and the referee keeps account of the ball. In most associations the entire time of the game is 90 minutes, divided into two portions of 45 minutes, with an intermission of 10 minutes intervening. The principal rules are known as the *Association Rules* and the *Rugby Rules*.

**FOOT ROT**, a disease common among sheep. The most prevalent form is due to an unusual growth of hoof, which causes the margin or toe to turn downward and ultimately crack, thus causing openings in which dirt and sand readily lodge. As a consequence the feet become swollen and ultimately ulcerated between the toes, where proud flesh forms and causes decay.

**FORAGE** (fōr'āj), a term used to designate any food suitable for horses, cattle, and sheep, including such as hay, straw, and ensilage. Among the forage plants cultivated extensively are clover, orchard grass, alfalfa, timothy, corn, broom corn, and sorghum. However, the straw

and chaff of many cereals, such as wheat and oats, are important animal food products. The species of plants cultivated for forage depend upon the temperature and aridity quite as much as upon the different kinds of soil. In many portions of the West native grasses still constitute an important forage crop, while in the East and the arid regions of the far West forage plants are grown with a high degree of care. In the West and Southwest, where moisture is supplied by irrigation, the larger forage plants are cultivated extensively, such as alfalfa, sorghum, and millet.

**FORAMINIFERA** (fō-rām-ĭ-nĭf'ĕ-rā), a group of small animals, classed with the mollusks on account of having beautiful shells. However, a few of the species are naked, while many have very complicated and remarkable coverings. They belong to the protozoan group and, like them, reproduce in all three ways common to that form of life. The species are widely distributed, but are most common in salt water. Fossils of these animals are very numerous, and vast beds of rock are constructed almost entirely of their shells. The chalk cliffs of England and the Silurian beds of Russia are examples of fossils of these animals.

**FORCE** (fōrs), an exertion or influence that, if made to act on a body, has a tendency to affect or stop it if in motion, or to move it when at rest. Light, heat, gravitation, electricity, motion, cohesion, magnetism, and chemical affinity are thought to be manifestations of the force from which originate all phenomena of the material world. Mechanical force originates from life, gravitation, and the sources of heat, light, and electricity. Two systems are used for measuring force, the Metric system and the English system, the dyne being the standard of measure in the former and the poundal in the latter. To measure the effect produced by any mechanical force it is necessary that three things be known—the point of application at which the force acts, the direction in which the force acts, and the intensity with which it acts. When two or more forces act in the same direction, the resultant is equal to the sum of the forces. If two equal forces act in opposite directions, thus opposing one another, the body acted upon remains at rest, but, if the forces acting are unequal, it moves in the direction of the greater with a force equivalent to their difference. Two forces acting at an angle with each other produce a resultant in an intermediate direction, the force of which equals the mean of the two acting forces. The *resolution* of a force is the separation of it into the components which produce



that force, and the *composition* of forces is the combining of two or more into one.

Various terms are used to designate forces according to their nature and the manner in which they act. The most common classification includes parallel forces, constant forces, accelerating forces, resultant forces, uniform forces, and variable forces. By *parallelogram of forces* is meant the method of determining the direction and intensity of two forces, while *unit of force* implies a single force, whose terms being known, serves as a unit to ascertain the amount of any other force. The force exerted in a direction outward from the center, by a body moving in a circular path, is called the *centrifugal force*, while the *centripetal force* is exerted from without toward the center. Since the centrifugal force is a consequence of the rotation, it ceases when the centripetal force ceases, and the body moves in a straight line known as a *tangent*. The area in which a force acts is called the *field*. Centrifugal force is proportional to the mass and to the square of the velocity of the rotating body. If the mass of the rotating body be doubled, it requires twice the amount of force to prevent it from moving away from the center of motion, and, if the velocity be doubled, four times the force is necessary for it to retain its position. The motion of the planets around the sun affords good illustrations of centrifugal and centripetal forces. These bodies constantly tend to move away from the sun by reason of the motion originally given to them, while the attraction of the sun holds them in an almost circular path.

**FORCE BILL**, the name applied to several bills passed by the Congress of the United States. In 1828 a protective tariff act created much discontent and South Carolina claimed that the State had power to nullify objectionable Federal enactments. Congress passed a bill to enforce the tariff law in 1833, known as the Force Bill or the Bloody Bill. A bill for the enforcement of the Fourteenth and Fifteenth amendments to the Constitution became law May 31, 1870. It made punishable by fine or imprisonment all attempts at intimidation, bribery, or hindrance in the matters of registration and qualifying for voting. A much more stringent law was enacted in 1871 to put down the conspiracies against civil rights by the Ku-Klux Klan. The name Force Bill has been applied to the Lodge election bill which passed the House July 2, 1890, "to amend and supplement the election laws of the United States, and to provide for a more efficient enforcement of such laws." This bill was defeated in

the Senate by a combination of those who favored the adoption of free coinage legislation.

**FOREST** (fōr'ĕst), a large tract of land covered with a natural growth of trees and underbrush, though often with intervening spaces of open ground. The countries of Europe have provided protection by law, by which it is designed to preserve the forests for judicious use and prevent wholesale and needless destruction. Such acts of preservation operated to preserve many desirable tracts in Austria, Germany, France, and other countries, of which Epping Forest, near London, is a good example. Similar laws have been passed in Canada and the United States, and, besides, there has been legislation aiming to extend rather than abridge the forest area. The timber-culture law passed in the United States in 1872 remained in force 21 years, and provided that 160 acres of the public domain could be acquired by cultivating ten acres of trees for a period of eight years. Under this act about 50,000,000 acres of trees were planted and cultivated in the great prairie regions of the West. The Nebraska State board of agriculture in 1874, under the suggestion of J. Sterling Morton, recommended that a day be dedicated each year to the planting of trees. This suggestion was acted upon by all the states and territories, not only through individual effort, but by the formal effort of public schools. As a consequence many trees and tracts of timber have been planted and cultivated on private and public property. See **Arbor Day**.

Natural forests are found widely distributed where moisture is abundant and the temperature is favorable to plant growth. The forests of the Torrid Zone are the most luxuriant and cover vast areas along the streams and bodies of water, even to a considerable height above sea level. As we proceed north and south from the Equator we find the forests gradually decreasing in density and size of trees up to the higher latitudes, where they finally become rare and gradually disappear. The most extensive forests of the world are found in the valleys of the Amazon and Orinoco; the lake region of Africa, and in the southern parts of Eurasia. The higher altitudes, even in tropical countries, are destitute of forest growth, though plant life thrives in such regions at a much higher elevation than in the Temperate Zone and extends far into the higher latitudes, even to regions having much soil perpetually below the freezing point of water.

The forest area of the United States is placed by the Department of Agriculture at about 500,000,000 acres. Alaska has excellent timber and





AMONG THE GIANT REDWOOD TREES IN THE MARIPOSA GROVE OF CALIFORNIA.







comparatively little of it has been put on the market. The output of lumber in the United States is 30,500,000,000 feet annually, of which the largest part is obtained in Wisconsin, Michigan, Minnesota, and on the Pacific coast. About one-fourth of the output is obtained in Michigan, Wisconsin, and Minnesota, which states yield an excellent quality of pine, hemlock, and the hard woods. Pine, fir, and spruce lumber is obtained in large quantities in Oregon, Washington, and California. The product is used chiefly in manufactures, railway construction, fencing, for building purposes, and for fuel. While there is danger of the visible supply decreasing beyond legitimate limits, the

mer. Their roots penetrate the soil and facilitate the entrance of water after rains and the shadow of their branches retards evaporation. In this way they extend the surface of moisture and visibly affect rainfall. This point of advantage is further accelerated by the fact that forests prevent accumulated snows from melting rapidly, thereby counteracting floods, such as result where the forest area is robbed of its timber. Where forests do not abound, the rainfall rapidly runs off the surface and finds its way back to the ocean. Besides causing floods, this tendency visibly influences temperature and productiveness.

The forest areas in the United States equal



larger use of steel for construction purposes is relieving notably the demands annually made upon the forests. Besides, the consumption is affected by the increased use of coal, gas, and electricity for motive and heating purposes.

Forests are the natural home of many birds and wild beasts and have marked utility for their influence upon the occupations of man. They supply material for dyes, medicines, and numerous articles of value in the arts. The soil is enriched by the decaying trunks and foliage of trees. They furnish shelter from winds and storms in the winter and are a protection against the scorching heat of the sum-

mer. Their roots penetrate the soil and facilitate the entrance of water after rains and the shadow of their branches retards evaporation. In this way they extend the surface of moisture and visibly affect rainfall. This point of advantage is further accelerated by the fact that forests prevent accumulated snows from melting rapidly, thereby counteracting floods, such as result where the forest area is robbed of its timber. Where forests do not abound, the rainfall rapidly runs off the surface and finds its way back to the ocean. Besides causing floods, this tendency visibly influences temperature and productiveness.

about one-third of the area of the country, exclusive of Alaska. About seven-tenths of the timbered area is between the Mississippi and the Atlantic coast. Of the entire forest wood 75 per cent. is coniferous, which requires about three-quarters of a century to grow to maturity. Timber of much value is obtained from the Philippines, where the forest areas exceed 40,000,000 acres. Canada has about a million square miles of standing timber and contains the largest white pine areas in the Western Hemisphere. The annual production of lumber aggregates \$80,000,000 per year, about one-third of which is exported to the United



States. Russia has the largest forest areas in the world, a total of 812,640,600 acres, three-fourths of which belong to the government. Forest fires and the clearing of the ground for cultivation are prolific sources of forest destruction. Great carelessness has been displayed in lumbering and in setting fires to brush left on the ground after the more valuable trees have been cut. However, the government has displayed much wisdom in protecting the forests and in encouraging schools of forestry.

**FORESTERS, Ancient Order of**, a fraternal organization founded in Yorkshire, England, in 1745. Though it has been maintained continuously since that time, its material growth dates from the early part of the 19th century. The first court was established in America in 1832, at Philadelphia, Pa., and since then it has spread rapidly in Canada and the United States. In 1908 it had about 9,500 courts, with 1,000,000 members, of whom about 50,000 were in Canada and the United States. Courts are maintained in 36 countries. It is one of the largest beneficiary societies of the world. The benefits distributed annually aggregate \$5,000,000.

**FORESTERS, Independent Order of**, a society founded in 1874 at Newark, N. J. It was reorganized in 1881 and maintains courts in Canada, the United States, Great Britain, Australia, and other countries. The society has about 5,000 local courts, which are under the direction of high courts, and the general government is vested in a supreme court. The order is both fraternal and benevolent, has 240,000 members, and has disbursed in benefits about \$19,500,000 since its organization.

**FORESTERS OF AMERICA**, a benevolent and fraternal society, reorganized under its present name in 1895. It originated from the Ancient Order of Foresters (q. v.), introduced in America in 1832, but separated from the mother organization in 1889. In 1908 it had 1,750 courts and 250,000 members. The annual payments as benefits approximate \$1,125,000. Since its organization about \$13,500,000 has been disbursed.

**FORESTRY**, the management and preservation of trees in communities. This branch of economic study is concerned with the planting of trees and the utilization of both cultivated and native forests with the view that the best possible good may be obtained. Man has been the worst enemy of forests in America since the discovery of this continent. Lumbering has greatly lessened the visible supply, but forests are also destroyed by insects, fungous diseases, drought, forest fires, and the grazing of ani-

mals. Attention has been directed to forestry both with the view of planting new forests and preserving old ones, and it is designed to prevent ruthless destruction as well as to utilize to the best advantage the supply of timber for fuel and for construction.

Forestry has been a branch of study in the institutions of Europe for many years, especially in Germany, whose foresters are considered the best prepared and most skillful in the world. The need of some rational system of forest management is recognized by the leading nations. Canada has forest reserves of about 12,500,000 acres and has a well-disciplined corps of officials to aid in diffusing knowledge of forestry and protecting the forests on the public lands. The Bureau of Forestry, established in 1901 under the Department of Agriculture, is an important branch of the government in the United States. The chief aim is to develop scientific forestry. In literature sent out by this bureau the benefits of studying forestry are shown, which include an investigation of climatic influences upon shrubs and trees.

Among the advantages of forests are that they conserve moisture and thereby increase rainfall. They temper hot and cold winds and are useful in reclaiming tracts of almost barren land. The benefits of wind-breaks are seen on the great prairies of Canada and the United States, where innumerable hedges and groves have been planted. Parks and clusters of trees furnish covering for birds and add to the enjoyment of man. The schools of forestry aid in studying the adaptation of various trees to particular localities, especially as they are influenced by soil, moisture, and temperature, and much valuable information has been given in regard to the selection of land for reforestation and the care to be given growing trees.

The interest in forestry is promoted not only by the general government, but likewise by the several states and minor subdivisions. In 1885 New York created a forest commission, and that State has a reservation in the Adirondack and Catskill regions amounting to 1,250,000 acres. Constitutional provisions for forestry have been made in many states, while in others the regulations are by legislative enactments. Colleges of agriculture have placed forestry in the regular courses and the American Forestry Association has promoted interest by holding meetings and issuing reports.

**FORGE** (fōrj), an open fireplace or hearth with forced draft for heating iron, steel, or other substances. The term is also applied to a workshop where metals are hammered and shaped by the aid of heat. Forges were for-



merly made of brick, with a large leather bellows to furnish the blasts of air, but at present are made largely of iron and the blast of air is obtained from a rapidly rotating fan wheel. All heavy forging is done by hammers run by machinery. In the great Krupp works at Essen,



BLACKSMITH'S FORGE.

PORTABLE FORGE.

Germany, is the largest forge hammer in the world. It is constructed so skillfully that it can be manipulated to gently crack a small nut or sufficiently forceful to crush a thick bar of iron.

**FORGERY** (fôr'jēr-ÿ), in law, the act of falsely making or materially altering a writing or written instrument, with intent to defraud. Forgery consists essentially in making a false instrument appear to be legal and genuine. It is a grave offense, punishable by fine or imprisonment in the penitentiary. The national governments of all countries provide punishment for forgery by legal enactments, and additional protection is provided by laws in the states and provinces. In most countries the Federal government has exclusive jurisdiction of cases which arise from forging, uttering, or publishing as true any papers relating to the nation, while the states and provinces have jurisdiction of those arising under their laws. The false making or altering of papers with intent to defraud are not the only offenses that come under the head of forgery, but such offenses as changing records and altering brands or stamps are included.

**FORGET-ME-NOT** (fôr-gět'mē-nöt), a genus of plants generally diffused over the North Temperate Zone. The flower is small and is blue in most species. It has five petals and a salver-shaped corolla. On account of its brilliancy of color, and, being the emblem of constancy in friendship and love, it is a favorite flower in most countries. The dark blue forget-me-not of the Azores is cultivated extensively. The present name is from the German *Vergiss-mein-nicht*, while the former English name, *scorpion grass*, is rarely used at present.

**FORKS.** See **Cutlery.**

**FORLORN HOPE** (fôr-lôrn'), a military term applied to a body of men selected from an army for the performance of some exceptionally dangerous duty, such as leading the assault upon a fortress or heading a perilous charge in battle. Those who undertake such a task usually are volunteers, and a liberal reward is generally given to those who survive.

**FORMIC ACID** (fôr'mik), a simple fatty acid of organic chemistry, so named from its being found in the bodies of ants. It is prepared artificially by dissolving sugar, starch, or tartaric acid in water, then adding sulphuric acid, and distilling the mixture on peroxide of manganese. Pure formic acid solidifies at a low temperature, forming a crystalline mass. It is strongly acid, colorless, and transparent, and has a pungent odor. It is very corrosive and, when placed on the skin, causes intense irritation.

**FORMOSA** (fôr-mō'sà), or **Taiwan**, an island lying off the eastern coast of China, in the Pacific Ocean. It is separated from the province of Fo-Kien by a strait about 85 miles wide. The island has a length of 240 miles, an average breadth of 72 miles, and an area of 13,418 square miles. The surface is mountainous, especially in the interior. Mount Morrison is the culminating peak, having a height of 14,360 feet. A part of the surface is made up of barren clay hills, but the plains and valleys are fertile. Among the principal products are sugar, rice, silk, tea, tobacco, camphor, vegetables, coal, and fruits. The climate is favorable and healthful and the rainfall is abundant. Formosa was opened to foreign trade by the Treaty of Tien-tsin in 1858, when Takow, Tainan, Anping, and Tamsui were made free ports. Japan, China, and Great Britain have the principal part of the trade. Camphor, salt, and opium are controlled as government monopolies. About 450 miles of railways are open to traffic and a number of others have been projected.

China undertook to explore and settle Formosa as early as 603. The Dutch controlled a large portion of the island in the 17th century, but it remained a Chinese territory the greater part of the time. About 500,000 Chinese immigrants settled in the western portion during the Chinese occupation of the island. They greatly modified the industries which prior to that time were under the exclusive control of the Malays. After the war between China and Japan, in 1895, it was ceded to the latter country by treaty, and now constitutes a Japanese possession. A native revolt occurred in 1897, but it



was suppressed by the government, and local officials were enjoined to show a spirit of fairness and benevolence in the administration of public affairs. Many schools and public institutions have been established by the Japanese. The native inhabitants are chiefly Hakkas and the aboriginal tribes and clans. Population, 1906, 3,081,962.

**FORT DEARBORN.** See *Dearborn, Fort.*

**FORT DODGE**, a city of Iowa, county seat of Webster County, on the Des Moines River, about 85 miles northwest of Des Moines. It is on the Chicago Great Western, the Illinois Central, the Minneapolis and Saint Louis, and other railroads. Intercommunication is by electric urban and interurban railways. The chief buildings include the post office, the county courthouse, the public library, the high school, the First National Bank, and a number of fine churches. Among the manufactures are flour, ironware, clothing, oatmeal, tile, pottery, stucco, and machinery. The surrounding country is fertile, possesses extensive dairy interests, and is rich in coal, gypsum, and fire clay deposits. Among the municipal facilities are paved streets, waterworks, electric and gas lighting, and a system of sanitary sewerage. It has a large trade in cereals and merchandise. Population, 1905, 14,369; in 1910, 15,543.

**FORT DUQUESNE** (du-kān'). See *Pittsburg.*

**FORT ERIE.** See *Erie, Fort.*

**FORT FISHER** (fish'ēr), a fortress below Wilmington, N. C., at the entrance to Cape Fear River. General Butler led a force of 6,000 men against the fortress in December, 1864, and was aided by Admiral Porter with a fleet of ironclads. The project of taking the fortress was abandoned after two days, but on Jan. 13, 1865, a second attempt was made by General Terry and Admiral Porter, which resulted in its capture. The Union army took 2,000 prisoners and 170 heavy guns.

**FORTH**, a firth and river of central Scotland, formed by the confluence of the Dhu and Duchray in Perthshire. The river is 170 miles long and merges into the Firth of Forth, a body of water extending fifty miles east from Alloa to the North Sea. It has important salmon and herring fisheries. The celebrated Forth Cantilever Bridge, a railway viaduct at Queensferry, is 4,000 feet long. This bridge is 8,295 feet, or about a mile and a half long, and the cantilevers cover about one mile. It was completed in 1889 at a cost of \$13,000,000.

**FORTS HENRY AND DONELSON**, two forts erected by the Confederates in Tennessee, near the border of Kentucky. Fort Henry was

located on the Tennessee River, about twelve miles from Fort Donelson, which was on the Cumberland River, being about forty miles from where these rivers flow into the Ohio. They were strongly manned in 1861 and constituted important strategic points, since they controlled the entrance into the Southwest by means of the Cumberland and Tennessee rivers. General Grant, assisted by a river fleet under Commodore Foote, decided to attack Fort Henry on Feb. 2, 1862. On the 6th Commodore Foote made a vigorous attack and compelled the surrender of the works, but the Federal military forces were delayed and the Confederate garrison meanwhile escaped to Fort Donelson. General Grant made a vigorous attack upon the latter on Feb. 13, 1862. Two days later General Buckner addressed a communication to General Grant in which he requested that a commission be appointed to settle upon terms of capitulation. To this Grant sent his famous reply: "No terms except unconditional and immediate surrender can be accepted. I propose to move immediately upon your works." The terms were accepted by Buckner, who surrendered 14,000 prisoners.

**FORTIFICATION** (fôr-tī-fī-kā'shŭn), a military defensive work, erected for the purpose of strengthening a place or position. The term also applies to the science of fortifying a position in such a way that it may be held by a body of men much inferior in numbers to their assailants. It implies a knowledge of the resistant power of materials as well as advantage in positions, so the construction may be devised in a manner that the enemy in attacking must of necessity suffer great loss. Defensive works are either regular or irregular as to construction, and, with respect to time, are distinguished as *permanent* and *temporary*, or *field*, fortifications.

The history of fortifications is as old as that of offensive and defensive warfare, though the process of construction has undergone numerous modifications, which were necessitated largely by the modern improvements in the implements of war. The student of history finds numerous references to defensive fortifications as the different peoples are studied. Thus, we recall the story of Troy, in which it is related that the city stood safely against the Grecians until the colossal wooden horse was taken within its walls against the admonition of Laocöon. The walls of Babylonia were 32 feet thick, 100 feet high, and strengthened by great towers. The walls of Jericho resisted the invading hosts of Israelites, and, according to the Scriptures, crumbled before them only after



divine aid was extended. Many ancient walls of Asiatic cities still remain. Though having answered a good purpose in resisting the attacks with battering rams and ancient implements, they serve but illy when brought to a test against modern ordnance.

Soon after gunpowder became known to the Europeans, the modern nations began to devise new implements of war, and likewise sought to counteract their effect by powerful works of defense. The Italians began in the 15th century to construct bastions, while the French engineer, Sébastien de Vauban (1633-1707), who served under Louis XIV., developed the *bastion system* to such an extent that it still prevails in France as the general type of fortifications. However, this system has given way largely in most countries to the German *polygonal system*, which is sometimes called the *caponiere system* on account of employing numerous caponieres to span ditches, thus utilizing them instead of bastions for defensive purposes.

In constructing field fortifications, engineers take advantage of position with the view that the enemy will be exposed to fire and cross fire in making the attack. The general plan aims to require a hazardous march across an open field, in which those within the line of fortifications may at an advantageous time send forth detachments to make counter charges. Among the field fortification works are the *redan*, which forms an angle in front of the enemy. It has two parapets protected by a ditch; the *redoubt*, an inclosure with a parapet and ditch encircling it; and the *lunette*, a redan construction with numerous short flanks. These works are so constructed that they flank each other within the range of rifle fire, and are further strengthened by entrenched camps and by a series of rectangular or square redoubts. In case the time to construct is limited, such simple entrenchments as shelter trenches are speedily thrown up. These temporary forms consist of earth thrown toward the front, back of it being a ditch in which the rifleman lies securely protected from the fire of lighter implements. An abatis of felled trees and barbed wire fences is effective in impeding the advance of the enemy. Barbed wire has been used extensively for this purpose within recent years.

The fortifications of seaports are quite different from those constructed for the defense of interior positions. Heavy ordnance which throw dynamite shells and other powerful explosives a distance of six or eight miles have made it necessary to greatly revolutionize defensive warfare. The largest guns obtainable are securely

mounted, and by means of them the enemy's ships can be reached by the most powerful explosives and leaden balls. For additional protection the enemy's ships are watched with the aid of powerful electric lights and swift steamers are utilized to scout. In many instances torpedoes plow under the water, by which it is aimed to strike the enemy's ships from below. The outer defensive works consist of submarine mines, which are set off by the enemy's ships, or by means of electric connection from the shore.

*Permanent fortifications* are constructed of massive stone and iron works and are designed to defend important cities or strategic points. It is doubtful whether any fortress can be built that would form a serious obstacle to a modern land and naval attack, if the assailants were supplied with the most powerful modern guns. The greatest fortress in the world is the celebrated stronghold of Gibraltar, on the coast of Spain. It is considered impregnable to military assault, though this is due to its natural situation rather than to its artificial strength. Since modern guns have been able to obliterate practically all the older forms of fortresses, the newer are designed for offensive action rather than great strongholds of defense. They are constructed on the spherical plan, supplied with guns of the heavier caliber, and designed for special effect against ricochet firing. Places permanently fortified are inclosed by *ramparts*; the upper surface, called the *terreplein*, serves as the location of troops and cannon. *Parapets* or *breastworks* protect the terreplein against the fire of the enemy, while *embrasures*, through which the guns are fired, pierce the parapets at convenient intervals. *Ditches* about twelve feet in depth are excavated outside the rampart, often filled with water, and rendered serviceable in delaying the enemy's advance, along with wire fences and by other obstructions. The United States has permanent seacoast defenses at about forty localities. They include Hampton Roads, Va., Boston, Mass., New York, N. Y., Washington, D. C., Charleston, S. C., Key West, Fla., New Orleans, La., Galveston, Tex., San Francisco, Cal., and the mouth of the Columbia River, Ore. and Wash. Many cities and seaports of Canada are protected by fortifications, of which those at Quebec, Quebec, Esquimaux, British Columbia, and Halifax, New Brunswick, are the most noteworthy. Indeed, Halifax is the chief naval station of the British in North America. It is defended by eleven forts and batteries, one of which, the Citadel, is counted, next to Quebec, the strongest fortification in America.



**FORT MADISON** (mäd'i-s'n), a city in Iowa, county seat of Lee County, on the Mississippi River, eighteen miles southwest of Burlington. It is on the Chicago, Burlington and Quincy and the Atchison, Topeka and Santa Fé railroads. Among the chief buildings are the county courthouse, the State penitentiary, the Catermole Memorial Library, and the high school. The manufactures include furniture, machinery, woodenware, flour, boots and shoes, paper, and leather. It has electric lighting and other public utilities. The city has an important trade in farm produce and merchandise. It was settled in 1832 and incorporated in 1836. Population, 1905, 8,767.

**FORT MIMS, Massacre of**, an assault during the Creek War, Aug. 30, 1813, at Fort Mims, about 35 miles north of Mobile, Ala. The fort was a temporary stockade under command of Dixon Bailey and about 550 persons had assembled there for protection. Weathersford, a half-breed, made an attack with a force of Indians. The fort made a vigorous defense, but was overpowered by superior numbers, and only fifteen escaped, all the others being massacred.

**FORT MONROE** (mün-rō'), or **Fortress Monroe**, the strongest fortification in the United States, situated on Hampton Roads, Virginia. It was erected for the defense of the Norfolk navy yard, on the coast of Virginia, and occupies a fine site at Old Point Comfort. The plans and construction were completed under a French engineer. It is on a reservation of 282 acres and has within it detached buildings for workshops, barracks, officers' quarters, storehouses, and an artillery school. Many tourists visit the place, owing to its fine climate and extensive hotel, railway, and steamboat connections. In the Civil War it was an important Confederate stronghold. Jefferson Davis was imprisoned for two years at Fort Monroe after the war closed.

**FORT MOULTRIE** (möl'tri), a fortification situated on Sullivan's Island, near the entrance to Charleston harbor, South Carolina. The fort was originally constructed of earth and logs, but was afterward rebuilt in masonry. A British fleet made an unsuccessful attack upon it in 1776. It was then known as Fort Sullivan and was defended by 6,500 Americans, of whom 435 were stationed at the fort. The British fleet under Sir Peter Parker and a force of regulars under Sir Henry Clinton made a combined attack, but they were compelled to abandon the invasion of the South. However, it surrendered to the British on May 7, 1780. The name was changed during the

Revolutionary War to Fort Moultrie in honor of Col. William Moultrie, who defended it at the beginning of the war. In December, 1860, it was abandoned by Major Anderson, when it fell into the possession of the Confederate forces.

**FORT NIAGARA** (nī-äg'ä-rä), a fort near the mouth of the Niagara River, on the American side, located by La Salle as a fortified trading post in 1669. This was afterward destroyed and abandoned and Fort Niagara was built on the same place by the French in 1725. The English under Sir William Johnson captured it during the French and Indian War, in 1759, hence the French were cut off from all their posts in the interior. During the American Revolution it was a center of British influence, whence many expeditions were sent to points farther south. It was evacuated by the British in 1796 as provided in the Treaty of 1783 and became the seat of an American garrison. In 1813 it was captured by the British, who crossed over from Canada and made a night attack upon the fort, but in 1815 it was again surrendered to the United States. It ceased to be a fort in 1826, when the Federal garrison was withdrawn.

**FORT PICKENS** (pik'enz), a fort in Florida, on Santa Rosa Island, at the entrance of Pensacola Harbor. A Federal force under Adam J. Slemmer was in possession of the fort at the beginning of the Civil War, and was besieged by the Confederates under Braxton Bragg. In April, 1861, reënforcements were sent to relieve the fort and it was held by the Federals throughout the war. Fort Pickens is a defense to the United States navy yard at Warrington.

**FORT PILLOW**, a fort on the Mississippi River, in Tennessee, forty miles north of Memphis. It was so named from General Pillow, under whose direction it was constructed by the Confederates in 1862, but a small Federal force captured it soon after. General Forrest made an attack upon it April 12, 1864, and the garrison was reduced after stubborn resistance. It was asserted that many of the Federals, about half of whom were Negroes, were massacred after they had surrendered, but this charge was denied by the Confederates on the ground that the garrison conducted a reckless defense, hence many of the soldiers were killed after resistance was futile.

**FORT SCOTT**, a city in Kansas, county seat of Bourbon County, on the Marmaton River, 98 miles south of Kansas City. It is on the Missouri Pacific, the Missouri, Kansas and Texas, and other railroads. The surrounding



country is fertile and contains valuable deposits of cement rock, flagstone, and bituminous coal. A system of street lighting, electric railways, a public park, and a city library are among the facilities. The public buildings include a United States courthouse and post office, a high school, an academy for girls, and a normal college. The manufactures include woolen goods, beet sugar, cigars, clothing, flour, machinery, soap, vehicles, and sorghum. It was settled in 1838 and incorporated as a city of the first class in 1886. Population, 1904, 14,081.

**FORT SMITH**, a city in Arkansas, county seat of Sebastian County, on the Arkansas and Poteau rivers, 130 miles northwest of Little Rock. It is on the Kansas City Southern, the Saint Louis and San Francisco, and other railroads. The chief buildings include the county courthouse, the United States customhouse, the high school, and the public library. It is the seat of a United States district court. The manufactures include cotton seed oil, cigars, furniture, ice, cotton goods, and machinery. Electric lights, rapid transit, pavements, and waterworks are among the improvements. It was settled in 1838, incorporated as a town in 1842, and chartered as a city in 1886. Population, 1900, 11,587; in 1910, 23,975.

**FORT STANWIX** (stān'wīks), a fort built by the English under Brigadier Stanwix in 1758, on the site occupied by Rome, N. Y. It was an important strategic point, owing to its location on the principle route between Canada and points in the State of New York. In 1768 Sir William Johnson made a treaty at this place with the Six Nations, who surrendered title to a large part of the region now included in West Virginia, Kentucky, and Pennsylvania. It was rebuilt in 1776 and named Fort Schuyler. The following year it was attacked by a British force under Saint Leger, who had advanced from Canada. See **Oriskany, Battle of**.

**FORT SUMTER** (sūm'tēr), a fortification situated at the entrance to Charleston harbor, South Carolina, and named after Thomas Sumter, an American leader in the Revolutionary War. South Carolina seceded in December, 1860, and Major Anderson, the commanding officer, abandoned the adjacent forts and occupied Fort Sumter with 100 men and 52 light guns. General Beauregard led an attack on the fort April 12, 1861, and two days later it was compelled to surrender. This event was the beginning of the Civil War, and the news of it immediately spread the fire of enthusiasm over the entire North and brought that sec-

tion to arms. The Confederates held the fort until after the evacuation of Charleston, but surrendered it on April 14, 1865, four years after its capture. Soon after the loss of Fort Sumter to the Confederates, Richmond was evacuated, the Confederate forces surrendered, and their cause was entirely abandoned. Since the Civil War it has been rebuilt and greatly improved.

**FORT WAYNE** (wān), a city of Indiana, county seat of Allen County, on the Maumee River and the Wabash and Erie Canal, about 150 miles southeast of Chicago, Ill. It is on the Wabash, the Pennsylvania, the Lake Erie and Western, the Lake Shore and Michigan Southern, the Grand Rapids and Indiana, and other railroads, and is the converging center of several electric interurban railways. Among the noteworthy buildings are the county courthouse, the Carnegie public library, the Federal building, the Concordia College (Lutheran), the Indiana School for Feeble-Minded Youth, and a Roman Catholic academy. The architecture is modern and substantial, including many tall office, bank, and hotel buildings. It is surrounded by a productive farming country and has a large wholesale and jobbing trade. Among the chief manufactures are agricultural implements, furniture, steam engines, car wheels, electrical apparatus, leather, stoves, woolen goods, and hardware. It has extensive systems of sewerage, stone and macadam paving, waterworks, and gas and electric lighting. Fort Wayne was so named from Gen. Anthony Wayne, who built a fort here in 1794, and a monument has been erected to his honor. It was chartered as a city in 1839 and became prosperous in 1840, after the completion of the Wabash and Erie Canal. Population, 1900, 45,115; in 1910, 63,933.

**FORT WORTH**, a city of Texas, county seat of Tarrant County, at the junction of the Trinity, Clear, and West rivers, about 170 miles north of Austin. It is on the Fort Worth and Denver, the Texas and Pacific, the Chicago, Rock Island and Pacific, the Gulf, Colorado and Santa Fé, and other railroads, and is connected with Dallas, thirty miles east, by an electric railway. The Clear River and numerous artesian wells furnish an ample supply of water for manufacturing and sanitary purposes. An extensive street railway system penetrates all parts of the city, while electric lighting, waterworks, public libraries, and an excellent school system are among the general facilities. It is the seat of the Natatorium, a bathing establishment costing \$50,000. Among the educational institutions are the Fort Worth



University, the Polytechnic College, the Fort Worth Medical College, and a Roman Catholic academy. The city hall, courthouse, high school, and chamber of commerce building are convenient and costly edifices. It has manufactures of wire, flour, hardware, jute, clothing, cotton and woolen goods, leather, and machinery. Fort Worth has a large trade in farm produce, live stock, and merchandise. It was settled in 1849 and incorporated in 1872. Population, 1900, 26,688; in 1910, 73,312.

**FORUM** (fō'rūm), in Roman history, a public place or square in a city where markets and public assemblies were held and where justice was administered. The most noted in Rome was the Forum Romanum, situated between Mount Palatine and the Capitoline Hill, which was adorned with exquisite statuary and magnificent buildings, and beautified by foliage, flowers, and walks. The government of Italy has recently made excavations and is preserving the more valuable relics for study. Legally, the term *forum* implies a court where an action may be instituted.

**FOSSILS** (fōs'sils), the organic bodies that were buried in past ages by deposits of earth, and which preserved their form or substance so as to be capable of identification. The term is also applied to indentations made by animals on rocks while forming, as the imprints of birds walking on pasty deposits. Some fossils consist of vegetable and animal parts in a good state of preservation, as the trunks of trees or the bones, teeth, and horns of animals, and the shells of mollusks. The process of fossilization is due to the decomposition of the least permanent in the organic structure and its replacement with some mineral matter. In some cases new material is substituted for the entire decomposed mass, while in others the organic remains are preserved in an almost perfect state. Shells, wood, and other substances are frequently changed into various siliceous fossils by subjecting the organism to the action of water containing silica in solution. Similar results take place when the mineral matter is iron oxide, pyrite, or calcium carbonate, while in rare cases barite and fluorite have a like effect. When the organic portions pass away in decay, the mineral matters slowly take their place.

Fossil footprints of extinct animals have been discovered in the Triassic and Carboniferous rocks of Eurasia and in the Cambrian, Silurian, and Carboniferous of America. The imprints are largely those of birds, reptiles, mollusks, fish, and insects, and were made either by the feet in walking or by the body in

making impressions in the mud after death. Fossil botany now includes many extinct plants, among them those of the Dakota group of cretaceous deposits, found in America; those of the Fayette formation, and those of the Florissant, found in Colorado, each of these including a large number of species. Among the recent publications on this subject are F. H. Knowlton's "Catalogue of Cretaceous and Tertiary Plants of North America" and A. C. Seward's "Fossil Plants for Students of Botany and Geology."

**FOSTORIA** (fōs-tō'rī-à), a city of Ohio, in Seneca County, about twelve miles west of Tiffin. It is on the Lake Erie and Western, the Baltimore and Ohio, and other railroads, and has a large trade in produce and merchandise. The surrounding country is fertile, producing cereals and fruit, and gas and oil fields are worked in the vicinity. Among the noteworthy buildings are the high school, the city hall, and the Ohio Normal University. The manufactures include flour, cigars, machinery, glass, and utensils. Gas and electric lights, street railways, waterworks, and fine school buildings are among the improvements. Fostoria was named from the father of Charles Foster, who was Governor of Ohio. The present charter dates from 1889. Population, 1900, 7,730.

**FOUNDRY** (found'rĭ), an establishment which is supplied with the necessary machinery to melt and mold cast iron and other metals on a large scale. Foundries are usually located near the blast furnaces, or have such furnaces within the main or adjacent buildings, and from these the products of pig iron are obtained for the second fusion, which is the special object of the foundry. The process of shaping metallic figures is done by pouring the molten materials into molds in which it cools and solidifies. This operation is called *found-ing* or *casting* (q. v.). The mold used is usually in two parts, one containing the pattern, which is surrounded by a fine molding sand, and the other part is tightly fitted to it. When the pattern is completely packed, it is removed carefully, leaving the sand so it forms a perfect mold for the object to be cast. The molten metal is poured into ladles, by which it is transmitted into the mold through small holes made through the sand. Much care is required in founding complicated parts of machinery. The manufacture of stoves, hollow ware, and various castings for machinery comprise the more important products of foundries. See **Casting; Furnace.**

**FOUNDLING HOSPITAL**, an institution



for the reception and support of deserted children. Two classes are maintained, those supported by the government and those depending for support on private or sectarian aid. Abandoned children are known as *foundlings*, and the cause of their desertion is in most cases illegitimate birth, though quite a number are abandoned, as a result of poverty or unhappy wedlock. Formerly the county poor farm was the only place provided for foundlings, but more recently better provisions have been made, especially in the larger cities, where foundling hospitals are very essential. The death rate in these institutions on an average is about 75 per cent., though it is frequently much higher. This is due to the circumstance that children received there are not in a good state of health, or are weakened by the anxiety and poverty of the mother. Children receive careful medical treatment and those that survive are usually placed in homes. The first foundling hospital was established in Milan, Italy, in 787. Soon after they became common in many cities of Europe. At present private or public institutions of this kind are maintained in many of the great cities of the United States and in some of the cities of Canada.

**FOUNTAIN** (foun'tin), an artificial basin containing water for drinking or other useful purposes, and connected by an arrangement of pipes through which water is forced to specific heights in ornamental jets. The pressure of the water at the head of the pipes is sufficient to cause it to rise to almost the same height at the orifice of issue. Many of the larger cities maintain elaborate fountains in public parks and squares for refreshing and ornamental purposes, while very beautiful effects are seen in connection with them at the great expositions. Among the most noted fountains are those at Rome, Berlin, and Paris. Those in Paris are mostly at the Place de la Concorde and at the Tuileries. The fountains seen at the international expositions are beautifully illuminated by electric lights, by means of which it is possible to secure elaborate color effects at night. Fine examples of these were furnished in the *Fountain of the Republic*, at Chicago in 1893; the fountains of *Man, Nature*, and *Progress*, at Buffalo in 1901; and the *Cascades*, at Saint Louis in 1904.

**FOUR-CORNERS**, a locality in Elgin County, Ontario. General Proctor was stationed at this place with a British force and was attacked by the Americans under General Harrison on Oct. 1, 1813, a short time before the Battle of the Thames. The Americans were repulsed at Four Corners.

**FOUR-O'CLOCK** (fōr'ō-klōk), an ornamental flowering plant native to Peru, but naturalized extensively in all the continents. It is so called because it blooms from about four o'clock in the afternoon until the next morning. Many varieties of colors have been obtained by cultivation. Most species are cultivated extensively in flowering beds and gardens. The calyx is often mistaken for a corolla, from its brilliance and calyxlike involucre.

**FOWL**, a term formerly used as a synonym of bird, but now restricted more particularly to the genus of birds known as *Gallus*, of which the East India jungle fowl is thought to be the original. The domestic fowl, including the cock and hen, belong to this class. That the domestication of fowls is of great antiquity is attested by figures on Egyptian monuments and the traditions of the Chinese, according to which they received their poultry from western countries as early as 1400 B. C. Among the best known species are the Leghorn, Spanish, Hamburg, Cochin, Brahma, Bantam, Plymouth Rock, Langshan, and Dorking. See **Poultry**.

**FOX**, an animal which is allied to the dog, having a long, bushy tail and erect ears. The pupil of the eyes is vertically elliptical. In all species the skull is rounded, the nose is very pointed, and the limbs are slender. However, they differ in size, color, and weight, but all exhibit the same artifices in obtaining prey and escaping danger. Foxes are so cunning that they are not easily caught in a trap. They burrow in the ground and live on animal food, unless pressed with hunger, when they feed on vegetable substances, especially seeds. Among the best known American species are the red, gray, cross, and Arctic foxes, which are hunted and trapped for their furs. The Arctic fox is smaller than the common fox, is pure white in winter, and abounds in the far north of the continent. It is gregarious and much more easily tamed than other species. Several species of the fox are found in Eurasia and Africa, though those common to the high latitudes are almost universally smaller in stature than those which frequent the warmer countries.

The cunning of the fox has caused it to enter largely as a popular figure into stories and fables. Some of these stories, especially those relating to its skill in getting food and in evading its enemies, are so remarkable that they are not universally believed. It is thought that this cunning developed as the result of the inherited experience of many generations. The cry is a yelping bark, but older ones learn to



imitate the voice of other animals and use this means to decoy their prey. Some species live out in the woods, but most of them burrow in the ground, or select a deserted nest of a rabbit or a badger. The home of a fox usually consists of several rooms or compartments, such as an outer room or hole, a supply room, and an apartment for sleeping. The male generally occupies the outer room, while the female and the young are back in the part which is best protected from intruders. In most cases the litter consists of from four to six, brought forth in April. During the day the fox remains in hiding, but it comes out at night and

**FOX**, the name of two rivers that rise in Wisconsin, though both are also known by other appellations. The Fox, or Pishtaka, has its source in Waukesha county, flows in a southerly direction and joins the Illinois River at Ottawa, Illinois. The Fox, or Neenah, rises in Green Lake county, makes a bold turn toward the west and north, after a tortuous course passes into Lake Winnebago, and thence flows northeast into Green Bay. Its entire course is about 250 miles. Near its headwater it approaches within two miles of the Wisconsin River, with which it is connected by a canal at Portage City, thus providing a union between Lake Michigan and the Mississippi River.

**FOX BAT**, the general name of any large bat, or flying fox, which is characterized by its habit of eating fruit. Seventy species have been catalogued, all of which are native to Asia, Africa, and the Malay Archipelago. The species are mostly large and tailless. They have large eyes and pointed teeth, and have the color of the red fox. They do much damage to mango and cocoanut plantations. In habit they are nocturnal, coming out at night in search of food. Their flesh is eaten by the natives.

**FOXGLOVE**, the common name of a genus of plants known as *Digitalis*, which includes a number of species that are native to Europe and Asia. The common foxgloves have erect stems with numerous large leaves at their bases. At the upper end of the stems are racemes of variously colored flowers. Several of the species have been greatly improved by cul-

tivation and are grown as flowering plants in gardens and parks. They thrive best in light, rich soil. The drug known as *digitalis*, which is obtained from a species of foxglove, is a bitter substance and has sedative and narcotic properties.

**FOXHOUND** (föx'hound), one of several breeds of dogs which are of value in fox hunting. It is noted for its fleetness, perseverance, physical strength, and fine scent. Its average height is 21 inches. The foxhound is supposed



HOME OF THE FOX.

moves about rapidly, often committing havoc among the poultry. The fox chase is looked upon as a favorite sport in England, where this animal is protected by law, except at a specified period, when it is pursued with dogs and horses which are trained especially for this purpose. The sport consists of seeing the cunning methods by which the animal seeks to avoid capture. It will often feign death and endure rough treatment, seeking thereby to make good its escape.





ÉMILE LOUBET, EX-PRESIDENT OF FRANCE.

Clément Armand Fallières was born at Mézin, France, November 6, 1841. He practiced law and in 1876 was elected to the Chamber of Deputies. He served as Minister of the Interior in 1882, 1883 and 1887 and was several times elected to the Senate, of which body he became its president in 1899. He succeeded Emile Loubet as President of France in 1906.



ARMAND FALLIÈRES, PRESIDENT OF FRANCE.







to be a cross between the staghound and the bloodhound.

**FOX INDIANS**, a tribe of North American Indians belonging to the Algonquin family. Formerly it occupied portions of Iowa, Nebraska, and Kansas, but now only few remnants remain in these states and in Oklahoma. Many of these Indians are industrious and progressive, having acquired both educational advancement and financial stability. See **Sacs and Foxes**.

**FOX SPARROW** (spär'rō), a handsome species of sparrow native to Canada and the United States. It has a rusty red plumage, but the breast is whitish. The eggs are thickly spotted and are laid in thickets or in tufts of grass. The song is loud and cheerful, resembling that of a thrush. It is migratory, passing far into the north of Canada to breed.

**FOXTAIL GRASS**, the name applied to several grasses with brush-like spikes which resemble the tail of a fox. Several species abound in meadows and pastures. They possess nutritive qualities, though some, from their hardy nature and remarkable tendency to multiply, are obnoxious weeds in cultivated lands. A number of species are naturalized in North America and are cultivated as forage plants.

**FOX TERRIER** (těr'ri-ēr), a small dog which is useful in following the fox to its habitation. The weight is about eighteen pounds. Its spirit is keen and lively, and it is adapted in every way for companionship and service in the hunt.

**FOYLE** (foil), a river in Ireland, formed by the junction of the Finn and Mourne. It forms the boundary between Donegal and Londonderry counties and flows into Lough Foyle, an inlet on the northern coast of Ireland, four miles below the city of Londonderry. The entire length is about seventy miles. It is famous for its salmon fisheries.

**FRACTION** (frāk'shūn), in algebra and arithmetic, an expression of one or more of the equal parts of a divided whole, or an expression for an unexecuted division, originally invented to represent a quantity less than a unit. The dividend number is called the *numerator*, because it numbers how many parts are taken, and the divisor is called the *denominator*, because it names the parts, thus, in the fraction  $\frac{3}{4}$ , 3 is the numerator and 4 is the denominator. A fraction is said to be *proper* when the denominator is greater than the numerator, and *improper*, when the numerator is greater than the denominator. In the former case the value is less and in the latter more than 1.

If both terms of the fraction are equal, it represents 1, or unity. A decimal fraction is one whose denominator is 1 with zeros annexed, in which the denominator is not written, but is understood from a point being prefixed, with zeros if necessary; thus, .086 for  $\frac{86}{1000}$ . All the fundamental operations in arithmetic, that is, addition, subtraction, multiplication, and division, may be performed in fractions, but the denomination must be the same. In decimal fractions the denomination depends upon the position of the decimal point, as .1, .01, .001. Common fractions are reduced to a *common denominator* by multiplying both terms of each fraction by the denominator of the other fractions.

**FRAMINGHAM** (frā'mīng-hām), a town of Massachusetts, in Middlesex County, on the Sudbury River, twenty miles west of Boston. It is on the Boston and Albany and the New York, New Haven and Hartford railroads. Among the chief buildings are a State normal school, a hospital, a public library, and a home for the aged. The manufactures include chairs, woolen cloth, rubber goods, and boots and shoes. The first settlement, made about 1647, was known as Danforth's Plantation. It was incorporated in 1700. Population, 1905, 11,548.

**FRANC** (frānk), a silver coin of France, divided into ten decimes and 100 centimes. It was first coined in 1795 and was adopted by Belgium in 1833 and by Switzerland in 1849. It corresponds in coinage to the cent of Canada and the United States, in that it is issued in different denominations, such as 1, 2, and 5 franc pieces. The value of a franc is about  $9\frac{1}{2}$  pence in English money and a little over 19 cents in the money of Canada and the United States.

**FRANCE** (frāns), a republic of Western Europe, located between latitude  $42^{\circ} 20'$  and  $51^{\circ} 5'$  north and longitude  $4^{\circ} 48'$  west and  $7^{\circ} 31'$  east from Greenwich. It is bounded on the north by the English Channel, the Strait of Dover, and the North Sea; east by Belgium, Germany, Switzerland, and Italy; south by the Mediterranean Sea and Spain; and west by the Atlantic Ocean and the English Channel. Its greatest breadth from east to west is 552 miles, and its length from north to south is 605 miles. In size it ranks fourth among the countries of Europe. The numerous coast indentations afford many good harbors, thus rendering the country capable of supporting an extensive maritime system. Numerous islands abound off the northwestern shore, the largest of which are Ré, Belle Isle, and Oléron. The total area is 207,107 square miles. This in-



cludes Corsica and a number of small islands, which have a surface of 3,700 square miles.

**DESCRIPTION.** The eastern portion of France is traversed by numerous mountain chains, of which the Pyrenees, Cévennes, and Vosges are the most prominent. These mountain ranges form the principal watershed, the rivers flowing from them to the west and north toward the Atlantic, and on the opposite side to the south and east into the Mediterranean. Vignemale, the highest peak of the Pyrenees in France, has an altitude of 10,792 feet. Mont Blanc, height 15,781 feet, is the culminating peak of the Alps, and is on the line between France and Italy, near Switzerland. The interior of France is marked by several volcanic groups known by the general name of Auvergne, while the coast region along the English Channel is largely level and exceedingly fertile. The Pyrenees separate France from Spain and have a general altitude of 9,000 feet. Passes for railroads are located at both ends of the range, near the coasts, but few highways cross these mountains. The Alps separate France from Switzerland and Italy, with celebrated passes and railway tunnels in the vicinity of Mont Cenis. The Jura Mountains are between France and Switzerland, and the Vosges extend from the western border into Germany. Corsica, where Monte Cinto has an elevation of 8,900 feet, belongs physically to Italy rather than France, and is united with it by a submarine plateau.

Many important river basins are formed by the foothills and mountains, through which flow numerous navigable streams. The entire number capable of navigation is about 200, and the total length of interior navigation aggregates 6,000 miles. Among the larger streams are the Rhone, the Loire, the Garonne, and the Seine. The largest of these is the Rhone, which passes from Switzerland through a gap between the Jura and the Alps into France, receives the Saône, another tributary, and flows southward into the Mediterranean by a delta. The Garonne rises in Spain, flows through a mountainous section in the upper course, and discharges into the Atlantic through the estuary of the Gironde. The Loire and Seine likewise discharge into the Atlantic. Other streams include the Isère, Durance, Dordogne, Mayenne, Eure, Charente, and Sarthe. Lake Geneva is the most important inland water, but a portion of it lies in Switzerland. Bourget and Annecy are other lakes of the Rhone Basin, and aside from those mentioned there is none of considerable size. A number of lagoons are located along the coast.

**CLIMATE.** As a whole the climate is favorable and among the most healthful in Europe. The isothermal lines of France indicate a normal temperature of about 50°. The regions in the southeast are the warmest and those in the northwest are the coldest, though all portions, except the most elevated mountain ranges, are susceptible to profitable cultivation, and are marked by atmospheric brightness and salubrity. At Paris the temperature averages 36° in January and 65° in July. The rainfall averages about thirty inches for the whole country, ranging from ten inches in the elevated northern plains to forty inches along the sea coast and in the Cévennes.

**FLORA AND FAUNA.** France has a flora quite like that of the other countries in continental Europe, except in the more recently formed summits, where lichens and mosses abound. Forests of ash, oak, pine, and spruce characterize the regions of medium elevation, and the chestnut and mulberry are common to the less elevated sections in the south of France. Nutritious grasses are very common. Wild animal life is not abundant, owing to the country having been settled a long period of time. The chamois is found in the mountains, the mouflon is met in Corsica, and the fallow deer and wild boar are preserved in private estates and on reservations. Many birds of song and plumage are common, and waterfowls are numerous along the coasts. The fisheries yield many valuable catches, including oysters.

**MINING.** Valenciennes, in the northeastern part, is the center of productive coal fields, which are estimated at about 2,250 square miles. The deposits consist chiefly of a good grade of bituminous coal, valuable in manufacturing, but anthracite is found in the department of Isère and lignite coal occurs in the Pyrenees. Iron ore is obtained in considerable quantities, especially in the Jurassic rocks and in the Pyrenees, but the output is not adequate to the demand. Some copper is obtained near Lyons. Other metals include zinc, nickel, silver, lead, and antimony. France is rich in building material and quarry products. Granite, limestone, and sandstone are abundant, and a fine grade of marble is quarried in the Alps and the Pyrenees. Roofing slate is quarried in the Ardennes and phosphate rock occurs in several localities. The latter is used in the manufacture of fertilizers.

**AGRICULTURE.** France is distinctly an agricultural country, being favored by a mild climate and general fertility of the soil. The methods employed by the peasants are modern and til-



lage is conducted with great care. About 6,750,000 people are employed in agricultural pursuits and fifty-eight per cent. of the land is under cultivation. Wheat, rye, barley, and oats are the staple cereals. In the production of wheat France exceeds all countries of Europe, except Russia. Beets are grown extensively for the manufacture of sugar. The government has a monopoly in the cultivation of tobacco. Other products include flax, maize, potatoes, rape, hemp, and buckwheat. Vegetables are produced in all sections, while fruits abound extensively, though they are grown most successfully in the southern portion, where the peach, pear, orange, lemon, fig, and citron thrive. The adaptable condition of the soil for the production of forage crop has caused France to rank as a leading country in the rearing of cattle, horses, sheep, and goats. However, it is necessary to import meat, but eggs, honey, and dairy products are exported. Dairying is an important industry and in many sections is associated more or less with the rearing of swine. The culture of silkworms receives marked attention in the warm portions, where it is fostered on a large scale. The vineyards are especially prolific and about one twenty-fifth of the whole surface is planted to vines.

**COMMERCE.** France has fostered a policy of tariff protection, especially during the period following the War of 1870-71, but more liberal rates have prevailed since 1882. Raw cotton, wool, raw silk, timber, cereals, and coal and coke are the chief imports, while the exports include leather, cotton and silk textiles, metal goods, chemical products, wine, and clothing. The nations that have the largest share of foreign trade are Great Britain, Belgium, Germany, Algeria, and the United States in the order named. The foreign trade has an annual value of \$2,250,000,000 and the exports slightly exceed the imports. Foreign trade is promoted by an efficient merchant marine, which consists of about 1,500 steamers and 15,000 sailing vessels.

**MANUFACTURES.** France ranks as the fourth manufacturing country, being exceeded only by Great Britain, Germany, and the United States. In the output of textile fabrics, especially silk goods, it has long held a prominent place. The textile fabrics center largely at Lyons, Rouen, and Paris. Cotton and woolen goods are made in large quantities at Rheims and Amiens; lace and gauze, at Saint Quentin; tapestry at Paris and Beauvais; and carpets, at Abbeville. Large quantities of safes, files, hardware, jewelry, and optical instruments are manufactured for exportation. In the manufacture of wine France has held a foremost position many cen-

turies, and its cognac is still the leading product of the kind in the world. It likewise has taken a foremost position in the manufactures of engines, motors, and automobiles. Fruit canning is carried on extensively and the fisheries yield many products employed in manufacturing. Special mention may be made of the tunny, anchovy, oyster, mackerel, and sardines, all of which are cured and canned.

**TRANSPORTATION.** Extensive railroad and canal facilities make it possible to carry on a vast interior commerce, and to bring the products for shipment to the principal seaports. The railways are largely under direct government supervision and in efficiency take a peculiarly high rank. They aggregate a total of 28,750 miles, hence Germany and Russia are the only European countries that have a larger mileage. Paris is the converging center of all the railway systems of France, with the exception of one line. The canals aggregate 2,975 miles and the navigable streams have a length of 5,500 miles. In addition there are many electric railways throughout the more populous sections of the country, and the highways are generally in a good condition. The canals connect the various river basins and facilitate transportation to the Atlantic Ocean, the North Sea, and the Mediterranean. Among the most important of the canals are the canal of Languedoc, which connects the Garonne with the Mediterranean; the Rhone and Rhine canal; and the canal of Bourgogne. Telegraph and telephone lines are everywhere manifest and efficiently managed, and, like the canals and railroads, are largely under direct government supervision and ownership.

**GOVERNMENT.** The government of France is a constitutional republic, in which three departments of government are recognized, and dates from Sept. 4, 1870, when the second empire was overthrown as a direct result of the Franco-German War. Its legislative authority is vested in two chambers, the Chamber of Deputies and the Senate. Representation in the former is elective and in the latter it is appointive by officials of the departments. In the Chamber of Deputies are 584 members, chosen for four years, and the Senate is composed of 300 members, elected for nine years, one-third retiring every three years. The entire country is divided into 87 departments. Each of these is divided for election purposes into *arrondissements*, and these are subdivided into smaller divisions for the purpose of local government. The system of justice, like that of Canada and the United States, originates in inferior courts, and, after passing through courts of appeals,



terminates in the supreme court of the state, which has its seat at the capital. Cases of attempt against the safety of the state or of plotting to change the form of government are tried by the Senate, which is then constituted as a high court of justice. The president is elected for a term of seven years by the two chambers, a majority of both bodies being necessary to a choice. He has the appointment of civil and military posts, and is assisted by twelve ministers whom he appoints. The ministry consists of ministers of the interior, finance, war, justice and public worship, marine, colonies, public instruction, foreign affairs, commerce, agriculture, public works, and labor.

**EDUCATION.** Educationally France occupies a high position among the countries of South-western Europe. The minister of public instruction, who is appointed by the president and is a member of the cabinet, has supervision of all the branches of education and is assisted by an educational council. Primary, secondary, and high schools are maintained under appropriate courses of study, and they are supplemented by colleges and universities devoted to industrial art, law, theology, literature, and medicine. All the communes are required to have primary schools, but, where the population exceeds 500, the schools for boys and girls are separate. In the capital of each department and some other cities are institutions of higher learning, the whole number being about 275. In 1908 the secondary schools were attended by 127,642 and the universities by 34,368 students.

**DEFENSE.** Military service is obligatory on every Frenchman from the age of 20 to 45 years, who is not declared unfit for military duty. The present peace footing is 575,000 men and officers, though the entire war strength, including the colonies, aggregates 3,500,000 men. France occupies a high position in the naval administration, which is divided into three marine divisions. The number of men and officers in the navy is placed at 54,350. It has 44 battleships completed or in the course of construction and a proportionately large number of protected cruisers, torpedo boats, and torpedo boat destroyers. The principal sources of revenue are land taxes, registration, customs and excises, railroads and telegraphs, and licenses. The total national debt is larger than that of any country in the world, being about \$6,800,000,000, and the revenue and expenditures are correspondingly large.

**INHABITANTS.** More than a million of the inhabitants of France proper are foreigners, mostly of European birth, while the rate of increase in population is very small, but there is a small

preponderance of births over deaths. However, the increase of the last several decades may be attributed to immigration. The three chief religious denominations are Roman Catholic, Lutheran, and Jewish in the order named. Religious worship has been free since the adoption of the Organic Articles in 1802, but the three churches named were subsidized by the state until 1905, when the law which separates the church and the state came into force. About two-thirds of the people are nominally Roman Catholics. Fifteen cities have a population of more than 100,000. Paris, the capital and largest city, is one of the most important centers of population in the world. The other cities of importance include Lyons, Marseilles, Bordeaux, Lille, Toulouse, Nantes, Saint Etienne, Havre, Rheims, Roubaix, Rouen, Rennes. The population of France, exclusive of the colonies, in 1906, was 39,252,267.

**COLONIES.** The colonial possessions of France have an area of 4,055,150 square miles and a population estimated at 56,675,000. They are variously distributed in Asia, Africa, America, and Oceania, and have been the means of greatly increasing foreign trade and influence. The larger part of these possessions is African and the colonies of Oceania are not particularly valuable. The latter include New Caledonia and a number of dependencies.

The French colonies of America are Guiana, Guadeloupe, Martinique, Saint Pierre, and Miquelon, and those of Asia include Indo-China, Annam, Cambodia, Cochinchina, Tonkin, and Laos. The African possessions embrace Algiers, French Congo, French Guinea, Comoro Isles, Dahomey, Ivory Coast, Mayotto, Madagascar, Somali Coast, Réunion, Senegal, Niger, Senegambia, Tunis, and Western Sahara.

**LANGUAGE.** Before the Romans occupied Gaul, Celtic was the chief dialect spoken in the region now occupied by France, and that language is still spoken in Brittany. The French language is classed with the Romanic group, of which it is the most important dialect, the other languages of this group being the Spanish, Italian, Portuguese, Provençal, and the Wallachian or Romanic. After Roman occupation the Gallic, Celtic, and other local dialects gradually became modified by the introduction of new elements, and by the 8th century a marked distinction existed between the popular language of France and the classic Latin. They were distinguished by the names *Romana* and *Latina*, and, when the new Romance tongue became generally adopted, it was named *French*. Louis the German in 842 took an oath in the Romance tongue in Strasburg, and this is re-



garded the oldest written document in that dialect extant. Francis I. prohibited the use of Latin at court in the beginning of the 16th century, since which time French has been recognized as the national language. French is spoken generally throughout the country, but Flemish and German are used locally on the border of Belgium and Germany, and Italian is spoken in the southeastern part. It has been the language of diplomacy, cookery, fine art, and the European aristocracy since the Middle French period. Its greatest popularity was attained in the reign of Napoleon, though it is now the language of about 50,000,000 people, and its literature is exceptionally rich.

**LITERATURE.** The literature of France is both extensive and valuable, embracing many products of a large number of eminent writers. It may be said to begin with the 11th century, when numerous poems were collected and published. These poems embrace at least three classes, including those that relate to the achievements of Charlemagne and his descendants; those relating to ancient history, particularly Alexander the Great; and those detailing the life and achievements of King Arthur. Philippe de Comines (1445-1509) is one of the first historians of eminence, dealing with the life and times of Louis XI. and his contemporaries, but the writings of Froissart (1337-1410), which include a collection of poems and tales of the chivalry of the 14th century, are perhaps the most popular productions of the early period. French literature was greatly modified by the revival of classical learning, when public thought was directed to classical study and sacred history. The humorist Rabelais (1490-1553) belongs to the same period, as also does the essayist Montaigne (1533-1592). In that period the great theological work of John Calvin, entitled "Institution of the Christian Religion," exercised a wide influence upon the public thought of France, and was the cause of inducing many writers to turn with renewed vigor to works in prose. Clément Marot (1495-1544) wrote numerous witty poetic productions, while Margaret of Navarre issued popular tales, and Jodelle (1532-1573) gave an impetus to tragedy.

With the advent of Louis XIV. came the golden age of French literature. At that time Pierre Corneille (1606-1684) wrote his masterpieces, entitled "Horace," "Cid," "Cinna," and "Polyeucte;" Pascal (1623-1662) created interest by his "Provençal Letters;" and Racine (1639-1699) wrote his "Iphigenie Phedre," "Athalie," and other noted comedies for the stage. Fine works in prose were added to the

general writings by Jean Louis Balzac (1594-1654) and Voiture (1598-1648), while Descartes produced works of high philosophical value. Molière wrote his familiar plays, "School of Women," "Misanthrope," and "Tartufe," and elegant sermons were added to French literature by Massillon, Bossuet, and Bourdaloue. Other writers of the 17th century include the historians, Cardinal de Retz and Madame de Sévigné; the biographical writers, Saint Evremond and La Rochefoucauld; and the miscellaneous writers, Le Sage and Bernard Fontenelle (1657-1757).

Many works of philosophical value were added to the literature in the 18th century, but that period likewise produced much of value in other essential lines. Voltaire not only wrote valuable works in philosophy, but also holds a high place as a historian, dramatist, and poet, and for more than half a century stood at the head of French letters. The satirist, Montesquieu, is the author of "Persian Letters" and of many historical and general works, including "Spirit of the Laws." As a writer of elegant style and profound thought Rousseau stands next to Voltaire, his chief works being "Nouvelle Heloise" and "Confessions," while his "Social Contract" and "Emile" continue to exercise a wide influence in education and politics. The "Encyclopaedie," an extensive review of general subjects, though quite hostile to religion, was published by Diderot and D'Alembert. Other works of importance include Prevost's "Manon Lescaut," Saint Pierre's "Paul and Virginia," Beaumarchais' "Barber of Seville," and Buffon's "Natural History." Helvetius, Lamettrie, Condorcet, and Condillac may be mentioned as other writers of note.

The 19th century produced a large number of writers, owing largely to the brilliant achievements of Napoleon and the general establishment of schools and institutions of higher learning. In that period rose the so-called Romantic School, of which Victor Hugo, Alfred de Vigny, and Alexandre Dumas are leading representatives. "Les Miserables" is the masterpiece of Hugo, while "Cinq-Mars" is the best novel from the pen of De Vigny, and "Three Guardsmen" and "Count of Monte Cristo" are popular works by Dumas. Among the novelists of eminence are Honoré de Balzac, who belongs to the so-called Realistic School, George Sand, Eugène Sue, Gustave Flaubert, Victorien Sardou, and Octave Feuillet. Jules Simon, Bastiat, and De Tocqueville rank among the eminent writers on political economy; Guizot, Thiers, Victor Duruy, and Henri Martin among the historians; Victor Cousin, Auguste Comte, and Lamennais



among the philosophical writers, and Cuvier and Saint-Hilaire among the scientific writers. Stanislas Julien and Burnouf added much of value to Oriental knowledge; Leconte de Lisle, Gautier, and Theodore Aubanel to poetry, and among the essayists and literary critics are Gustave Planché, Théophile Gautier, and Paul de Saint-Victor.

The beginning of the 20th century witnessed unusual activity in French literature. It is evident that the century will be unusually prolific and that the productions will excel in number and value those of the previous period. Among the eminent historians are Ernest Lavisse and M. Rambaud; among the poets, Henri de Régnier and Paul Verlaine; among the critics, Charles Bernard Renouvier and Edgar Quinet; and among the general writers, Emile Zola, Marcel Monnier, Alphonse Daudet, Emile Faguet (born in 1847), and Frederick Masson. For several years at the beginning of the century much was written upon social and political events, owing to the long discussion of the Dreyfus affair. Such writers as Émile Zola and Anatole France wrote much on the side of Dreyfus, while Bourget, Barrès, and Brunetière took a position in opposition to the influences created by the affair. The period has been especially prolific in the field of fiction and the drama.

**HISTORY.** Julius Caesar, who wrote regarding his invasion and conquest in 59 B. C., furnishes the first authentic history of France. The Roman name was Gallia, while the early English was Gaul, and the people were largely Celtic in race, though other settlements were maintained, especially by the Aquitani and Belgae, with here and there tribes of Germans and Greeks. At that early period it contained parts of Switzerland, Germany, and Belgium, as well as the whole of France. The name France was derived from the Franks, a Germanic tribe that made settlements in Gaul after the decline of the Roman Empire. By the 2d century A. D. it was Romanized in civilization, language, and religion. Under the Roman rule it advanced materially in civilization and refinement and the population increased rapidly. Gradually agriculture and manufacture took the place of the simpler arts of the semisavage people.

The Franks by the end of the 5th century made themselves masters of nearly all of France and conquered adjacent territory east of the Rhine. In 481 Clovis, a descendant of Merovig, established the first dynasty, called the Merovingian, with his capital at Paris, and reigned until his death in 511, when his kingdom became divided among his four sons. The country was

subsequently divided among other rulers under a general law of inheritance, by which numerous principalities rose. The last of the first dynasty terminated in 752, when the Carolingian arose, its greatest representative being Charlemagne, who was the second ruler. At that time there was no real kingdom of France, for the reason that the first dynasty was Germanic, and Charlemagne founded a German rather than a French empire.

The true founder of the French monarchy was Hugh Capet, who established the Capetian dynasty in 987, and added the fiefs of Orleans and Paris to the monarchy. For two centuries the Capetian dynasty endeavored to reconquer former prerogatives from vassals, and strained its powers in resisting English pretensions to the crown of France. The first branch of Capetian kings became extinct with the death of Charles IV., in 1328, for the reason that the Salic law excluded female succession. At that time the crown passed to Philip of Valois, who ascended the throne as Philip VI., which led to a series of wars with England on account of the claims made by Edward III. to the throne, and these continued for 125 years. The most important battles occurred at Crécy in 1346, Poitiers in 1356, and Agincourt in 1415. All of these resulted more or less favorably to England and gave that country many of the best provinces, while the Treaty of Troyes, drawn shortly after the Battle of Agincourt, recognized the succession of Edward III. to the crown of France. The animation of the French, due to the noble deeds of Joan of Arc between 1429 and 1431, caused a complete change and drove the English from the country, the only possession remaining to them being Calais.

Louis IV. laid the foundation of a great monarchy in 1461, largely restored internal peace, and brought back a feeling of nationalism. The Valois-Orleans branch of the Valois line succeeded to the throne in 1498, but in 1515 the crown reverted to another branch of the house of Valois in the person of Francis I. This sovereign carried forward the attempts to conquer Italy begun by previous monarchs, and became involved in five great wars with Germany, which terminated in the loss of some prestige and the transfer of Savoy and Piedmont by the Treaty of Cateau-Cambresis, though this loss was at least partly balanced by securing Calais, the last possession of the English in France. Francis II. reigned only in 1559-60, but during this brief time the Catholic house of Guise attained power, while the opposing movements for the reforms were led by the house of Bourbon. The religious wars



of this epoch shed much blood and retarded the industrial growth of France. Within this period occurred the massacre of Saint Bartholomew, and the great national debt which weighed upon France more than two centuries was fastened upon the country. The religious wars terminated only when Henry IV., previously King of Navarre, went over to the Catholic Church from the leadership of the Huguenots.

Louis XIII. succeeded to the throne in 1610 and inaugurated a new policy by siding with Richelieu, a Protestant prince, in a reformation. At his death in 1643, Louis XIV. began a memorable reign, which was marked by a still more vigorous policy and led to the highest power and widest influence attained by the French monarchy. Under his wise direction French literature, art, and science developed to a higher plane than before known, education flourished, and the borders of France were extended to the Rhine. The efficient service of the military engineer, Sébastien Vauban (1633-1707), strengthened French fortifications, while its ministers secured advantageous commercial treaties. Louis XV. added Corsica and Lorraine to France by the Treaty of Paris. However, in 1763 French colonies were largely ceded to England on account of misfortunes in war.

The weakness of Louis XVI., the success of the American Revolution, and the great spirit of unrest that marked the closing of the 18th century led to the revolution of 1789. War raged with all its horrors and cast an unfortunate people into a great sea of bloodshed, which finally led to the execution of Louis XVI., in January, 1793. This was followed by a treaty of peace and the general amnesty of 1795. The French Republic was recognized by the Treaty of Basel in the same year, while a new constitution was formulated by the convention, which finally dissolved in October. The scheme of government provided a chamber of 500 to propose laws, the chamber of ancients to approve them, and the executive of five members called the Directory. Napoleon Bonaparte soon became the most prominent man in France. His successes led to the overthrow of the Directory and the establishment of the Consulate, himself being appointed first consul for a term of ten years. The brilliant victory won on the battlefield of Marengo and the extension of France to the Rhine led to the proclamation in 1804, by which he became emperor, and was soon after confirmed by a popular vote of the people. Pope Pius VII. consecrated Napoleon emperor at Paris, and crowned him King of Italy in 1805.

Though an extensive coalition was formed

against Napoleon by European powers, they were unable to check his career and France became the greatest power of Europe. The great Battle of Austerlitz in 1805 caused the King of Naples to be dethroned, Holland became a vassal kingdom, and Prussia was humiliated. At that time the kingdom set up by Napoleon extended from Naples to Denmark and the capitals were Amsterdam, Paris, and Rome. The Russian invasion of 1812 cost France 300,000 men, but the allied forces were defeated in the Battle of Leipzig in 1813. In 1814 the allied armies drove the French from Germany and captured Paris, on March 30. Napoleon was required to abdicate and retired to Elba as a mere prince. Louis XVIII. became King of France and concluded the Peace of Paris, but was soon driven from power by the return of Napoleon, who assumed authority without resistance. The allied powers reorganized, brought on his final defeat at Waterloo in 1815, and sent him a prisoner to Saint Helena.

The long line of French kings ended with Louis Philippe, who was driven into exile by the revolution of 1848, and a republic was proclaimed with Louis Napoleon as the president. By a vote of the people he was made emperor in 1851, with the title of Napoleon III. The growing discontent of the people caused him to declare war against Germany in 1870, which resulted in a disastrous loss to the French army upon every battlefield, and the empire ended with the capture of Napoleon and 83,000 men at Sedan. As a war indemnity France was required to cede Alsace and a part of Lorraine to Germany and pay \$1,000,000,000 in gold. Civil war broke out in Paris under the leadership of the Commune, which was put down with difficulty.

The second republic having been organized, M. Thiers was chosen the first president. With the overthrow of the administration in 1873 came the election of Marshal MacMahon, who resigned the presidency in 1879, and was succeeded by Jules Grévy. The last mentioned was followed in the presidency by Sadi Carnot in 1887. After the assassination of Carnot in 1894, Jean Casimir-Périer succeeded to the presidency, and, when the latter resigned in 1895, Felix Faure attained the election. President Faure died on Feb. 16, 1899, and was succeeded by M. Loubet. In 1906 Clément Armand Fallières was elected president by the liberal party. The present republic has enjoyed a long era of prosperity, an epoch in which France has become the seat of great expositions and larger industrial enterprises, and has taken a high rank in the arts of peace.



**FRANCHISE** (frän'chiz), a special privilege granted by government to individuals or corporations, and which do not belong to the citizens of the state or country by common right. In a political sense the term franchise denotes the right of suffrage and is commonly called the *elective franchise*. However, it is generally applied to special privileges granted for the purpose of constructing improvements for profit, such as the establishment and operation of toll bridges and ferries. Towns and cities grant franchises to gas, water, heating, and electric light companies, and the alleys and streets are used for the purpose of promoting the business in which such concerns are interested. Formerly franchises of this kind were granted by the town or city council, but in most states and countries such privileges can be obtained only by a direct vote of the majority of the people, the proposition to make the grant being submitted to the electors at a regular or special election. A common instance of a franchise or charter is one granted by the state or province to certain persons, which authorizes them to engage in business as a corporation. Franchises of this kind as well as those granted by towns and cities to operate and control public utilities are in most cases subject to a special tax.

**FRANCIS MOUNTAINS**, a group of the White Mountains, in New Hampshire, from which they are separated by the White Mountain Notch. Mount Lafayette, height 5,295 feet, is the highest peak. Many beautiful lakes, steep precipices, and natural forests give the region a grand and beautiful aspect.

**FRANCO-GERMAN WAR**, a military contest between France and Germany, caused chiefly by the jealousy of Napoleon III. of the growing importance of Prussia. Bismarck had determined to place Prussia at the head of a united Germany, owing to which Austria was excluded after the war of 1866, when the growing sentiment for German nationality threatened to isolate France. The crown of Spain was offered by General Prim to Leopold of Hohenzollern, a prince of the reigning family of Prussia, which excited the jealousy of Napoleon, who demanded that Leopold should retire as a candidate. Although the King of Prussia refused to demand this of Leopold, the latter declined the Spanish crown voluntarily, when Napoleon insisted that the King of Prussia should furnish a guarantee that the refusal would be final. This demand was of course refused, hence the French government formally declared war on July 19, 1870.

Both countries entered upon the prosecution

of the war with marked enthusiasm, but France was comparatively illy prepared for the conflict. While that country had about 250,000 men ready to move forward in August, 1870, it had few available reserves. On the other hand, the North German Confederation was able to put 450,000 men into the field at once and had nearly that number of reserves available for active service. Napoleon had hoped that the South German States would refuse to join Prussia, but these, enthused with the sentiment of nationality, threw their influence against France. Three armies moved upon French territory, the first under General von Steinmetz at Trèves, the second under Prince Frederick Charles in Rhenish Palatinate, and the third under the Crown Prince of Prussia on the frontier of Baden.

The German armies, after winning successes at Weissenburg and at Wörth, succeeded in separating the two divisions of the French army under Marshals Bazaine and MacMahon. The former was repulsed in the Battle of Mars-la-tour, after which he took a position at Gravelotte, where he was defeated on August 18th by an army of 200,000 Germans. Bazaine now fell back upon Metz, where he was besieged until in September, when he was compelled to surrender with an army of 175,000 men. In the meantime MacMahon was surrounded at Sedan, where he was defeated on September 2d and surrendered with an army of 83,000 men. Both Napoleon and MacMahon were among the prisoners of war.

The capture of Napoleon caused a revolution in Paris, where the republic was proclaimed two days after the fall of Sedan. However, the victorious armies marched upon Paris and placed it in a state of siege. Although efforts were made to relieve the capital, it was forced to surrender in February, 1871. The preliminary terms of peace with Germany were arranged by Thiers in the same month, and they were approved by the national assembly in March. France was required to cede Alsace and a part of Lorraine and pay a war indemnity of \$1,000,000,000. It was provided in the treaty that German troops should occupy certain departments until the entire sum was paid. The final treaty of Frankfort was signed in May, 1871. As a result of the war, Germany was consolidated into an empire and France became a republic.

**FRANCOLIN** (frän'kō-lin), the name of several species of birds related to the partridges, native to Asia and Africa. The plumage is variegated, but in most species it is a yellowish brown with black and white mark-



ings and the bill and tail are long. The flesh is much esteemed for food, hence these birds are hunted as game. When alarmed, they conceal themselves in the brushwood or run with considerable speed, taking wing only when they are in danger. They feed early in the morning and late in the evening, when they search for grains, insects, and bulbous roots. Their flight is accompanied by a whirring sound, and their cry, uttered chiefly when in search of food and at pairing time, is something like a shrill laughter.

**FRANKFORT** (fränk'fürt), a city in Indiana, county seat of Clinton County, on Prairie Branch River, forty miles northwest of Indianapolis. It is on the Lake Erie and Western, the Vandalia Line, and other railroads, and is surrounded by a rich agricultural, dairying, and fruit-growing country. Among the noteworthy buildings are the county courthouse, the public library, the high school, and a number of fine churches. It has electric and gas lighting, street paving, and a sewerage system. Among the manufactures are pottery, carriages, flour, cigars, machinery, and ironware. It has extensive railroad machine shops. Population, 1900, 7,100.

**FRANKFORT**, a city of Franklin County, Kentucky, capital of the State and of Franklin County, on the Kentucky River, sixty miles east of Louisville. It is on the Louisville and Nashville and the Chesapeake and Ohio railroads, in the center of the blue grass region, and occupies a fine site on both sides of the river, which is spanned by a suspension bridge 700 feet long. The chief buildings include the State capitol, the State arsenal, the Governor's mansion, the State prison, an institution for feeble-minded children, and the State normal school for colored students. It has several fine monuments, including those erected to the soldiers who died in the War of 1812 and the Mexican War. The State library contains over 100,000 volumes.

Frankfort has manufactures of pottery, twine, barrels, lumber products, vehicles, whisky, cotton goods, and machinery. It has extensive systems of electric street railways, sewerage, and public lighting. Franklin Cemetery, on one of the hills near the city, contains the grave of Daniel Boone. Frankfort was founded in 1786 by Gen. James Wilkinson, and became the capital of the State in 1892. Population, 1900, 9,487.

**FRANKFORT-ON-THE-MAIN**, a city in the province of Hesse-Nassau, Germany, twenty miles northeast of Mainz, on the Main River. The older part has narrow streets and many buildings in which the high gables project over the walls, but the newer section is modern and

has many fine residences and tall structures of steel and stone. Ziel street is the chief thoroughfare and merges into Kaiserstrasse. The market place, or Römerberg, is in the heart of the older part of the city. Many tourists are attracted to the house where Luther lived, the one in which Goethe was born, and the noted Rothschild Library. Besides the public schools, it contains the Städel Art Institution, a museum of history, and many important societies of literature and art. In its squares and public parks are numerous statues of celebrated citizens, among them those of Gutenberg, Goethe, and Schiller. The most prominent of its buildings include the Cathedral of Saint Bartholomew, the public hall, the opera house, the courts of justice, and the central railroad station, the depot being one of the finest in Europe. Frankfort is one of the wealthiest cities of modern Europe and contains the ancestral home of the Rothschilds. It holds high rank as a center of manufacturing and in the volume of its jobbing trade. The streets are generally paved with stone and asphalt and traversed by electric street railways. Systems of sewerage, waterworks, and gas and electric lighting are operated by the municipality. Among the manufactured products are perfumery, ironware, soap, chemicals, clothing, sewing machines, leather goods, and fabrics. It received its name from Charlemagne, who made it the seat of a political and religious council in 794. The city became Protestant as early as 1530. It was the place of meeting for the German diet in 1816-36. In the 13th century it became a free city and after 1562 it was the place of election and coronation of the German emperors. Here have been concluded many important peace treaties, among them the treaty closing the Franco-German War, which was signed in May, 1871. Among the banking and money markets of Europe Frankfort takes very high rank. Population, 1905, 334,978.

**FRANKFORT-ON-THE-ODER**, a commercial city in the province of Brandenburg, Germany, on the Oder River, about fifty miles southeast of Berlin. Several railroad lines connect it with the national capital and the cities of Central Europe. The noteworthy buildings include the Church of Saint Mary, the Reformed Church, the city hall, or Rathaus, the theater, and the railway station. Among the manufactures are leather, machinery, fabrics, clothing, chemicals, pottery, furniture, toys, and porcelain. The river is navigable and is connected by canals with the Elbe and Vistula, thus giving ample outlet for its manufactured products, jobbing trade, and passenger traffic. Telephones, elec-



tric railways, a public library, the gymnasium, waterworks, and an extensive system of gas and electric lighting are among the public utilities. The city became a free municipality in 1253 and was important as a member of the Hanseatic League. It suffered greatly during the Thirty Years' War. Nearly all the inhabitants are Protestants. Population, 1905, 64,304.

**FRANKINCENSE** (frānk'in-sēns), a gum or resin, which, when burning, yields aromatic fumes and is used extensively as an incense in religious services. The Greeks and Jews, as well as other ancient peoples, employed olibanum, the product of a tree found in India, and it is still employed chiefly in the East. In Europe and North America it is more common to use the exudations of certain coniferous trees, such as the silver fir, which are resinous products. They exude from the trees and harden by exposure to the air. The taste is balsamic and the odor when burning is pleasant.

**FRANKING PRIVILEGE**, the right of sending letters and packages by mail free of charge. This privilege was extended in England to members of Parliament by the Postmaster-General and later by statute, but it was abolished in 1840. Official correspondence and public documents are transmitted through the mails by officials of the government free of charge in most countries, though this privilege pertains only to business which is related strictly to certain officers of the Federal departments. The United States granted the franking privilege to soldiers of the Revolutionary War, but individuals have not had privilege to send mail in this way since 1873. Envelopes and wrappers of packages used for official purposes are marked *Official Business*, both in Canada and the United States, and in some countries stamps bearing the imprint *Official* are used. Persons not entitled to the privilege of sending mail in such wrappers or under such stamps are subject to a heavy fine in case they procure and use them.

**FRANKLIN** (frānk'līn), or **Frankland**, the name of a proposed State formed by the inhabitants of what is now Tennessee. They revolted from the control of North Carolina in 1784, framed and ratified a constitution, elected a Legislature and State officers, and undertook to conduct a civil war against North Carolina. John Sevier, the Governor of Franklin, raised an army, but was defeated in an engagement and taken prisoner. In 1788 the Legislature of North Carolina pardoned the offenders in Franklin, and two years later the territory was ceded to the United States government, hence the disturbance was quieted.

**FRANKLIN**, a large district in the northern part of the Dominion of Canada, including the Arctic Archipelago. It is located chiefly north of the Arctic Circle, only a small portion of Baffin Land extending farther south. The chief islands are Grinnell Land, Prince Albert Land, North Devon, Melville Island, and Baffin Land. Animal and vegetable life are very scant and the inhabitants, consisting chiefly of Eskimos, are not numerous. Important fisheries and minerals abound. The area is about 500,000 square miles.

**FRANKLIN**, a city of Indiana, county seat of Johnson County, twenty miles south of Indianapolis, on the Cleveland, Cincinnati, Chicago and Saint Louis and other railroads. It has several fine county buildings and is surrounded by a fertile farming region. The manufactures include flour, cigars, ironware, and machinery. It is the seat of Franklin College, a Baptist institution. Electric lights, waterworks, and a system of drainage are among the improvements. Population, 1900, 4,005.

**FRANKLIN**, a town of Massachusetts, in Norfolk County, 25 miles southwest of Boston, on the New York, New Haven and Hartford Railroad. It has a public library and a number of fine schools. The Dean Academy, a coeducational institution, is located here. The manufactures include pianos, clothing, and cotton and woolen goods. Franklin was incorporated in 1778. Population, 1905, 5,344.

**FRANKLIN**, a city of New Hampshire, in Merrimac County, 95 miles northwest of Boston, Mass., on the Boston and Maine Railroad. It is located at the junction of the Winnepesaukee and Pemigewasset rivers, which form the Merrimac at this place. Water power for manufacturing is utilized extensively and the industrial enterprises are well established. Needles, hosiery, machinery, paper, woolen goods, and clothing are the manufactures. Waterworks and electric lights are included among the public utilities. Franklin is the seat of the New Hampshire Orphans' Home, and is noted as the birthplace of Daniel Webster. It was incorporated in 1828 as a town and its city charter was issued in 1895. Population, 1900, 5,846.

**FRANKLIN**, county seat of Venango County, Pennsylvania, on the Allegheny River, about seventy miles north of Pittsburg. It is on the Erie, the Pennsylvania, and other railroads, and has a large trade in farm produce, coal, and merchandise. The county courthouse, the public library, and the high school are among the chief buildings. It has two public parks, street pavements, and sewerage and waterworks sys-



tems. Among the manufactured products are machinery, flour, fabrics, oil, vehicles, and cigars. Valuable deposits of mineral oil and coal abound in the vicinity. Franklin was settled in 1753 and incorporated in 1795. Population, 1900, 7,317.

**FRANKLIN, Battle of**, an engagement of the Civil War in America, at Franklin, Tenn., on Nov. 30, 1864. General Hood, to counteract Sherman in his march to the sea, had taken a large force of Confederates into Kentucky and Tennessee, and was threatening an invasion of the states farther north. General Thomas, who had been with Sherman's army was sent north to Nashville, and General Schofield operated with a Federal force against Hood's army. Schofield strengthened his position at Franklin, on the Harpeth River, where he was attacked by the Confederates, who made desperate assaults, but were beaten back each time with considerable loss. The Federals withdrew to Nashville during the night, where they joined the army under Thomas. The Federals engaged in the Battle of Franklin numbered 25,000, while the Confederates had about 40,000 men. Both sides fought with remarkable gallantry.

**FRANKS**, the name of a number of German tribes that inhabited the regions of the Lower Rhine in the 3d century. They defeated the Romans in Gaul and controlled France from that time until the rise of the Capetian dynasty in 987, giving to that country the Merovingian dynasty, from 481 to 987. For security against hostile tribes, they lived in villages. They committed their laws to writing, were industrious, and gave France the Salic laws. The descendants from these peoples now form the chief Germanic element of northern France and the western part of Germany.

**FRANZ JOSEPH LAND** (fränts yō'zěf), an island archipelago in the Arctic Ocean, north of Nova Zembla. It was discovered by the Payer-Weyprecht expedition in 1873 and was named in honor of the Emperor of Austria, Francis Joseph I. The group includes about sixty islands, many of which are separated from each other by deep and narrow fiords and channels. They include Zichy Land, Wilczek Land, and Alexandra Land. The surface is generally rocky and level, from 150 to 500 feet above the sea, and several peaks have an altitude of 2,800 feet. Grass, mosses, and lichen are the chief plants. Polar bears, foxes, seals, and wild fowls are plentiful. The islands are not inhabited by man.

**FRASER** (frā'zēr), the largest river of British Columbia, rises in the lake region of the Rocky Mountains. It has a general course to-

ward the south, and, after flowing 740 miles, discharges into the Gulf of Georgia. The Fraser is navigable for more than 150 miles, contains valuable salmon fisheries, and flows through a mineral country rich in gold and silver deposits. Its principal tributaries are the Stuart, Thompson, and Chilcote rivers. The lower valley, which is very fertile, is traversed by the Canadian Pacific Railway. Among the towns on its banks are New Westminster, Hope, Yale, and Lytton.

**FRATERNAL SOCIETIES** (frā-tēr'nəl). See **Benefit Associations**.

**FRATERNITIES**, the name applied to various organizations of students in the colleges and universities of the United States. They are frequently termed College Secret Societies, or Greek-letter Fraternities, and members of them are sometimes spoken of as *Frats*. The names are taken from several letters of the Greek alphabet, as *Phi Beta Kappa*, and from these the secret motto of the fraternity is remembered, since these letters are the beginning of the words in the motto. The fraternities are composed of chapters, the latter being branches in the various colleges that belong to a particular fraternity. The largest proportion of the members belong to the academic departments, though all students in the different collegiate courses are eligible to membership. Conventions are held annually or biennially by each fraternity, which is usually composed of from two to eighty chapters. Some of the fraternities are strictly professional, as those of law and medical institutions, but the greater number are maintained for literary advancement and social enjoyment.

The first Greek-letter society was organized at the College of William and Mary, Virginia, in 1776, and named *Phi Beta Kappa*. Its purpose was announced to be friendly intercourse and literary advancement among scholars. However, the present fraternity system of the United States originated in 1825, when a number of students of Union College, New York, organized the *Kappa Alpha*. Similar organizations which are maintained by young women who attend colleges and universities are known as sororities. The first of these, known as *Kappa Alpha Theta*, was organized in 1870 at De Pauw University, Indiana. Since then many others have been established. The members who attend college are styled *active* and afterward they become known as *alumni*. Catalogues, magazines, and song books are published by many of the fraternities and a large number maintain chapter houses. Though opposition to societies of this kind has sprung



up, they are defended by many leading educators, who have generally expressed their belief in the practical utility of college fraternities.

**FRAUD**, in law, any cunning or deception used to cheat or deceive another. It is essentially a false representation of some matter of fact, and is intended to deceive another as to his legal injury. The law distinguishes a false representation of fact, which is necessary in committing a fraud, from a mere expression of opinion. Frauds are classed as either actual or constructive. An *actual fraud* is one in which the perpetrator is guilty of dishonest intention. *Constructive fraud* consists of acts which may not be dishonest in intention, but which are considered in law as being in bad faith. The case of a person charged with the duty of selling property for another, in which he himself is the purchaser, is considered constructive fraud, since it is assumed that he will make the purchase at the best price possible. A party who is guilty of fraud may be punished under the criminal code and at the same time be required in a civil suit to return the goods or settle the damages sustained by the owner.

**FREDERICK** (frĕd'ĕr-ĭk), a city in Maryland, county seat of Frederick county, 32 miles northwest of Washington, D. C. It is on the Pennsylvania and the Baltimore and Ohio railroads. The surrounding country is agricultural and contains rich deposits of iron, copper, slate, and limestone. It is the seat of a fine school system, Frederick College, and a State asylum for the deaf and dumb. Among the noteworthy buildings are the county courthouse, the Emergency Hospital, and the public library. It has manufactures of flour, coaches, tobacco and cigars, machinery, and woolen goods. The public utilities include waterworks, sewerage, and street paving of stone and macadam. The two battles of South Mountain and Monocacy occurred near the city. Francis S. Key was a native of the county and is buried in Mount Olivet Cemetery. Frederick was settled in 1745 and incorporated in 1817. The first Methodist church in America was organized here by Robert Strawbridge in 1764. Population, 1900, 9,296.

**FREDERICKSBURG**, a city in Spottsylvania County, Virginia, about sixty miles north of Richmond, on the Richmond, Fredericksburg and Potomac and the Potomac, Fredericksburg and Piedmont railroads. It is surrounded by a hilly but productive country. The site is on the Rappahannock River, which is

crossed by several bridges, and is noted for its beautiful Confederate and Federal cemeteries. It has a public park, a fine high school, and a library. The manufactures include cigars, leather, flour, silk and woolen goods, and machinery. It was incorporated in 1782. Population, 1900, 5,068.

**FREDERICKSBURG, Battle of**, one of the important battles of the Civil War. It occurred at Fredericksburg, Virginia, on Dec. 13, 1862. General Burnside had resolved to march upon Richmond, and, accordingly, moved his troops to the heights opposite Fredericksburg, on the north side of the Rappahannock. His army consisted of 125,000 men, the right wing of which was commanded by Sumner, the center by Hooker, and the left by Franklin. The army under General Lee numbered 80,000 men, with Jackson as commander of the right wing and Longstreet of the left. The Federal forces crossed the river by three pontoon bridges in the two days preceding the battle. It was planned that Burnside should make the chief attack and hold the road, while Sumner and Hooker should carry the stone wall which ran along the foot of the hill and ultimately storm the heights. An insufficient number of troops had been assigned to Franklin to effect the object intended. The attacks made by Hooker and Sumner were unsuccessful, but failed largely for want of support from Franklin. The Confederate loss was 5,250, while the Union army lost 12,350, and the entire battle proved disastrous to the Federals. Two days later Burnside withdrew from Fredericksburg, and he and Franklin were relieved of their commands shortly after. General Hooker was appointed to succeed Burnside in command of the Army of the Potomac.

**FREDERICTON** (frĕd'ĕr-ĭk-tŭn), a city of Canada, capital of New Brunswick and of York County, on the Canada Eastern, the Canadian Pacific, and other railways. It is located on the Saint John River, 60 miles northwest of Saint John, 84 miles from the Bay of Fundy. It has broad and well-improved streets and is important as a commercial and manufacturing center. The chief architectural structures include a hospital, the legislative library, a customhouse, several schools, and the Parliament buildings. It is the seat of an Anglican bishopric and of the New Brunswick University. Among the manufactures are lumber products, leather, machinery, and boots and shoes. The domestic and foreign trade is important, owing to its convenient location on railways and on the Saint John River, which is navigable for large vessels to this



point. It was founded as Saint Anne in 1740. The name was changed to Fredericton in 1785, and two years later it became the capital of New Brunswick. Population, 1901, 7,117.

**FREDONIA** (frê-dō'nī-à), a town of New York, in Chautauqua County, 45 miles southwest of Buffalo, on the Dunkirk, Allegheny Valley and Pittsburg Railroad. It is the seat of a State normal school. Among the enterprises are machine shops, canneries, nurseries, and an electric light plant. It has a public library, waterworks, and several fine schools. The first settlement in its vicinity was made in 1803 and it was incorporated in 1829. Population, 1905, 5,148; in 1910, 5,285.

**FREE CHURCH**, the general name of a religious denomination which originated from an established church. The most important are the Free Church of England and the Free Church of Scotland. The former is a Protestant Episcopal organization founded in 1844. While the ritual is practically identical with that of the national church, it is free from state control, and claims the liberty of establishing a liturgical service on an evangelical basis. The Free Church of Scotland became a separate body in 1843, when it organized as a branch of the Presbyterian church, as distinct from the Established Church. The separation was brought about by a law of the general assembly passed in 1834, which provided that a majority of the male heads of families, who were full members of the church, could veto or bar the appointment of a minister who was not acceptable to a parish church. This act of legislation caused a conflict between the civil and ecclesiastical powers, but the House of Lords, in 1839, set aside a decision of the civil courts which had annulled the act, hence a large number of members, under the leadership of Chalmers and Candlish, established the Free Church of Scotland. While it renounced the benefits of establishment, it maintains the doctrine and discipline of the Church of Scotland.

**FREE CITIES**, a name applied to cities that form independent governments or states by themselves. At the time of the French Revolution there were about fifty free cities in Europe, mostly members of the German Confederation, but at present there are only three, the cities of Lübeck, Bremen, and Hamburg, and they retain their privileges under the reconstituted German Empire. All others lost their special privileges on account of international political changes.

**FREEDMEN'S BUREAU** (frêd'menz bū-rō), formerly a branch of the War Department

of the United States, organized by an act of Congress in 1865 with the view of providing for the needs of liberated slaves, and to aid in fitting them to become self-supporting citizens. Gen. O. O. Howard was appointed commissioner. The bureau was discontinued in 1870. In the five years of its existence it handled a fund of nearly \$20,000,000, which was raised by grants, bounties, and prizes, and gave valuable assistance to the freedmen during temporary need.

**FREELAND** (frē'land), a borough of Pennsylvania, in Luzerne County, 38 miles south of Wilkesbarre, on the Lehigh Valley Railroad. It is surrounded by a farming and anthracite coal mining region. The manufactures include hardware, machinery, cigars, and clothing. It has a growing market in merchandise, coal, and produce. Population, 1900, 5,254.

**FREEMASON** (frē'mā-s'n), a member of a secret fraternity known as the Freemasons, which dates from the Middle Ages. Originally membership was limited to skilled artisans, but now it includes a far wider range, and the fraternity has branches and lodges in all civilized countries. The present form of organization was adopted in 1717, when the fraternity was reorganized on the avowed principles of charity, brotherly love, and mutual assistance. According to the legends of the craft, it is traced back through the centuries to the building of Solomon's temple, and according to some to the tower of Babel and the building of Noah's ark. Many interesting details are given as to its early organization. Its slow but steady development is traced from the times of Solomon, Hiram, King of Tyre (II Samuel v., 11), the Pharaohs, the ancient Roman nation, and lastly the Knights Templar.

The modern fraternity of Freemasons has its true source in the building corporations maintained in the mediaeval period, when members of those organizations passed to different portions of Europe to hew stone and construct massive and durable forms of architecture. Certain signs and passwords were used by the skilled workmen, which served as a sign of fraternity, efficiency, and worthiness, such signs being kept a secret among the craft. The most distinct types of production by the stonemasons are found in the monasteries and other massive edifices of Germany. In England they date from 926, when a conference of masons was held at York, attended by King Athelstan. In the 12th century they proceeded to Scotland, of which fact many massive abbeys give evidence. The reorganization of 1717 occurred at London, while branches were es-



established in France in 1725; America, in 1730; Russia, in 1731; Germany, in 1740; and later in all civilized countries. From the first branch lodge established in New Jersey sprang many thousands of others, until at present there are sixty grand lodges in the United States and British America, about 12,000 subordinate lodges, and a membership of 1,198,845.

Findel's "History of Freemasonry," translated into the English in 1889, is the most scientific and complete work on the subject of Freemasonry. It contains an intensely interesting account of the growth and development of the fraternity. At various times, like other secret societies, it has been declared useless and harmful by divers religious councils. In the United States and elsewhere there are numerous degrees, to which applicants are initiated under a system of instruction and tests.

The election of new members is by ballot and various signs, passwords, and grips are given, by which members in need of assistance and succor may be tested before more than ordinary or usual benefits are extended. The grand and subordinate lodges elect officers by ballot, who are eligible to reelection. Careful study of a suitable course is incumbent upon the members and officers, in order to secure the greatest degree of efficiency and skill in conducting the business appertaining to the fraternity.

**FREE METHODISTS**, a Protestant sect organized at Peking, N. Y., in 1860. It is an outgrowth of the Methodist Episcopal church, and was formed by the followers of two ministers who did not approve of the decisions of a conference held at Genesee, N. Y., on points of Christian practice. In the main Free Methodists agree with the Methodist Episcopal church on points of doctrine. They do not recognize the office of bishop, but instead have an elective superintendent, who serves four years. The singing in churches is strictly congregational, without instrumental music, and the seats in the church are free. They insist upon plainness of dress and simplicity in living, approve of and practice freeness in prayer and testimonial meetings, and encourage extemporaneous preaching. The doctrine of Christian perfection is insisted upon. The church has about 32,500 members, 1,200 church buildings, and promotes religious work through Sunday schools and protracted meetings. Missions are maintained in all the continents. The *Free Methodist*, published in Chicago, is one of the leading church journals.

**FREEPORT** (frē'pōrt), a city and the county seat of Stephenson County, Illinois, 108 miles

northwest of Chicago, on the Pecatonica River. It is on the Illinois Central, the Chicago and Northwestern, and the Chicago, Milwaukee and Saint Paul railroads, and has communication by electric railways. The chief buildings are the courthouse, the public library, and the Saint Francis Hospital. Besides having a fine public school system, it is the seat of Freeport College, a Presbyterian institution founded in 1872. Among the manufactured products are carriages, flour, bicycles, farm machinery, vinegar, hardware, and cigars. Douglas and Lincoln had a noted debate at Freeport in 1858, when the former declared a doctrine regarding Dred Scott case which afterward became known as the *Freeport heresy*. The vicinity was settled in 1835 and Freeport was chartered as a city in 1885. Population, 1910, 17,567.

**FREE PORTS**, a name applied to ports at whose wharves vessels of all nations are permitted to load, reload, or unload free of commercial charges and customs duties, paying only a nominal harbor fee. Free ports were established in the Middle Ages for the purpose of attracting trade to certain cities, and these enjoyed special advantages when prohibitive or protective customs went into effect in other commercial centers. Since 1888 the free port cities have become greatly limited, among the few remaining in Europe being Hamburg, Bremen, and Trieste. Those not European include Hongkong, Singapore, Livingstone, in Guatemala, and several others.

**FREE-SOIL PARTY**, a political party of the United States, organized at Buffalo, N. Y., in 1848. It maintained an opposition to the extension of slavery as its cardinal principle. At first it was made up of different minor parties, such as the Barnburners, Liberty party, Whigs, and Abolition party. The first candidate for President of the Free-Soil party was Martin Van Buren and its last was John P. Hale, the former in 1848 and the latter in 1852. As neither candidate received a considerable number of votes, the party was merged into the newly formed Republican party in 1856.

**FREETHINKERS** (frē'thīnk-ērz), a term originated in England and applied to a class of deists in the 17th and 18th centuries, who held tenets in favor of natural as against revealed religion. In the time of Frederick the Great the term began to be used in Germany. In France it was applied to such writers as Diderot, Voltaire, and Helvetius, and in England it had reference to a class which included Hume and Lord Bolingbroke. At present the term is common among Christians as well as others, since it is taken to designate rationalism.



**FREETOWN**, a city of West Africa, capital of the British colony of Sierra Leone, about five miles from the Atlantic coast. It is located on the Sierra Leone River, 32 miles by rail from Songotown, and is surrounded by a low tract, which is separated from the inland by a chain of mountains. The chief buildings include a mission house, a supreme court, a cathedral, and a number of schools. It is an imperial coaling station and has a large export trade in palm oil, hides, India rubber, and fruits. The city has only about 200 European inhabitants. Population, 1908, 38,063.

**FREE TRADE**, the term applied to national and interstate commerce when it is unrestricted by tariffs or customs. Advocates of this system hold that commerce among the nations should be as unrestricted as the trade among the various states of the Union, or among the provinces of Canada, though some think that duties should be levied, but only to obtain revenue and without regard to the effect on domestic industries. Among the advantages argued in favor of such a system are that it is the method of nature, by which every individual has a right to buy in the cheapest market and sell in the dearest, and that attempts to check this right result sooner or later in an artificial commercial condition and cause financial disaster. It is held that the right of property implies freedom for every one to do the best he can with his own, so long as he does not infringe on the rights of others, and that protection benefits only a minority of a nation at the expense of a great majority. As to protecting infant industries, it is held by free traders that long experience has demonstrated that individuals benefited by a tariff system continue to advocate taxation for their personal gain, and that the institutions meant to be matured after years of paternal assistance never reach maturity. In 1846 Great Britain made a step toward free trade by opening the ports to the unlimited and untaxed admission of grain, and since then has gradually extended the free list until the commercial policy is practically one of free trade.

No great political party of the United States has yet advocated an absolute system of free trade. The free list has been enlarged greatly by placing on it commodities and raw materials not produced within the country, largely through the advocacy of a policy of *tariffs for revenue* only, thereby making the object rather one of collecting revenue than for the limitation or prohibition of imports. The principle of free trade is in direct opposition to a system of stimulating industry by *bounties* or lim-

iting importation by so-called *protection* or a protective tariff system. It is claimed on one hand that nations like England, consuming more of the principal products than they produce, thrive under a system of free trade, while, on the other hand, the countries producing largely the food and apparel products can be benefited best by a partial free list and limited tariffs, though local conditions largely tend to modify or restrict the particular legislation which is most essential to the common weal. In this respect the experience of Germany, where high tariff rates are maintained, furnishes numerous examples.

**FREE WILL**, the power to choose between two courses of conduct without external compulsion. The freedom of the will has long been a subject for discussion in theology and psychology. This controversy hinges upon the question whether the will is free to choose, or whether it is limited by various circumstances that make free choice impossible. Those who think the will is not free to act believe that it is influenced beyond control by various conditions and circumstances, that it acts in accordance with the natural law, that it is governed by previous activity and experience, and that these, acting separately or in unison, make free choice between alternatives impossible. On the other hand, it is argued that the will enables man to select for himself his own course of action and put forth force or effort for the execution of the course he has chosen. However, it is necessary to make choices and put forth effort in accordance with the fixed laws of nature. Only when man is conscious that he makes a free choice and acts accordingly, it is possible for him to feel responsible for his actions. According to this view, he may be prevented from executing his volitions by human interference, but in the matter of making the choice he is not subject to limitation.

**FREEWILL BAPTISTS**, a denomination of evangelical Christians founded by Benjamin Randall (1749-1808). He was a member of the Baptist church in South Burwick, Me., but began to differ from that denomination soon after entering the ministry. In 1780 he founded a new church at New Durham, N. H. The distinctive tenets of the Freewill Baptists are the doctrines of *free salvation* and *open communion*, as opposed to those of *election* and *closed communion*. This denomination is represented by organizations in Canada and the United States and has about 100,000 members. It is strongest in New England. Bates College at Lewiston, Me., is one of its many educational institutions. It has about 1,600 churches



and promotes missionary work through Sunday schools and numerous missions.

**FREEZING** (frēz'ing), the changing of a liquid into a solid under the influence of cold. A large body of water cannot be cooled below the temperature of 32° Fahr., since, when brought to that condition, the entire mass changes to ice. During the change from water to ice heat is liberated from the water, the amount being correspondingly greater than any other substance liberates in cooling. Consequently, an equal amount of heat disappears when ice is changed into water. All liquids solidify at a given temperature, known as the *freezing point*, which differs in the different liquids. Thus, water solidifies at 32°; mercury at -39°; sulphuric acid, at -40°; and alcohol, at -203°. The terms *melting point* and *point of fusion* are used interchangeably with the term *freezing point*.

Advantage is taken of the cooling produced by the solution of solids to obtain low temperatures, and freezing mixtures are made by combining solids, or liquids and solids, which, when mixed, dissolve and cause a reduction of temperature. A simple mixture of this kind consists of 33 parts of common salt and 100 parts of snow, with which a temperature as low as -5.8 Fahr. can be obtained. The most powerful mixture known, which will make alcohol of the consistency of oil or melted wax, is made by dissolving solid carbonic acid, or solid nitrous oxide gas, in sulphuric ether, giving a temperature of -120° to -200° Fahr. When matter passes from a liquid to a gaseous state, heat is again liberated, the degree of cold varying with the rapidity and extent of evaporation. See **Ice**.

**FREIBERG** (frī'bērg), a city of Germany, in the kingdom of Saxony, 35 miles southwest of Dresden. It is situated on the northern slope of the Erzgebirge, and is surrounded by a productive mining country. Commerce is facilitated by important railway and electric railroad lines. The manufactures include woollens, leather, fertilizers, machinery, and clothing. In the districts adjacent to the city are numerous smelters, which utilize the silver, lead, and copper mined in the vicinity. Freiberg is the seat of a gymnasium, a celebrated mining academy, and chemical and assay laboratories. It has a fine Gothic cathedral constructed in 1490, and contains the castle of Freudenstein. Gas and electric lighting, stone and asphalt paving, sewerage, waterworks, and a public library are among the municipal improvements. The city was made a part of Saxony in 1485. Population, 1906, 30,806.

**FREIBURG** (frī'bōōrg), a city of Baden, Germany, on the Dreisam River, 32 miles northeast of Basel. It has several beautiful specimens of Gothic architecture, the most important being the Gothic cathedral, which is built of red sandstone and rivals the noted Minster of Strassburg. This edifice has a tower 380 feet high and is remarkable for lightness and elegance. It was begun in 1122 and completed in 1513. It is the seat of the University of Freiburg, founded in 1457 by the Archduke Albert of Austria. This institution has 1,500 students and a library of 275,000. Other noteworthy buildings include the Ludwigskirche, the Rathaus, the Merchants' Hall, the grand ducal palace, and several theaters and museums. It has manufactures of clothing, potash, tobacco, paper, chicory, textiles, and machinery. Several railroads and electric car lines furnish ample means of communication, while many modern municipal facilities abound, such as telephones and electric lights. Freiburg was founded in 1090 and became a free city in 1120. It has belonged to Baden since 1806. Population, 1905, 74,098.

**FREIGHT** (frāt), the general name of merchandise in the process of transportation, either on ships or on railway cars. Originally the term was applied to the cargo carried by a vessel, and later it came to be used to designate the price paid to the charterer of a ship for the carriage of goods. Now it is used to describe the goods carried on land as well as on water. The conditions of carriage are usually set forth in a bill of lading, which is issued by the party receiving the freight to the shipper, and is evidence that the goods were received in the proper condition for carriage and delivery at some particular place. See **Carrier**.

**FREMONT** (frē-mōnt'), a city in Ohio, county seat of Sandusky County, on the Sandusky River, thirty miles southeast of Toledo. It is on the Lake Erie and Western, the Lake Shore and Michigan Southern, and other railroads, and has transportation facilities by electric railways and by navigation on the Sandusky River, being at the head of river navigation. Among the chief buildings are the county courthouse, the Birchard public library, and the high school. It is the seat of a normal and business college, and has city waterworks and gas and electric lights. The manufactures include flour, boilers, butter and cheese, woolen fabrics, machinery, and vehicles. It was a trading post as early as 1785 and became Fort Stephenson in 1812. The name was changed to Fremont in 1850, in honor of General Fremont. Population, 1900, 8,439.



**FREMONT**, a city in Nebraska, county seat of Dodge County, on the Platte River, 35 miles west of Omaha. It is on the Union Pacific and the Chicago and Northwestern railroads. The surrounding country is fertile and noted for its production of cereals and domestic animals. Among the chief buildings are the Fremont Normal School, the courthouse, the public library, and the high school. It has sewerage, electric lighting, graded and paved streets, waterworks, and telephone connections. The manufactures include flour, cigars, woolen goods, ironware, cured meat, machinery, and dairy products. It was settled in 1857 and incorporated in 1871. Population, 1900, 7,241.

**FRENCH AND INDIAN WARS**, the name usually applied to four wars between the French and the English in America. They occurred in the period of exploration and settlement, in the 17th and 18th centuries, and were due in part to conflicting claims in America and partly to divergent interests in Europe. The French had settled chiefly on the Saint Lawrence and Mississippi, and based their claims upon the theory that a settlement at the source of a river gave title to all the basin, while the English held the view that settlement on the Atlantic coast extended their right across the continent to the Pacific. Migration, induced by an expansion of the colonies toward the west, caused the rival claimants to build forts on the frontier, which soon brought on active hostilities.

1. *King William's War*, the first of this series, began in 1689, when William and Mary ascended the throne of England. War was declared between England and France and at once spread to the colonies. Governor Frontenac of Canada, in 1690, sent three expeditions against the English frontiers. These expeditions included many Indians, who killed and scalped a large number of the settlers. Sir William Phipps was sent with a fleet and 1,800 men against Acadia and Port Royal, both of which he captured, but they were retaken by the French in 1691. In 1696 the French took possession of Newfoundland and captured Andover and other points in Massachusetts, but the Treaty of Ryswick, in 1697, ended the war.

2. *Queen Anne's War* began in 1702, when the War of the Spanish Succession commenced in Europe. James Moore of South Carolina, with a force of whites and Indians, destroyed several Spanish settlements in Florida. The French made an attack upon Charlestown in 1706, but were repulsed. A body of Canadians and Indians obtained possession of many points in New England and punished the English

severely at Deerfield, and Haverhill, Mass. Three expeditions were sent by the English into Acadia, and the last of these, in 1710, proved successful. In 1713 the war was ended by the Treaty of Utrecht, which ceded Acadia, Newfoundland, and the Hudson Bay territory to England.

3. *King George's War* began in 1744, when the War of the Austrian Succession commenced in Europe. An attack was made by the French upon the northeastern settlement and privateers from Louisbourg, in Cape Breton, harassed the coast of New England. William Pepperell of Maine was sent with a force against Louisbourg, which was captured on June 17, 1745, after a siege of two months. Another expedition was organized against Quebec, but the Treaty of Aix-la-Chapelle terminated the war in 1748. By the terms of this treaty Louisbourg was restored to France, and the territorial conditions remained as they were before the war.

4. The *French and Indian War* was the American phase of the Seven Years' War, and was the final struggle between France and England for the possession of North America. France claimed the region west of the Alleghenies as part of the basins of the Mississippi and the Saint Lawrence, and had about 80,000 whites and the friendship of many Indians. The English had about 1,100,000 white colonists, but their people were divided into thirteen discordant governments. George Washington with a force of Virginian volunteers made an attack upon Great Meadows and was soon after compelled to surrender at Fort Necessity, a strategic point erected to defend the western frontier. In 1755 the English sent an expedition under Braddock against Fort Duquesne (Pittsburg), but they were attacked and completely routed. Other expeditions were made by way of Champlain and Fort Niagara with the view of capturing the French posts near Nova Scotia, but these proved unsuccessful. The English were defeated in all their projects until William Pitt became the head of the ministry in England, in 1757, when a general scheme was formed to conquer America. The following year Wolfe and Amherst captured Louisbourg, Forbes reduced Fort Duquesne, and Bradstreet captured Fort Frontenac. Ticonderoga and Crown Point were captured by Amherst in 1759 and Niagara was taken by Prideaux in the same year. General Wolfe captured Quebec as a result of the Battle upon the Plains of Abraham, in the same year, and the following year Montreal fell, thus completing the conquest of Canada. By



the Treaty of Paris, in 1763, France ceded all lands east of the Mississippi to England, and all the lands west of the Mississippi were ceded to Spain, while Spain ceded Florida to England. This war enforced the necessity of union upon the colonists and left Spain as the only rival of England in America.

**FRENCH BEAN**, a twining annual plant with alternate leaves, whitish flowers, and seeds more or less kidney-shaped. Several species are cultivated, the most common being the *Lima bean*. They are native to the East Indies, whence they were brought to Europe by the French, but are now grown very extensively in all countries.

**FRENCH BROAD**, a river of the United States, rises in Transylvania County, North Carolina, and flows through that State and Tennessee. It joins the Holston River four miles above Knoxville, after a course of about 200 miles. The country through which it passes is famed for its scenery, especially from Asheville to the Tennessee border, where many deep and beautiful gorges characterize the banks, some of which are 300 feet high.

**FRENCH CONGO** (kõŋ'gõ), a large colonial possession of France in West Africa, bounded on the north by Wadai; east and south by Egyptian Sudan and the Congo Free State; and west by the Atlantic, Kamerun (Cameroon), and Nigeria. It extends north to Lake Tchad and is separated from the Congo Free State largely by the Congo, the Uvangi, and the Welle rivers. The area is estimated at 590,000 square miles. A number of bays and many lagoons diversify the coast. The southeastern part is in the valley of the Congo, which is fertile and well timbered. Among the principal rivers are the Gabun, Sanga, and Ogowai. Although the country is valuable for its minerals and fertility of soil, the climate is unhealthful.

The native inhabitants are chiefly savage, engaging in hunting, fishing, and rude forms of agriculture. Among the exports are caoutchouc, ebony, palm kernels, coffee, redwood, ivory, palm oil, elephants' teeth, and drum opal. The French title to this possession is based on the explorations of M. de Brazza. He obtained concessions from the natives and occupied Gabun, a region along the coast which is now included with the colony. The country possesses valuable timber, fertile soil, and is susceptible to material development. Libreville, on the Gulf of Guinea, is the capital, whence the colonial government is administered under the direction of France. Other cities

are Mayumba, Baraka, Lambarene, Brazzaville, and Franceville. Population, 1906, 12,480,000.

**FRENCH GUIANA** (gě-ä'nà). See **Guiana**.

**FRENCH GUINEA** (gřn'ě), a colonial possession of France, on the western coast of Africa, between Sierra Leone and Portuguese Guinea. It extends inland to Senegal and the French territory in the Sudan. The area is about 106,200 square miles. It is largely a mountainous country, but has a favorable climate and valuable forests. The drainage is partly by the Niger and partly toward the west by the Grande. Among the chief productions are live stock, cereals, ivory, palm oil, India rubber gum, and sesame. The region was explored by the Portuguese at an early date, but the French have carried on a trade since 1685 and took possession of the country in 1869. It was made a separate colony in 1890. Konakry, on the island of Tombo, is the capital and chief port. It is connected with the mainland by a bridge. The estimated population, in 1908, was 1,460,500.

**FRENCH INDO-CHINA**. See **Indo-China**.

**FRENCH LANGUAGE**. See **France**.

**FRENCH REVOLUTION**, the political and military contest of France which overthrew the old feudal *régime* and the Bourbon monarchy. It began in 1789 with the meeting of the States-General and ended in 1799 with the establishment of the consulate, of which Napoleon Bonaparte was proclaimed consul for life in 1802. Previous to the Revolution, France was disturbed by a great spirit of unrest, which was intensified by the success of the American Revolution and the weakness of Louis XVI. The distress of the people had increased rapidly and the state of the finances became more desperate. Prominent men and women, who discussed political abuses and their remedies with dangerous fluency, crowded the royal palace and the salons of Paris. The government finally yielded to a general clamor for the reassembling of the States-General, and the election of members for the states took place with indescribable tumult. Meanwhile Paris was flooded with pamphlets upon the absorbing theme, and when the States-General met at Versailles on May 5, 1789, it ended the monarchy and was the immediate cause of the Revolution.

Great pomp was displayed when the States-General convened and much was expected from that body. It first undertook to settle the question of method in voting, which had formerly been by class instead of by poll. Under



this plan the clergy and nobles, acting together, had a decided advantage over the third estate, or the commons. Five weeks were spent in useless parleys, when the commons decided to be the national assembly, and proceeded to deliberate upon the affairs of the state without reference to the other bodies. Louis XVI. now suspended the meetings and convened a royal sitting, at which he ordered the members of the States-General to assemble in their respective rooms. The clergy and nobles obeyed, but the commons refused to have the Assembly dissolved and through Mirabeau declared: "We are here by the will of the people, and nothing but the bayonet shall drive us hence." This signaled the loss of the royal authority, and the clergy and nobles joined the third estate.

The royal authority having failed, no resource but submission or the bayonet was open to the king. The first wave of intense excitement passed over the country on July 12, when it was reported that Necker had been dismissed and troops were rapidly collecting at Versailles. Two days later the Bastille was stormed by an immense crowd, and many of the prisoners were murdered and their bleeding heads were borne on pikes along the streets. It was the first scene in the tragedy of the Revolution. Soon after the Assembly abolished all feudal rights and privileges and adopted a Declaration of the Rights of Man, which outlined the leading principles of a limited monarchy based upon a constitution. This was followed by the organization of the National Guard, but the Commune of Paris was fast getting control of the Revolution. A mob of men and women made an attack upon Versailles, where the royal guards were put to death, and the king and queen were required to return to Paris.

Although the king had taken an oath to support the new constitution, his sincerity was under suspicion, since concerted efforts were made by the émigrés (q. v.) to secure assistance from foreign powers as a means to end the Revolution. The king and queen escaped from Paris in 1791, but were arrested at Varennes, about seventy miles from Paris, and were forced to return. In 1791 the National Assembly had declared its members ineligible to reelection, which body was now succeeded by the Legislative Assembly. This body was made up of three powerful factions; the Girondists, who were republican; the Feuillants, who supported the constitution; and the Mountain, a party that was made up largely of demagogues and anarchists. Louis

unwisely dismissed the Feuillant ministry and appointed a Girondist cabinet, and war was soon after declared against the empire by Prussia and Austria.

The campaign against foreign enemies proved a failure, causing the breach between the king and the Assembly to widen. He soon dismissed the Girondist ministry and sought an alliance with friendly princes, but the Jacobins and Girondists instigated an insurrection. On June 20, 1792, a mob made an attack upon the Tuileries, but the leaders were persuaded to disperse the people. The second attack upon the Tuileries took place on Aug. 10, which was sacked and plundered by the frenzied mob. Louis threw himself upon the mercy of the Legislative Assembly, which was compelled by the mob to put him in prison and suspend him from office. On Sept. 20 the National Convention, as the next Assembly was called, met to take up the government. It included some of the most violent revolutionists, such as Danton, Marat, Camille Desmoulins, and Robespierre, and immediately abolished royalty and proclaimed the republic. The extremists finally carried a measure to confiscate the property of the nobles and priests, and promoted a policy favorable to the annexation of Belgium. A German army had previously invaded France, but was defeated by Dumouriez at Valmy. Louis was accused of plotting against the liberty of the people, and after a stormy debate was declared guilty and sentenced to die. He asked for a respite of three days, but was refused and executed while the crowd shouted *Vive la République!* This aroused the nations of Europe and a concerted organization was affected by Holland, England, Spain, and Germany to strangle the Revolution, which threatened to overthrow the royalties and aristocracies of Europe. The Austrians defeated Dumouriez, who soon after joined the allied camp against the revolutionists.

The government now organized the Committee of Public Safety and France was thrown into the Reign of Terror. The Jacobins, under the lead of Robespierre, ordered the Girondists arrested, and those who escaped were outlawed and pursued with unrelenting vengeance. All the prisons were crowded, some of the most illustrious citizens were condemned, and the guillotine was kept at work in every part of France. Among those executed were Madame Roland, Philippe Egalité, and Queen Marie Antoinette. Lavoisier, the chemist; Bailly, the astronomer; and De Noailles, the marshal of France, were among the many il-



lustrious persons who were hurried to the scaffold. Many churches and convents were plundered, tombs were rifled, Notre Dame was converted into a Temple of Reason, and red caps were worn to indicate that liberty had been enthroned. At length the terrorists were divided and Robespierre, who had been the most conspicuous figure among them, was beheaded on July 28, 1794. The Reign of Terror was now at an end, the Jacobin Club was disorganized, thousands of prisoners were released and the Terrorists were disarmed. Many defenders of the new republic volunteered to protect the frontiers against foreign invasions. The States-General was organized into two houses, the Council of Five Hundred and the Council of the Ancients, the former to propose and the latter to pass or reject laws. Executive power was lodged in a directory of five persons. Napoleon Bonaparte was called to defend the Tuileries. He planted cannon that swept the insurgents as they came within range of his pitiless guns, thus ending the last insurrection of the people.

**FRENCH SOMALILAND** (sō-mä'lê-länd), a colonial possession of France in the north-eastern part of Africa, bordering on the Gulf of Aden. It is bounded on the north by Eritrea, east by the Gulf of Aden, south by British Somaliland, and west and southwest by Abyssinia. The area is 45,000 square miles. The surface is hilly along the coast and much of the interior is an elevated plateau, ranging about 4,000 feet above sea level. Gold, coffee, ivory, and fruits are exported; and foodstuffs, machinery, tobacco, and cotton and silk textiles are imported. Jibuti, the chief port, is connected with the interior by a railway and is the seat of colonial government. A part of the possession has belonged to France since 1855, when Obok was made a French port. Subsequently the boundary was moved inland and treaties were made with Italy, England, and Abyssinia in the period of 1887-96, definitely fixing the boundaries. The government is administered by a governor, who is assisted by a general council of six members. Galla and Danakil races constitute the larger portion of the natives. Population, 201,500.

**FRENCHTOWN**, a village in Michigan, the site of which is now occupied by the town of Monroe, about 22 miles southwest of Detroit. It was the scene of a battle on Jan. 14, 1813, when an American force of 650 men under Colonel Lewis defeated a force of British and Indians under Major Reynolds. A second engagement occurred at the same place on Jan. 22, 1813. The British under Colonel

Proctor made an attack upon General Winchester, who now commanded at Frenchtown, and the Americans were compelled to surrender. Many of the latter were massacred by the Indians, hence the affair is sometimes called the Massacre of the Raisin River.

**FRENCH WEST AFRICA**, a territorial possession of France, including nearly all of the Sahara. It was made a governor generalship on Oct. 17, 1899, and in 1902 was divided into Dahomey, Ivory Coast, Senegal, French Guinea, Senegambia, and the military territory of the Niger. Government authority over all of these possessions is exercised by the governor general of French West Africa, who has his seat at Saint Louis, in Senegal.

**FRESCO** (frēs'kō), the art of painting with water colors on fresh plaster, or on a wall covered with mortar not entirely dry. The most satisfactory results are obtained when the plaster is laid on as the painting proceeds, since the unhardened fresh plastered walls permit the color to sink and form a more satisfactory surface. It was highly developed as an art by the ancients, and is now generally employed for large pictures on walls and ceilings. Numerous well-preserved frescoes are to be seen in many of the temples. Splendid specimens of ancient frescoes were found in Pompeii, Egypt, India, and Mexico, though the art was not brought to the greatest perfection until the rise of the finer Italian art in the 16th century. Many of the ancient paintings were executed in what is called *fresco secca*, which is quite distinct from genuine fresco, since it is executed on dry walls and ceilings, previously moistened with limewater.

**FRESNO** (frēz'nō), a city of California, county seat of Fresno County, about 40 miles north of Tulare Lake and 200 miles southeast of San Francisco. It is on the Southern Pacific and the Atchison, Topeka and Santa Fé railroads. The noteworthy buildings include the Carnegie public library, the Federal building, the county courthouse, and the high school. It has systems of waterworks, electric lighting, pavements and electric street railways. Among the manufactures are flour, furniture, agricultural implements, ironware, cigars, and wine. The surrounding country is fruit, cereal, sheep, and mineral producing. An abundance of water power is drawn from the falls of the San Joaquin River, about 30 miles distant. Population, 1900, 12,470.

**FRIAR**, a member of a monastic brotherhood, especially one who belongs to such mendicant orders as the Dominicans, Franciscans, Carmelites, and Augustinians. The term is



commonly used to distinguish members of modern religious communities in the Roman Catholic church from the older title of monk, which has special reference to the Benedictines and their branches. In reference to the clothing worn, the Dominicans were formerly called *Black Friars*; the Franciscans, *Gray Friars*; and the Carmelites, *Barred Friars*. The monks are generally called friars in Ireland.

**FRICTION** (frīk'shūn), in mechanics, the resistance arising when two or more bodies move while the surfaces are in contact. It is usually classified as *sliding* or *rolling*, the former being exemplified by the sliding of a sled or skate and the latter by the friction of the wheels of a wagon on the ground. All bodies have elevations and depressions, more or less prominent, and the projecting points of one body render movement more difficult by entering the cavities of the other. However, the intensity of friction depends to some extent upon pressure and slightly upon adhesion. Friction is greatest when a body at rest begins to move, thereby making it difficult for a force to displace the body, owing to its inertia being influenced by friction. The inertness is greatest in large and heavy bodies. Oil and other lubricants are used to lessen friction in machinery and instruments. Friction is a retarding force in nature, and gives stability to bodies which otherwise would be easily displaced. Since friction generates heat, it is one of the chief means of developing electricity.

**FRIDAY** (frī'dā), the sixth day of the week, following Thursday and preceding Saturday. It occurs on the same day as the Mohammedan Sabbath and is the day for general fasts and obligation in the Anglican, Greek, and Roman churches. Friday was named from Freya (q. v.), a Scandinavian goddess.

**FRIENDLY ISLANDS**, or **Tonga Islands**, an island group in the South Pacific Ocean, about 250 miles southeast of the Fiji Islands. The islands, about 150 in number, are divided into three groups by two narrow channels and have a total area of 390 square miles. Tongatabu, having an area of 125 square miles, is the largest and contains Nukualofa, the capital. About 30 of the islands are inhabited by friendly natives. They are partly of volcanic and partly of coral origin and have a fertile soil. A number of the volcanoes are active, including Tofoa, height 2,785 feet, and Late, height 1,790 feet. Copra, sponges, coffee, wool, and tropical fruits are the chief products. Manufacturing is in a primitive state, the

products including rude machinery, pottery, and wearing apparel used by the natives. Christian missionaries began active work in 1877, since which time the Christian cause has secured many adherents, schools have been established, and a general advance has been made in moral and intellectual development. The government is directed by a native Christian chief and is administered under a constitution, which provided for a representative parliament and a well-established judiciary. European customs, education, machinery, and utensils have been introduced to a large extent. The island group was discovered in 1643 by Tasman. It was visited in 1777 by Captain Cook, who applied the present name. The islands were declared neutral by the Declaration of Berlin in 1886, but Germany, Great Britain, and the United States held special treaties. In 1899, with the assent of Germany and the United States, Great Britain proclaimed a protectorate. Population, 1906, 21,661.

**FRIENDS, Society of.** See **Quakers**.

**FRIGATE** (frīg'ât), a name applied originally to a class of long vessels common in the Mediterranean, navigated with sails and oars. It is now used to designate warships that have a high speed and great fighting power. Many of the largest men-of-war belong to this class and carry from twenty to forty guns, sometimes more than that number.

**FRIGATE BIRD**, a tropical web-footed bird, related to the pelican and sometimes called frigate pelican and man-of-war bird. It is so named from its fierce attack upon other birds, especially when they are carrying articles of food. The bill is longer than the head, the tail has twelve large feathers and is forked, and the extent of wing is about seven feet. Birds of this kind have great power of flight and are frequently seen a thousand miles from land. They often fly in flocks so high that they are scarcely visible, but are very awkward in moving about on the land. These birds are common to the intertropical coasts of the Atlantic and Pacific oceans, and are rarely found north of South Carolina.

**FRISIANS** (frīzh'anz), an ancient German race that dwelt in the northwestern part of Germany, between the Rhine and the Ems. The Romans under Drusus made them tributary, but later they instigated several revolutions on account of Roman oppression. Subsequently their district was reduced to Friesland, but in the 9th century they obtained their independence, which they maintained until 1498, when their history became merged into that of Germany and Holland. They are an industrious



people, have a fine literature, and include a number of eminent historians, poets, and scientists. Modern Frisian is usually divided into East and West Frisian, but both branches have been influenced very largely by the German, especially by the *Platt Deutsch*.

**FROBISHER BAY**, an inlet on the southeastern coast of Baffin Land, about 20 miles wide and 200 miles long, and marked by precipitous, rocky shores. It is located about midway between Hudson Strait and Cumberland Sound, west of the southern point of Greenland, and at its entrance is Resolution Island. The fisheries are valuable, but the catching season is short on account of extremely cold winters.

**FROG**, a tailless amphibian animal which belongs to the leaping *Batrachians*. It has four legs, a flat head, a rounded nose, a very large

gelatinous mass with minute, black globules. By the end of April they have enlarged and hatched, the young being known as *tadpoles*. The tadpoles breathe by means of gills and have a tail, swimming about like small fish. Their hind legs appear first, later the fore legs, after which they remain dormant and the tail is absorbed, when they are said to "live on their tail." Soon after they quit the water and begin to breathe by lungs instead of gills. The process of breathing is carried on by the action of the muscles of the throat and abdomen.

All species of frogs are destitute of ribs. They make a loud, croaking sound, especially the bullfrog of North America, which grows to a length of fifteen to twenty inches. While frogs are usually green in color, they often have stripes or spots of dark-brown on the back, and the throat is yellow. The eggs of the frogs, like those of fishes, are fertilized after they are laid. Many people consider the hind legs of the American bullfrog excellent food. Several species known as wood frogs live in timber districts, frequenting the trunks and limbs of trees in search of food.

**FRONDE** (frônd), the name of a political faction in France which headed an insurrectionary movement during the latter part of the minority of Louis XIV. It was so named from *frondeurs*, meaning slingers, since their attacks upon Cardinal Mazarin were said to resemble the act of boys throwing stones with slings. The movement started in 1648, when the Parliament refused to register certain objectionable royal edicts that followed the breaking up of the

feudal system, and, when the king compelled that body to register, the people rose in defense of their rights. The struggle continued until 1652, by which time the nobles had won great constitutional reforms, but they had no definite object except selfish profit and were not directed by a strong leader, hence Mazarin regained his former power. As a whole, the War of the Fronde may be classed as a useless political and military contest, since the loss of advantages that had been gained temporarily contributed to make Louis XIV. an absolute monarch.

**FROST** (fröst), the minute crystals of ice formed directly from the vapor of water. At a temperature of 32° Fahr. the watery vapor becomes so cold that it cannot condense into water, but falls to the earth in the shape of frost instead of dew. This is known as *white* or *hoar frost*. The name is often applied to



METAMORPHOSIS OF THE FROG.

1, egg; 2, egg partly incubated; 3, newly hatched tadpole; 4, tadpole with gills; 5, outside gills replaced by internal ones; 6, tadpole with hind limbs; 7, tadpole with four limbs; 8, tadpole with rudimental tail; 9, adult frog.

mouth, and teeth on the upper jaw and palate. The hind legs are very long and stout and the feet are webbed. On the hind feet are five toes, while the front feet have only four. The tongue is thick and fastened in front to the lower jaw so the back part may be thrown out of the mouth very quickly, thus enabling it to catch insects, bugs, and various other forms of life on which it feeds. It swims by means of its hind legs and lives much of the time in the water. However, an adult frog cannot live wholly in the water, having lungs, thus being required to come to the surface at intervals to breathe. In winter it lies burrowed in the mud, and its harsh *croak* may be heard in spring as soon as the sun has loosened the frost.

The female frog lays from 600 to 1,200 eggs, usually in March or April, which consist of a



moisture hardened by cold after it has fallen in the form of dew, or to the inside of window panes in a warm room. Frost is very destructive to plants, as the water in the juices expands when it freezes and thereby bursts the vesicles. Clouds and smoke act as a covering to check radiation. Winds bring fresh masses of air into contact with the cold objects and prevent frost, which accounts for dew and frost falling most abundantly at night when there is little movement in the atmosphere. *Black frost* is caused by cold so severe that plants freeze and change color without showing any signs of hoar frost. A *frostbite* is a state of numbness of any part of the body of an animal, but especially of the extremities, by exposure to extreme cold. In like manner plants partially frosted are said to be frost-bitten. Slight frostbites in animals often cause chilblains, which are annoying but not very dangerous, but in severe cases gangrene may set in or they may result in permanent injury or even death. Rubbing and applications of snow or cold water are recommended as soon as the injury is discovered.

**FROSTBURG** (fröst'bûrg), a town of Maryland, in Allegheny County, in the western part of the State, on the Cumberland and Pennsylvania Railroad. The location is on a fine plateau between Dan's and the Savage mountains, about 2,150 feet above the sea, and the surrounding country has extensive coal mines and deposits of fire clay. It is the seat of a State normal school. The manufactures include brick, machinery, clothing, and cigars. Frostburg is popular as a summer resort. Population, 1900, 5,274.

**FRUIT** (früt), in botany, a mature ovary of a plant, which contains the seeds, especially such plant products as are pleasant to the taste and eaten by man and animals. Other parts of the flower, most frequently the calyx, sometimes remain after the flowering is over, undergo a further development, and form part of the fruit. All that is external to the seed in ripe fruit is called the *pericarp* and is the edible portion, except in such berries as grapes, gooseberries, and others, whose pulpy matter is formed from the placentas of the seeds. The value of fruit to man exceeds that of all other parts of plants. Among the more important fruits in the temperate climates are apples, peaches, plums, cherries, melons, apricots, mulberries, strawberries, raspberries, and others, while with those of the warmer regions may be included the dates, olives, figs, grapes, oranges, bananas, nuts, etc. Fruit is grown very extensively for the market, both in Canada and the

United States, although the latter country has a wider range of climate and produces a greater number of species than Canada. See **Horticulture**.

**FUCA**, Juan de (hōō-än' dâ fōō'kâ), a strait between the United States and British America, separating Vancouver Island from the State of Washington. It connects the Pacific Ocean with Puget Sound and the Strait of Georgia, the former lying south and the latter north of its eastern extremity. It is from 15 to 30 miles wide, about 100 miles long, and contains a number of islands. The Strait of Juan de Fuca was so named from Juan de Fuca, a Greek navigator, who discovered it about 1592.

**FU-CHOW**. See **Foochow**.

**FUCHSIA** (fū'shī-à), a genus of flowering



FUCHSIA.

shrubs native to Mexico, South America, and New Zealand, and so named from the discoverer, Leonard Fuchs (1501-1566), a German



botanist. About seventy species have been described. The calyx is funnel-shaped and four-parted, with the four petals set alternately, the style is long, and the stigma is capitate. Popularly they are called *ladies' eardrops*, from the appearance of the pendulous flowers. They are favorites as house and garden plants and thrive in a light, rich soil, though growing best in a mixture of loam and peat. New plants may be developed from young cuttings set in sand or loam.

**FUEL** (fū'ēl), the material with which a fire is fed, including various forms of carbonaceous matter, such as gaseous, liquid, and solid substances. The phenomenon of heat arises by combining fuel with oxygen, as by combustion, and forms an essential element for manufacturing and domestic purposes. Natural gas, common coal gas, and acetylene gas are used very extensively for heating, lighting, and manufacturing. Among the liquid fuels are alcohol, creosote, petroleum, shale oil, and various vegetable and animal oils. Each of these is employed with success for divers purposes, though petroleum and creosote constitute the principal kinds used in the large manufacturing establishments. Crude petroleum has come into extensive use on locomotives as well as steamboats. Alcohol is a valuable fuel where a small volume of heat, which can be easily regulated, is wanted for small manufacturing enterprises and in experiments. Among the solid fuels are wood, coal, peat, wood charcoal, and coke.

In pioneer settlements and countries destitute of mineral fuel, wood and its products are the principal forms used, though coal and its products constitute by far the most important fuel used in the great centers of manufacture, ocean navigation, railroad operation, and for heating purposes. The extensive natural gas deposits in America and Eurasia are having a marked influence, not only in propelling machinery, but in smelting and refining. Within recent years lighting by electricity has displaced the consumption of fuel for street illumination and largely as material for house lighting, especially in large centers of population. At the present rate at which electricity is coming into use for heating purposes, it is not improbable that some plan will be devised to displace many other forms by this inexhaustible agent.

**FUGITIVE SLAVE LAW** (fū'jī-tīv), the statutes of the United States which provided for the return of the slaves who escaped from the State in which they were held in servitude. The surrender of slaves that had escaped to another State was a matter of mere comity un-

der the colonial government as well as under the Articles of Confederation. Though the word *slave* is not used in the Constitution of the United States, a clause in Article IV. directs that escaped slaves be returned to their masters. In 1793 the first law of Congress was passed under this provision, and it directed that escaped slaves and criminals be returned. The provision imposing on magistrates of the states certain duties under Federal statutes led to some complications, but an attempt in 1818 to amend it failed. A new and more stringent law was provided by the Compromise of 1850, under which the refusal of the marshal to execute writs under the act subjected him to a fine. He was made liable for the value of slaves escaping from his custody, and those obstructing an arrest or attempting a rescue were made subject to a fine together with imprisonment. A commissioner who investigated and adjudged the prisoner a slave was allowed a fee of \$10.00, but only \$5.00 was paid to him, if the person was set free, and the testimony of the person claimed as a slave was never taken. These provisions caused a large number of free Negroes in the North to be kidnapped. Many northern states passed personal liberty laws, by which the breach preceding the Civil War was widened. The fugitive slave laws were not repealed until 1864.

**FUJIYAMA** (fō-jī-yā'mā), or **Fuju-San**, the highest elevation of Japan, situated on the island of Hondo, in the province of Suruga, about 60 miles west of Tokio. Its crater is 500 feet deep. The mountain was active at numerous times prior to 1707, but since then has been dormant. It has an elevation of 12,365 feet above sea level. The Buddhists hold it sacred and wander in large companies to its higher places of interest from July to September, when the snow is melted under the more direct rays of the sun. Many shrines and temples are maintained at different elevations.

**FULAH** (fōō'lā), a race of Negroes native to Africa, found chiefly in the basin of the Senegal River, but distributed more or less widely throughout the Sudan. The color is light brown; the stature, medium; the head, long; the speech, Negroid; and the hair, woolly, but not frizzled. They give evidence of considerable shrewdness and intelligence, and are skilled in manual labor and the manufacture of native clothing and utensils. In the eastern part of the Sudan they are mixed largely with the Ethiopian races.

**FULLER'S EARTH**, a kind of greenish-white clay found in many parts of Europe. It is formed chiefly from alumina, with which are



mixed lime, silica, and several other ingredients. This clay is much used by manufacturers in cleansing the oil from woolen fabrics, since it is much cheaper than soap.

**FULMAR** (fŭl'mär), a species of aquatic birds belonging to the petrels, native to the island of Saint Kilda and many of the Arctic coasts. These birds are about the size of a domestic duck. They feed on whale blubber, fish, and putrid animal matter. The fulmar is valued for the oil obtained from its stomach and for its feathers and eggs. The natives gather the eggs, considering them excellent as food. Several species of the fulmar are found in the Pacific Ocean, though they are larger than those native to the Arctic regions.

**FULMINATION** (fŭl-mĭ-nā'shŭn), the sudden decomposition of bodies by percussion or heat. It is accompanied by light and a loud report. Fulminates or fulminating compounds are explosives formed by preparing fulminic acid with gold, silver, platinum, mercury, or other bases. The percussion caps contain fulminate of mercury, which forms the priming. Fulminating powder is a mixture of niter, sulphur, and potash.

**FULTON** (fŭl'tŭn), a city of New York, in Oswego County, 25 miles northwest of Syracuse, on the New York Central and the Lackawanna railroads. It is located on the Oswego River and the Oswego Canal. A public library, waterworks, electric lighting and pavements are among the public improvements. It has an academy, a hospital, and several fine churches. The manufactures include cutlery, flour, condensed milk, and machinery. The first settlement on its site was made in 1791 and its present charter dates from 1902, when the villages of Fulton and Oswego Falls were united. Population, 1905, 8,847; in 1910, 10,480.

**FUNCHAL** (fŭn-shäl'), a city in the island of Madeira, of which it is the capital. It is located west of Morocco and southwest of Gibraltar, and is important as a Spanish coaling station. The chief buildings include an opera house, a cathedral, a museum, and the government building. Its site rises abruptly from the sea, hence many of the streets are narrow and steep, but they are nicely lighted by electricity and improved by grading. The harbor is well fortified and is the only port in Madeira that can be reached by large steamers. Its favorable climate has caused it to be popular as a health resort. Population, 1907, 20,986.

**FUNCTION** (fŭnk'shŭn), the term applied in the study of animal or vegetable life to designate the specific office or work which any organ or system of organs is intended to per-

form. The vital functions are those which are necessary to life. In the higher animals they consist of the specific office or work of the heart, brain, and lungs. The functions relating to the external world, such as voluntary motion and the senses, are called animal functions. On the other hand, the processes of assimilation, respiration, absorption, digestion, and expulsion are called natural or vegetative functions.

**FUNDY** (fŭn'dĭ), Bay of, an inlet of the Atlantic, separating Nova Scotia from New Brunswick. It is 165 miles long and has an average width of 35 miles. At its upper extremity it branches into Chignecto Bay and Minas Channel and Basin, which are separated from the Gulf of Saint Lawrence by a narrow isthmus. Navigation is rendered dangerous by tides that rise and fall rapidly from fifteen to seventy feet. Grand Manan and other islands are at the southern entrance. The Saint Croix and Saint John rivers flow into the bay. A ship railway connects Chignecto Bay with Northumberland Strait.

**FUNGI** (fŭn'ji), a large group of flowerless plants, which, in their different forms, are known as mushroom, toadstool, blight, mold, rust, smut, mildew, and by other appellations. Fungi are closely akin to the lichen, but are a lower order and occur in different situations, chiefly drawing their food from the objects on which they are found. Their structure is cellular and they are propagated by spores. Some species grow in green pastures and others on decaying trees, or on grasses or grains, which they destroy. Many thrive on books and other objects when they are stored in damp places and some are found on man and animals in certain diseases. Fungi are present wherever decay is going on. Many species grow very rapidly, springing up in a single night and dying as quickly, and some grow very slowly, adding to their main body year by year. Various forms of fungi are so small that they can scarcely be seen, while others measure several feet in circumference. Several species are used for food and some are valuable for medicine.

Fungi occur in all parts of the earth where it is not too cold for vegetable growth, but they are most plentiful in moist, temperate climates. Edible mushrooms, well-known species of fungi, grow wild in Europe and America, and are largely cultivated for food. Some species are grown in great quantities for the market. Truffles are fungi growing under ground like the potato and are used for flavoring sauces and meats. They commonly grow about a foot under ground in loose soil, where they are located by dogs trained to search for them as they do



for game. Truffles are about the size of a hen's egg, white or brownish in color, and rough and warty on the outside. They are native to Eurasia, but are grown in America. Mildew, rust, and smut grow on plants and destroy them, and are dreaded by gardeners and farmers. There is scarcely any plant that is entirely free from affection by fungus growths, the condition of climate having much to do with their effect. Mold grows on bread or cheese, while mildew appears under certain conditions on cloth or paper, destroying the fiber.

**FUR**, the short, soft coat of hair which covers the skin of many mammals. In some species the fur proper is found next to the skin and under the hairs, which are longer and coarser. Fur, in its usual trade acceptation, is a dressed skin containing the short, fine hairs and from which the long hairs have been pulled. Before it is fit for use, a skin must be thoroughly cleaned, steeped, and scoured in a bath of meal, alum, and salt, after which it is washed in soap and soda, cleaned and dried. Other methods are used to prepare for tanning. Furs are often colored, the fur of the seal being commonly changed from a dirty yellow to a rich brown. All the chief fur-bearing animals, such as the sable, marten, mink, ermine, beaver, and otter, are treated in special articles, which see. The use of furs or fur pelts for covering the body is coeval with the earliest history of all northern nations or tribes. Subsequently it grew into an article of barter and trade, first among themselves and then with their neighbors of more temperate climes, where it became an article of fashion, ornament, and luxury.

The fur trade, in the early history of America, gave rise to vast commercial ventures on the part of individuals and companies, who operated to facilitate settlement and the discovery of unknown wealth. Russia extended its dominion over Siberia to secure the rich fur trade. Practically the same motive induced the Dutch East India Company to turn its attention to America. The French, after establishing trading posts at Montreal and Quebec and exploring the Great Lakes, battled against England many years to retain possession of the region rich in fur-bearing animals. The Hudson's Bay Company, organized in 1670, had exclusive trade with the Indians nearly 200 years, but the royal grant was taken from it in 1868. Since then there have been private collectors and dealers throughout Canada, who compete in the open market for a share of the trade. This likewise is true of Alaska and other regions which are rich in furs. London and Leipzig are the most important fur markets of the world. The enterprise

in the United States, although quite extensive, has been conducted by individuals rather than corporations. The Alaska Fur Company holds two of the Aleutian Islands with exclusive right to kill not to exceed 100,000 fur seals yearly. New York City has the largest fur trade in America.

**FURLONG** (fûr'lông), meaning furrow-length, an English measure of 40 rods, perches, or poles, equivalent to one-eighth of a mile, or 220 yards.

**FURNACE** (fûr'nâs), a chamber in which fuel is burned for the production of heat. The heat generated in such structures is commonly utilized in steam engines, melting ores or metals, warming houses, baking bread, and making pottery. While there are various forms of construction, they should be so built that a perfect combustion of the fuel may be possible, and to apply effectually the greatest possible amount of heat. Unless the plans are carefully made, the heat will dissipate without being concentrated directly on the substance to be acted upon in the process of heating. The constructor must likewise aim to supply means whereby an operator can easily control at pleasure the degree of heat necessary. Furnaces are variously designated according to the draught applied. Those in which the draught is natural are called *air furnaces*, those into which a strong current of air is injected by artificial means are termed *blast furnaces*, and those in which a low arch roof is utilized to turn the flame upon the object against which the heat is to be directed are termed *reverberatory furnaces*.

Several classes of furnaces are in use for heating residences and other buildings, such as hot air, hot water, and gas furnaces. In hot-air furnaces the heat is radiated through large pipes into the apartments to be warmed, while in hot-water systems the pipes are connected with radiators in the different apartments, which are filled with water, and this is induced to circulate by applying the heat to a definite portion of the system, thus causing hot water to pass to the different rooms and the colder to flow back into contact with the heater. Heating by steam requires practically the same kind of apparatus. Gas furnaces are those in which gas is utilized for fuel. They are constructed in a manner that either hot air or hot water can be applied. In electric heating the current is obtained from a dynamo, which is propelled by steam generated through the agency of a furnace, or by water power. The outer framework of an electric heater is commonly of thin cast iron, having projections to radiate the heat. Coils of resistance wire, from which the heat of the elec-



tric current radiates, are within the framework. From five to twenty amperes are necessary to produce an equable amount of heat on a three-foot heater, on a 110-volt circuit. The heaters are placed where required, connected by wire, and so constructed that the current may be turned on or off by means of a switch, as in an incandescent lamp.

**FURNEAUX ISLANDS** (fûr-nō'), a group of islands between Australia and Tasmania, so named from Tobias Furneaux (1735-1781), who discovered them in 1773. They are located at the east end of Bass Strait. Flinders Island, the largest of the group, is 10 miles wide and 35 miles long. Cape Barran Island, the second in size, is separated from Flinders Island by Franklin Strait. These islands, for the purpose of local government, belong to Tasmania.

**FUR SEAL**, or **Sea Bear**. See **Seal**.

**FÜRTH** (für't), a city in Bavaria, Germany, six miles northwest of Nuremberg, at the junction of the Rednitz and Pegnitz rivers. It is a prosperous city and has extensive railway and electric railroad facilities. The chief buildings include the Church of Saint Michael, the public library, the Rathaus, and several secondary schools. It has a large trade in hops and merchandise. Among the manufactures are jewelry, toys, machinery, lead pencils, and scientific instruments. Gustavus Adolphus occupied it in 1632, but was defeated by Wallenstein at Alte Veste, three miles southwest of the city. Fürth has belonged to Bavaria since 1806. Population, 1905, 60,635.

**FUSAN** (fō-sän'), or **Pusan**, a city and seaport of Corea, on the southwestern coast of the peninsula, seven miles from the mouth of the Nan-tong River. It is connected with Seoul, the capital, by a railway and has a safe and commodious harbor, which is protected by Deer Island and several others. Many of the inhabitants are foreigners, chiefly Japanese, to whom the place is known as Kan (the post). It has a large trade in rice, fish, cotton, hides, and merchandise. Fusan has been an open port since 1876. Population, 1907, including Tong-nai, 39,865.

**FUSE** (fūz), or **Fuze**, a tube or casing filled with combustible material and used for igniting a charge in a mine, for blasting, and in discharging a hollow projectile. Fuses were invented as soon as hollow projectiles came into use, and are made in various forms appropriate to the purpose for which they are designed. In mining, blasting, and for submarine purposes a cord or tube which contains a slow-burning

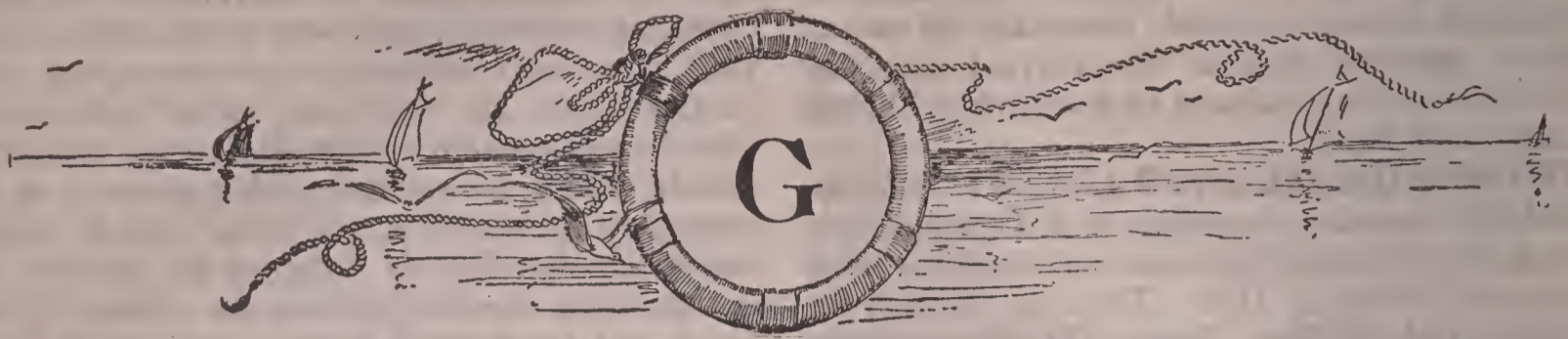
composition is used, thereby allowing the operators time to get to a place of safety before it burns down to the charge. Many of these, such as the *Bickford fuse*, are covered with pitch, contain gunpowder, and burn at the rate of one yard in seventy seconds. *Percussion* and *concussion* fuses are used for hollow projectiles. The former contain a capsule charged with fulminate, which is exploded with a plunger, or its equivalent, when the projectile strikes, while the concussion fuse is designed to explode the charge when the shell strikes the object. Time fuses and mechanical fuses are used in some forms of torpedoes with dynamite, gun cotton, and other powerful explosives, and are adapted to burn at different times by cutting off a portion of the cord, or are timed by the character of the composition used. Electric fuses are used extensively in the newer implements of war and methods of blasting, and are adapted to ignite by passing an electric spark through them, thereby bringing the current in contact with the explosive composition within.

**FUSEL OIL** (fū'sěl), a heavy, inflammable product formed during the fermentation of molasses, potatoes, corn wort, beet roots, and the juice of grapes. In the rectification of spirits it is separated and occurs as an acrid, or oily, liquid, in the last stages of distillation. It has a peculiar odor, a pungent taste, and is poisonous, producing nervous depression and headache. Its presence in brandy, whisky, and other beverages can be detected by rubbing them on the hand, when ethyl alcohol will evaporate and the fusel oil may be readily recognized.

**FUSING POINT**, the degree of heat at which any substance begins to melt or liquify. Every substance can be fused at a certain temperature, which is the same in a given substance, if the pressure is constant and uniform, but is very different in different metals and substances. Whenever the fusing commences, the temperature of the body ceases to rise, no matter what the intensity or the source of the heat, and the temperature remains constant until the body is completely fused. On the Fahrenheit thermometer the fusing or melting point of mercury is placed at  $-37.80^{\circ}$ ; ice,  $+32^{\circ}$ ; butter,  $+89.6^{\circ}$ ; phosphorus,  $+109.4^{\circ}$ ; sulphur,  $+237^{\circ}$ ; tin,  $+395^{\circ}$ ; lead,  $+619^{\circ}$ ; zinc,  $+680^{\circ}$ ; antimony,  $+809^{\circ}$ ; silver,  $+1,832^{\circ}$ ; gold,  $+2,282^{\circ}$ ; and iron,  $+2,732^{\circ}$ . The term *vitreous fusion* is applied in the case of substances that melt gradually and have no definite point of fusion.

**FUSIYAMA**. See **Fujiyama**.





G

GADFLY

**G**, the seventh letter and the fifth consonant in the English alphabet. The Greek name *gamma* is an adaptation of the Canaanite term *gimel*, meaning camel. It has two sounds, the hard and soft, and is formed by placing the tongue against the roof of the mouth, then lowering the tongue and giving utterance to voice. The hard sound occurs before a, o, and u, as in *gate*, *god*, and *gun*; before the consonants l and r, as in *gloat*, and *groan*; when preceding e and i in beginning a word, as in *get* and *give*; and when final, as in *big*. The soft sound was unknown in Anglo-Saxon. It corresponds to ch, as in *church*, and is represented by g before e, i, and y, as in *gem*, *gin*, and *gymnasium*. G is silent before n, as in *gnat*. As a symbol it represents the seventh of the Dominical letters. In music it is the fifth note of the normal scale of C, called *sol*, and the lowest note of the grave hexachord.

**GABELLE** (gä-běl'), a French term derived from the German word *Gabe*, meaning gift or tribute, and applied to the duty imposed upon salt. It was first levied in 1286 as a means to protect the trade in salt, which was made a government monopoly. This tax was very unpopular, since it carried with it the provision that every family was compelled to purchase a certain amount of salt per week, and officers intrusted with the enforcement of the law collected it directly from the people. The law was finally repealed in 1790, owing to a widespread rebellion in some of the provinces.

**GABLE** (gä'b'l), the upper, exterior part of a wall at the end of a building, which receives the roof. It is triangular in form, the roof sloping from the ridge to the eaves, and comprises the gable end of the wall. In classical architecture, such as the Greek temples, it forms the pediment. During the Middle Ages the gable was usually narrow and pointed, owing to the construction of steep roofs. In Gothic

architecture it became quite ornamental, because of the introduction of various decorative features, including tracery and other ornamentations. Gables continue to be a prominent feature of residential buildings, especially in Europe, but in the newer buildings of cities they have been displaced largely by the walls in continuous blocks.

**GABUN** (gä-bōon'), or **Gaboon**, an estuary near Libreville, on the western coast of Africa, articulating with the Gulf of Guinea. It is fifty miles long and from seven to ten miles wide. The Comó and several other rivers flow into it and it is sufficiently deep for the largest vessels. The country surrounding it was formerly known as the Gaboon territory, which now forms a part of the French Congo. See **French Congo**.

**GADFLY** (gäd'flī), or **Horsefly**, the common name applied to various two-winged flies found in the woods and elsewhere during the



1, GADFLY; 2, BOTFLY.

hot weather. These insects are smaller than the botfly (q. v.). They suck the blood of man and animals and cause a large lump, which forms a tumor and secretes pus, wherever they feed for some time. The eggs are deposited in the skin of animals, and the young subsist upon the pus that exudes from the tumor. The mouth has six sharp needles. These constitute



a proboscis, or sucker, with which they penetrate the thickest skin. Many species have been described, including the common black gadfly. Another species, the mourning horsefly, has a greenish head and golden eyes.

**GADSDEN** (gădz'den), county seat of Etowah County, Alabama, on the Coosa River, sixty miles northeast of Birmingham. It is on the Southern, the Louisville and Nashville, and the Chattanooga Southern railroads. The surrounding country produces fruits, timber, and minerals, especially coal and iron. It has a number of fine schools and county buildings. The manufactures include flour, machinery, iron-ware, cotton goods, and tobacco products. Gadsden was settled about 1845 and incorporated in 1867. Population, 1900, 4,282; in 1910, 10,557.

**GADSDEN PURCHASE**, a tract of land which is now included in New Mexico and Arizona. It embraces an area of 45,535 square miles, and is bounded on the north by the Gila River, on the east by the Rio Grande, on the south by an arbitrary line, and on the west by the Colorado. The average width from north to south is 120 miles. It was purchased from Mexico in December, 1853, for the United States by Gen. James Gadsden for \$10,000,000, and the treaty was ratified the following year. The sale of this territory was opposed by many Mexicans and caused Santa Anna to be banished in 1855.

**GADWALL** (găd'wəl), or **Gray Duck**, a water fowl found in the northern part of both hemispheres, but confined chiefly to bodies of fresh water. It is smaller than the mallard and is a bird of passage. The flesh is highly prized as food. In autumn it moves southward, but returns early in the spring to breed in the northern part of the United States and the southern section of Canada. The color is black and white, but the feathers are variously shaded with brown, giving it a grayish appearance.

**GAEL** (gāl), or **Gail**, the name of the northern and western branch of the Celtic family of nations. They inhabited the highlands of Scotland, the Isle of Man, and Ireland. Those of the latter country were generally known as Gael of Erin and the others as Gael of Albion. The term Gaelic is now generally applied to the dialect spoken in the highlands of Scotland, which is a branch of the Celtic language, while the people of Ireland and the Isle of Man speak the Irish and Manx, respectively.

**GAETA** (gă-ă'tà), a fortified seaport city of Italy, on the Gulf of Gaeta, about seventy miles northwest of Naples. The city is located on a promontory, which is crowned by the tomb of

Manatius Plancus, who was a friend of Augustus. This structure, known as the Torre d'Orlando, is 160 feet high and is 158 feet in diameter. Gaeta was originally occupied by the Greeks, who constructed many fine public buildings, but it was later conquered by the Romans, who improved and fortified it. Later it was made a part of the Byzantine Empire, was annexed to Sicily in 1184, and was finally captured by the forces of Victor Emmanuel in 1861. Its importance is based largely upon its fortifications, though it has some industries and is visited by tourists for its historical associations. Population, 1906, 5,638.

**GAG RULE**, a name applied to any concerted effort to suppress the exercise of the right of a citizen, especially the right of petition. It originated in 1836, when Congress adopted a rule that all petitions be laid on the table unnoticed. This action was caused by many petitions for the abolition of slavery being presented to Congress. The gag rule was the result of a motion made by John C. Calhoun, but it tended to increase the desire to file petitions, and John Quincy Adams upheld the anti-slavery principles in Congress during ten years. The gag rule was finally rescinded on Dec. 3, 1844.

**GAINES'S MILL** (gānz'ěz), **Battle of**, one of a series of battles occurring in Hanover County, Virginia, during the peninsular campaign conducted by McClellan. A part of the Federal army crossed the Chickahominy under command of McClellan, while Fitz-John Porter occupied a position on the north bank of the river with a force of 35,000 men. Generals Lee and Stonewall Jackson made an attack on Porter, June 27, 1862, with a Confederate army numbering 55,000 men. The Federals were driven back with much loss after a two hours' struggle, and were finally forced to give way before superior numbers. Porter crossed the Chickahominy in rapid retreat, burning bridges behind him. His total loss was 6,387 men and 22 guns, and the Confederate loss was somewhat larger. The Battle of Cold Harbor was fought in the same vicinity two years later.

**GAINESVILLE**, a city in Texas, county seat of Cooke County, about eight miles south of the Red River and sixty miles north of Fort Worth. It is on the Missouri, Kansas and Texas and the Gulf, Colorado and Santa Fé railroads. The surrounding country is agricultural and stock raising. It has a county courthouse, a public library, a high school, and several fine churches. Among the manufactures are soap, ice, brick, flour, brooms, machinery, and utensils. It was settled in 1851 and incorporated in 1873. Population, 1900, 7,874.



**GALÁPAGOS** (gà-lä'pä-gös), an archipelago of volcanic islands in the Pacific Ocean, about 650 miles west of Ecuador, of which they comprise a possession. The group includes twelve islands of considerable size, of which Albemarle is the largest. The total area is 2,400 square miles. Much of the surface is mountainous, but the soil is productive. The climate is healthful and favorable to occupation by Europeans. Sugar, fruits, cattle, and goats are the principal products. The islands are remarkable for the presence of many birds, though the flora is limited. Many species of turtles and porpoises prevail and lizards and snakes are well represented. These islands were discovered in 1570 and Darwin explored them in 1836. The government of Ecuador has made a number of attempts to colonize the larger islands, but they are very sparsely settled. Population, 1909, 415.

**GALATIA** (gà lä'shī-à), the name anciently applied to an extensive region of Asia Minor, so called from a large number of Gallic inhabitants, who settled there about 277 B. C. The Gallic invaders of Greece in the 3d century B. C., under Brennus, not only took possession of Byzantium, but crossed the Hellespont, and subdued a large portion of Phrygia and Troas. Later they were confined to certain districts by Attalus, King of Pergamus, the settlements being bounded by Phrygia, Lycaonia, Pontus, Cappadocia, Paphlagonia, and Bithynia. The Galatians retained their old Celtic language more or less distinctly for several centuries, were twice visited by Saint Paul, and produced numerous scholars. In government they were divided into three tribes and twelve tetrarchies, each being under a chief. Saint Paul addressed one of his epistles to the churches in Galatia.

**GALATIANS** (gà-lä'shānz), **Epistle to the**, a book of the New Testament, addressed by Saint Paul to the churches of Galatia. Many Hebrew converts belonged to the churches of Galatia and they had incorporated Jewish rites with the ordinances of Christian worship. Paul recalls them to the simplicity of the Gospel in this epistle, in which he vindicates his apostolic commission, urges the doctrine of salvation as the cardinal truth of Christianity, and concludes with exhortations and a benediction. It is thought that this epistle was written earlier than those addressed to the Thessalonians.

**GALATZ** (gä'läts), or **Galacz**, a city of Rumania, in Moldavia, on the Danube River, 85 miles above the Sulina mouth. It is situated between the mouths of the Perth and the Sereth and is important for its railroad and river transportation facilities. The trade consists chiefly

in grain, tallow, wine, cheese, wool, and fruits. Among the manufactures are clothing, earthenware, machinery, cigars, and leather. It is the seat of a bishop and several schools. Among its principal buildings are a convent, a hospital, several Greek churches, and a number of large bazaars. It has been the scene of many battles between the Turks and Russians. In 1883 it was made a free port. Population, 1907, 65,503.

**GALENA** (gä-lē'nà), or **Lead Glance**, the sulphurate of lead, the ore which furnishes most of the lead of commerce. Pure galena contains 13.3 per cent. of sulphur and 86.7 of lead, but it is usually mixed with a small proportion of copper, silver, zinc, antimony, or selenium. The color resembles that of lead, but it has a metallic luster. It is usually found massive, but sometimes granular or crystallized. The fragments are cubical, into which it is easily broken. It is found in beds, veins, and imbedded masses, frequently accompanying other metallic ores. *Argentiferous galena* is the name applied to deposits that contain a large proportion of silver. Deposits of galena occur in many parts of Canada and the United States, especially in the Rocky Mountains. It is mined near Galena, Ill., in Missouri, Colorado, Wisconsin, British Columbia, and other sections of North America.

**GALENA**, county seat of Jo Daviess County, Illinois, on the Fevre River, eighteen miles southeast of Dubuque, Iowa. It is on the Chicago, Burlington and Quincy, the Illinois Central, and the Chicago and Northwestern railroads. The noteworthy buildings include the county courthouse, the public library, the Federal building, and the high school. Grant Park contains a statue of U. S. Grant. The surrounding country is agricultural and produces zinc, lead, and other minerals. Among the manufactured products are furniture, ironware, boots and shoes, machinery, brick, cigars, dairy products, and woodenware. The city has electric lighting, a sewerage system, and waterworks. Ulysses S. Grant resided in Galena a number of years. It was settled in 1827 and incorporated in 1839. Population, 1910, 4,835.

**GALENA**, a city in Cherokee County, Kansas, in the southeastern part of the State, seven miles west of Joplin, Mo. It is on the Missouri, Kansas and Texas, the Saint Louis and San Francisco, and other railroads, and is surrounded by a lead and zinc producing country. The chief buildings include a public library and several fine public schools and churches. It has a foundry, grain elevators, and several smelters. The vicinity was first



settled in 1877 and owes its development largely to its mineral interests. Population, 1900, 10,158; 1905, 6,449.

**GALESBURG** (gālz'bürġ), a city and the county seat of Knox County, Illinois, about 163 miles southwest of Chicago, on the Chicago, Burlington and Quincy, the Atchison, Topeka and Santa Fé, and other railroads. The surrounding country is agricultural and dairying, and contains an abundance of bituminous coal deposits. It has a fine county courthouse, a public library of 25,750 volumes, and a park. The institutions include Knox College, Lombard University, Saint Joseph's Academy, and the Ryder Divinity School. Among the municipal facilities are paved streets, gas and electric lighting, electric street railways, and a system of city waterworks. The manufactures include flour, brooms, carriages, tobacco, steam engines and boilers, and farming machinery. Population, 1900, 18,607.

**GALICIA** (gā-līsh'ī-ä), a province of Austria, whose boundary is formed by Russia on the north and east, and by Bukowina, Hungary, and Silesia on the south and west. It has an area of 30,315 square miles. The Carpathians trend between it and Hungary. Its chief rivers are the Dniester and several tributaries of the Danube and Vistula. Among the principal products are cereals, beef and dairy cattle, horses, poultry, fruits, silk, and divers manufactures. The minerals include coal, alabaster, copper, rock salt, iron, marble, and calamine, of which iron and rock salt are the most important. The inhabitants consist chiefly of two Slavic peoples, the Poles and Ruthenians, but they include many Germans and Greeks. A well-organized public school system is maintained, which terminates in the celebrated universities of Lemberg and Cracow. Lemberg is the capital. Among the other important cities are Cracow, Przemyśl, and Tarnopol. Extensive lines of railroads and navigable streams facilitate commercial intercourse. Owing to its productive soil and other natural resources, the province holds a position of importance in the Austrian commonwealth.

Galiccia was originally inhabited by Germanic peoples, but the Poles and Ruthenians immigrated in large numbers in the Middle Ages. In the 12th century it was made an independent state, but it soon became tributary to Poland. In 1772, at the first partition of Poland, it was annexed to Austria. It has been the scene of many revolts, but still remains a crown land of the house of Hapsburg. Population, 1906, 7,412,399.

**GALILEE** (gāl'ī-lē), the name applied an-

ciently to one of the four Roman divisions of Palestine. It was bounded by the Jordan River on the east, by Samaria on the south, by the Mediterranean and Phoenicia on the west, and by Syria and the mountains of Lebanon on the north. The northern portion is wooded, but the lower part is level and exceedingly fertile. In the time of Christ the former was usually called Upper Galilee and the latter was known as Lower Galilee. At present the whole of Galilee is included in the vilayet of Syria. Within this region were situated the twenty towns given by Solomon to Hiram, King of Tyre, as compensation for his assistance in building the temple.

Galilee was the early seat of Christian influence and its four towns, Nazareth, Capernaum, Nain, and Cana, are closely associated with the life and travels of Christ. The inhabitants consisted chiefly of Greeks, Syrians, Phoenicians, Arabs, and Jews, and occupied themselves largely as fishermen. They were held in contempt by the educated Jews because of their simplicity of manner and lack of education, on account of which the name Galileans was early applied to Christians. Galilee became the seat of the Jewish doctors of law after the destruction of Jerusalem, and Jewish learning centered largely at Tiberias. Numerous ruins still exist in some portions of Galilee, though most of the region is populated by a destitute people and the towns are stricken with poverty and indolence.

**GALILEE, Sea of**, an inland lake of Syria, also called Sea of Tiberias, Lake of Gennesaret, and Sea of Chinneroth. It is situated on the east central boundary of Palestine. The surface is 682 feet below the Mediterranean sea. Its extent from north to south is twelve miles; width, seven miles; and general depth, 825 feet. The basin is of volcanic origin, the water is fresh and cool, and the northern and eastern coasts are precipitous and barren. It receives the inflow from the Jordan and several other streams, abounds with edible fish, and is known for its association with many important events connected with Christ and the apostles. The region surrounding the lake was densely populated in the time of Christ, though at present there are only the remains of ruined towns, including Capernaum, Magdala, Tiberias, and several others of minor importance. A railroad line connects the lake region with the Mediterranean Sea, and offers assurance that at least a limited amount of prosperity will come to the people within the next few decades on account of increased commercial, fishing, and manufacturing enterprises.



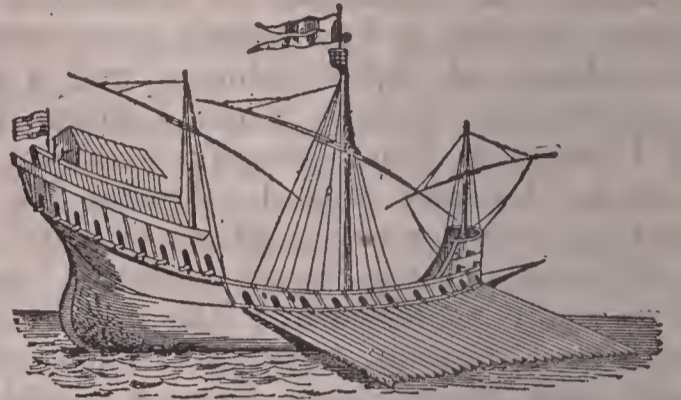
**GALION** (gāl'i-ŭn), a city of Crawford County, Ohio, eighty miles southwest of Cleveland, on the Erie and the Cleveland, Cincinnati, Chicago and Saint Louis railroads. The surrounding country is cereal, fruit, and stock producing. It has a public library, a fine high school, and several costly church and business buildings. Among the manufactures are vehicles, ironware, flour, pottery, brick, tobacco, and machinery. It is well improved and has many modern facilities, such as electric lighting and street pavements. The place was platted in 1831 and incorporated in 1878. Population, 1900, 7,282.

**GALLAS** (gāl'lās), or **Oroma**, a race of Ethiopian people who inhabit the eastern part of Africa, chiefly south and east of Abyssinia. They seem to hold an immediate place between the Negroes and the Arabians. Their color is dark brown, their hair is strong and frizzled, and their eyes are small. In stature they are generally large and well formed, the lips are moderate, and the nose is quite straight. Some writers think the Gallas among the best developed races of Africa. They are engaged chiefly in agriculture and stock raising. A majority are pagans, but quite a number belong to the Mohammedan faith and to the Christian church of Abyssinia.

**GALL BLADDER**, a pear-shaped sac attached to the liver, lodged in a groove on the lower side of that organ. It contains the bile, which is stored for a brief time, or as needed for use in digestion. The bile enters through the cystic duct into the gall bladder, where it becomes viscid and of a darker color, and passes from it to the gall duct when the food enters the small intestines. Three coats compose the walls of the gall bladder: the inner or mucous coat, the intermediate or muscular coat, and the serous or outer coat. The sphincter muscle, which opens and closes the opening into the duodenum, is subjected to a reflex movement when the bile is discharged. See **Bile**.

**GALLEY** (gāl'ly), a vessel formerly used extensively in the Mediterranean. It is low and flat-built, has one deck, and is navigated with sails and oars. The length varied from 100 to 200 feet, the medium sizes being known as half galleys and the smallest as quarter galleys. On each side were twenty oars, which were worked by several men, and there were two masts covered with lateen sails. The *gal-leasses* were the largest in size. They had beams thirty feet long, carried three masts and about twenty guns, and were propelled by about 250 rowers. In the reign of Charles VI.

they were introduced into France, but were abolished in 1748 by Louis XV. These vessels were used for offensive and defensive warfare, and in the time of peace served in furthering commercial enterprises. Similar vessels were kept by the ancient Greeks and Romans for war purposes, but during the time of peace they aided in commerce and colonization along



· VENETIAN GALLEASS.

the seacoast. In printing, a galley is an oblong tray, used to receive the type from the composing stick, and which serves to arrange it in a column or page. The galley has a flange, about one-half an inch in height, on both sides and at one end. After being taken from the galley to the imposing stone, the type is arranged in a chase.

**GALLIPOLI** (gāl-lēp'ō-lē), a seaport city of European Turkey, in the vilayet of Adrianople, 125 miles southwest of Constantinople. It is located at the northern end of the Dardanelles and was once strongly fortified, but its commerce has declined and the fortifications are in a dilapidated condition. The streets are irregular and poorly paved, but it has a number of fine bazaars and many mosques. The manufactures include cotton and silk goods, leather, clothing, and utensils. The town was of great importance in ancient times, since it commands the entrance into the Sea of Marmora. The Turks captured it in 1354 and in 1854, during the Crimean War, it was the landing place of the allied forces. Population, 1906, 28,590.

**GALLIPOLIS** (gāl-lī-pō-lēs'), a city of Ohio, county seat of Gallia County, 56 miles southeast of Chillicothe. It is located on the Ohio River and on the Toledo and Ohio Central and other railroads. The surrounding country contains valuable coal deposits. The manufactures include stoves, furniture, leather, and machinery. Waterworks, electric lights, and sewerage are among the improvements. It is the seat of Gallia Academy, has a public library, and contains several fine schools and



churches. It was settled by French colonists in 1790 and was chartered as a city in 1865. Population, 1900, 5,432.

**GALLIUM** (găl'li-ŭm), a chemical element discovered in 1875 by the French chemist Lecoq de Boisbaudran. It resembles aluminium in the character and composition of its compound, and is obtained in a number of zinc blends, especially on the Rhine. It has a gray color and a brilliant luster, and may be hammered into thin plates that do not break easily by bending. See **Chemistry**.

**GALLON** (găl'lŭn), a measure of capacity used in measuring liquids. The standard gallon, sometimes called wine gallon, contains 231 cubic inches and is used in the United States. It is equal to 8.3388 avoirdupois pounds, or 3.7853 liters. A gallon contains four quarts and is equal to eight pints, or thirty-two gills. The English imperial gallon contains 277.274 cubic inches and is equal to ten pounds avoirdupois of distilled water.

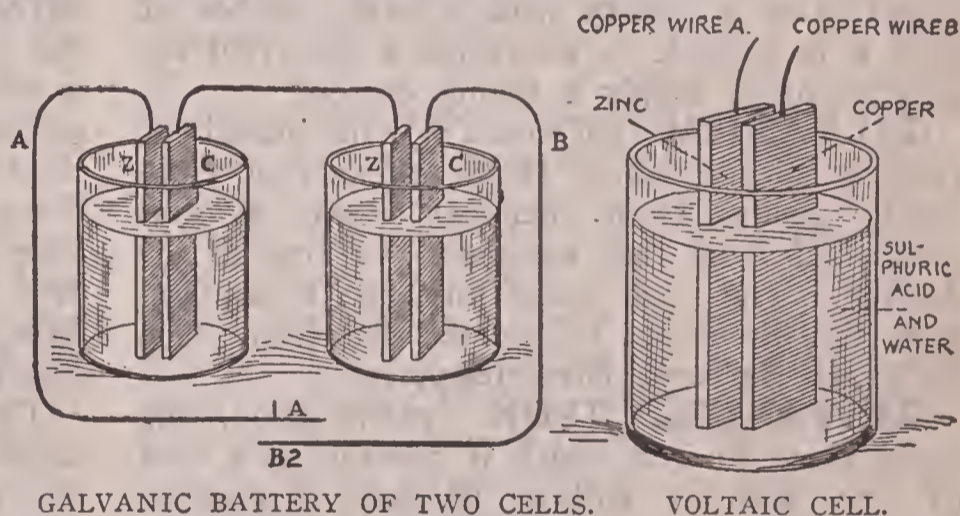
**GALLS**, or **Gallnuts**, the abnormal growth produced on growing plants by a number of insects or closely allied mites. These insects deposit their eggs in the bark or leaves, and within the galls that subsequently develop are nourished and developed the young in certain stages of their growth. The deformities vary in form, color, and texture, ranging from the simple pouchlike bulging of the leaf to the most imperfect and complicated structure. Many gallnuts are important as articles of commerce, especially those obtained from the dwarf oak in Western Asia. They are brought to America principally from Syria and Asia Minor, and vary in size from that of a pea to that of a nutmeg. Those gathered when of good size, but before the insect by which they are caused has eaten its way out, are the best commercial product. They are known as *black* or *blue galls* and are rich in gallic acid, which is used in medicine and for the manufacture of ink and dyes. Those gathered after the insect has escaped are called *white galls* from their lighter dingy color. Those engaged in the enterprise of cultivating trees for their galls examine them carefully about the season of gathering, in order that they may be collected in their best condition. Gall insects are very numerous. They include the gadfly, the sawfly, and some species of mites, aphides, and spiders.

**GALLSTONES.** See **Bile**.

**GALT** (gălt), a city of Ontario, in Waterloo County, on the Grand River, 54 miles from its entrance into Lake Erie. It is on the Canadian

Pacific and the Grand Trunk railways and is surrounded by a fertile region. Waterworks, electric lighting, and street pavements are among the public utilities. The manufactures include flour, woolen goods, ironware, edge-ware, and machinery. It has a considerable trade in produce and merchandise. Several educational institutions, including a collegiate institute, are located here. It was named from John Galt, the Scotch author. Population, 1901, 7,866.

**GALVANIC BATTERY** (găl-văn'ik), or **Voltaic Battery**, a combination of two metals in a liquid chemically acting upon one to a greater extent than the other. The discovery is due to Luigi Galvani (q. v.), from whom the name was applied. In experimenting with the legs of recently killed frogs he noticed that, when hung up against an iron balustrade and the large nerves of the frogs' legs were brought in contact with the metal, they twitched as violently as in life. This phenomenon was due to bringing the muscles into electric connection.



He ascribed the action to a vital fluid, which he thought came out of the nerves and flowed through the iron to the muscles. The experiments attracted the attention of Volta, a distinguished physicist of Pavia, who showed that these movements were caused by electricity and constructed an arrangement called a *voltaic battery* or *pile*, by which powerful continuous currents could be readily produced.

The simplest form of the voltaic cell consists of a plate of zinc and a plate of copper immersed in water containing sulphuric acid. The accompanying illustration shows a single voltaic cell and a battery of two cells, showing the method of coupling up the plates of continuous cells. No action takes place, if the zinc is pure, until a complete circuit is made by connecting the plates with a wire, but the plates must not come in contact with each other in the liquid. The action occurs between the liquid and the zinc, and hydrogen gas is seen to escape in mi-



nute bubbles from the copper. This gas, being produced by the current of electricity, continues to flow in the circuit as long as the chemical action continues. In this simple voltaic cell the end of the projecting copper plate is the positive pole or terminal, and the corresponding end of the zinc plate is the negative pole or terminal.

Many forms of voltaic cells are in use, but usually they are arranged in two classes—single-fluid cells and double-fluid cells. In the former only a simple electrolyte is employed, and in the latter two different electrolytes are used, one for each element of the voltaic couple. Ordinary zinc is impure and, when the circuit is broken, is wasted by the electrolyte acting upon it. This tends to weaken the strength of the current when the circuit is replaced. The waste may be averted by amalgamating the zinc, which is done by dipping it in acid and then rubbing mercury over its surface. A battery consists of two or more voltaic cells so connected as to secure a stronger current than can be obtained from a single cell. By constructing a battery with a large number of cells it is possible to overcome a powerful resistance or to supply a strong current.

**GALVANISM** (gäl'vâ-nîz'm), the branch of electric science which treats of current electricity arising from chemical action, as distinguished from that generated by heat or induction. The term came into use from Galvani, the discoverer of animal electricity. See **Galvanic Battery**; **Electricity**, etc.

**GALVANIZED IRON** (gäl'vâ-nîzd), the name given to iron which is covered by a coat of zinc, with or without galvanic deposition. Properly galvanized iron is a sheet of iron first plated with tin and then immersed in a sal ammoniac and zinc mixed fluid, which forms another coating. Less properly the iron is cleaned by diluted acid and friction, heated, and, without any galvanic current, is plunged into a bath of melted zinc covered with sal ammoniac and stirred until the surface becomes coated with zinc. Articles made of galvanized iron, such as household utensils, fencing wire, roofing sheets, and water pipes, are proof against corrosion as long as the iron is covered with the coating.

**GALVANOMETER** (gäl-vâ-nöm'ê-tër), an instrument used for measuring or indicating delicate currents of electricity. Many forms of this instrument are in common use, but all of them take advantage of the force exerted by currents on movable magnets in their neighborhood. The common form consists of an electromagnet, on which a magnetic needle is balanced. The direction of the current is indicated as the

needle is turned toward the right or the left, and a scale of degrees indicates the strength of the current as the needle moves. In the tangent galvanometer, which is used to measure stronger currents, the conducting wire is carried in the circumference of a circle entirely around the needle so that its diameter is ten or twelve times the length of the needle. The current in these instruments is proportional, not to the angle through which the needle turns, but to the tangent of the needle.

**GALVESTON** (gäl'vës-tün), a city of Texas, county seat of Galveston County, on Galveston Island, at the entrance of Galveston Bay. It is on the Southern Pacific, the Missouri, Kansas and Texas, the International and Great Northern, and other railroads, and has direct steamboat connection with the leading ports of America and Europe. The bay is from ten to twenty miles wide and about thirty miles long, and the island has a width of three miles and a length of about thirty. An extensive breakwater has been constructed to protect the harbor, which affords unexcelled anchorage for the largest vessels. Intercommunication is by a network of electric railways, with which are connected several suburban and interurban lines. The city is protected from overflows by a sea wall of cement and concrete. This structure, completed in 1904, is 17,595 feet long, five feet wide at the top and sixteen feet at the base, and is seventeen feet higher than the mean low tide.

The city has an area of about fourteen square miles and is built mainly toward the inland side of the island. It has well-improved streets, especially the newer part, where much has been done to raise the surface by grading. Among the noteworthy buildings are the county courthouse, the customhouse and post office, the Ball High School, the Rosenberg Library, the Masonic Temple, the Y. M. C. A. building, and many business houses and hotels. It is the seat of the medical department of the State University, two Roman Catholic academies, Saint Mary's Hospital, two orphan asylums, and other institutions. A railroad bridge nearly two miles long connects the island with the mainland.

As a cotton market Galveston is one of the most important centers in the United States, while its trade in lumber, wool, live stock, and cereals is correspondingly large. Among the manufactures are flour, ironware, beverages, cotton-seed oil, clothing, fabrics, and machinery. It ranks second in exports among the exporting cities of the United States and its exports of cotton are paralleled only by those of New Orleans. The municipal improvements, such as



gas and electric lighting, waterworks, sewerage, and pavements, are well established. Galveston was settled in 1837 and incorporated in 1839. General Magruder captured it for the Confederates in 1863. In 1900 a large part of it was destroyed by a severe storm, but it was rebuilt with an enterprise equaled only by the activity of its business men. Population, 1910, 36,981.

**GALVESTON BAY**, an inlet on the southeastern shore of Texas, extending about thirty miles inland from the Gulf of Mexico. It is separated from the latter by Galveston Island, which is connected with the mainland by a railway, whose terminus is at Port Bolivar, opposite Galveston. The area is about 450 square miles.

**GALWAY** (gäl'wä), a seaport city of Ireland, capital of Galway County, 120 miles west of Dublin. It is located at the mouth of the Corrib River, on the northern shore of Galway Bay, and has a large export trade in wool, fish, marble, and agricultural produce. The manufactures include flour, canned fish, ironware, and spirituous liquors. The older part of the town has crooked streets, but the newer part is well platted and built of substantial material. Among the chief buildings is the Church of Saint Nicholas, founded in 1320. It has a fine county courthouse, five nunneries, and three monasteries, and is the seat of Queen's College. The city has railroad and electric railway facilities, waterworks, and gas and electric lighting. The Irish language is spoken by many of the people. Population, 1906, 13,634.

**GALWAY BAY**, an important bay on the western coast of Ireland, extending inland from the Atlantic, between the counties of Clare and Galway. It is from six to twenty miles wide and thirty miles long, and at its entrance are the Arran Islands. Galway, a seaport of western Ireland, is situated on the northern shore.

**GAMBIA** (gäm'bī-ä), the oldest and most northerly British colony on the west coast of Africa. It has an area of 69 square miles. The surrounding sphere of influence tributary to Gambia comprises with it a colony and a protectorate of 3,061 square miles. Rice, cotton, corn, hides, beeswax, and rubber are exported. The district contains some exceedingly fertile tracts of land, though much is unproductive. As a colonial possession it is important mainly on account of commanding the Gambia River, which furnishes extensive means for interior navigation and trade. The government is administered through a local executive and a legislative council. Bathurst, situated on the island of Saint Mary, is the chief town and has 7,500 inhabitants. Only a comparatively few

of the inhabitants are whites, about 200, and a majority of the natives are Mohammedans. A considerable missionary work has been done by the Christian churches. The slave trade was abolished in 1906. Population, 1906, of the colony, 13,945; of the protectorate, 77,284.

**GAMBIA**, an important river of Western Africa, rises in the mountains north of Liberia, flows in a northwesterly direction to the Atlantic, and has a total length of 725 miles. The estuary has a width of 25 miles some distance from its mouth, but at the place where its waters join the Atlantic it is only about two miles wide. The lower valley is overflowed in the rainy season, leaving rich alluvial deposits, which greatly enhance the annual productions. Vessels navigate the river for 650 miles from June to November, but large craft sail only about 90 miles inland.

**GAMBLING** (gäm'blīng), the practice of playing a game of chance for pecuniary profit. It was the custom in very early times to exercise some legal control over the sports and pastimes of the people, especially those involving an element of game or gambling. Certain games were reserved for people of the higher classes in society, or were prohibited altogether. In modern times legislation has been directed toward suppressing the games that are considered dangerous to life, as well as those in which gambling is made the direct object. *Betting* is a form of gambling and is prohibited in most countries, though prizes are permitted, such as those awarded to the winner in a foot race or to the successful side in a game of ball. The laws of England and the United States provide a penalty for those who keep a gambling house as well as for those who actually engage in gambling.

**GAMBOGE** (gäm-bōōj'), a gum resin used in painting and for lacquer work. It is obtained from the gamboge tree, which is native to the East Indies and Southern Asia. It grows to a height of forty feet and has oval leaves, small flowers, and clusters of edible fruit. The gum resin is obtained by making an incision in the tree, when the gamboge exudes as a yellowish juice, and after exposure to the air becomes hard. It is collected in earthen vessels and left to thicken, or is poured when semi-fluid into the hollow joints of the bamboo, thus giving it the form of cylindrical sticks. The finer quality of gamboge is brittle and of a reddish-orange color, has no odor, and is acrid to the taste. Powdered gamboge has a bright yellow color. Several species of trees in Mexico yield gamboge, but the quality is inferior to that obtained from Asia.



**GAME**, the general name applied to birds and animals that are hunted for their flesh or for various commercial purposes. These animals are pursued and captured by some persons as a vocation and for purposes of recreation. *Game laws* have been enacted to regulate the hunting of game, otherwise many species of useful animals would be exterminated by useless destruction. At first legislation was directed more particularly to prevent hunting for a brief period during the breeding season, but now the laws are more stringent and either prohibit killing some animals at any time, or limit the hunting seasons to a short period each year. In some countries it is required that a license be taken out before any kind of game can be killed, while in others hunting under any circumstances is prohibited. The ruthless destruction of the buffalo and elk has exterminated them in the hunting grounds and they are found at present only in parks and reservations. Such animals as the quail, deer, duck, goose, brant, and grouse may be hunted only at certain seasons, depending upon the locality and the habits of the species.

*Game preserves* are grounds set apart for breeding and protecting of game. They are either private or public. Private preserves are very numerous in Europe, where the wealthy maintain them to breed and hunt useful species. Such estates are the property of the nobles, especially in Germany, Austria-Hungary, and Great Britain. Many large preserves are maintained in Canada and the United States, in which it is aimed to protect the primeval scenery as well as many species of game. The Roberval Club of Canada has a preserve of 500 square miles in the Laurentian Mountains, and the most notable government preserve of Canada is that of Henri Menier, which consists of the entire Anticosti Island, in the Gulf of Saint Lawrence. The Vanderbilt game preserve at Biltmore, N. C., is the largest private reservation of this kind in the United States. That country has many public reservations, such as the Yellowstone National Park, where animals and natural scenery are protected for the benefit of the people.

**GAMES**, a class of amusements or sports, played either as a pastime or to test physical or mental skill. Among many ancient peoples, especially the Greeks and Romans, it was customary to play games at regular intervals. These games were in the form of public exhibitions of skill and strength. They were maintained under the patronage of the government and usually accompanied with religious ceremonies. The Grecian games included the Isth-

mian, Nemean, Olympian, and Pythian. The gladiatorial games of Rome made famous the circus and the amphitheater. Among the most popular modern games may be mentioned baseball, cards, croquet, tennis, billiards, football, etc. See **Athletics; Circus; Olympic Games**.

**GANGES** (gān'jēz), one of the most important rivers of Asia, rises in Garhwal, at the western slope of the Himalaya Mountains. It is formed by the junction of the Bhagirathi and the Alaknanda rivers, at Deoprag, about ten miles east of Srinagar. The Bhagirathi is regarded a sacred stream by the natives, has its head 13,800 feet above sea level, and is considered the source of the Ganges, though a larger volume of water is brought from a great distance by the Alaknanda. Among the principal tributaries of the Ganges are the Jumna, Gandak, Son, and Kusi, though there are numerous other tributaries, while the Brahmaputra receives the main channel of the delta, called the Padna, or Padda, and the other streams of the delta flow into the Bay of Bengal. The lower basin constitutes the great valley of Hindustan. It contains much fertility and is one of the most important regions of Asia. Branches begin to flow out from the main stream about 225 miles from its mouth, forming a vast delta in the nature of level and waste swamps, through which many channels course and intersect each other at various points. The entire length is 1,550 miles and the basin drained embraces 395,000 square miles. The largest branches of the delta are the Hugli and the Meghna, the former being on the west side and the latter on the east, and these begin about 200 miles or more from the sea.

Among the principal cities situated on the banks of the Ganges are Cawnpore, Faruckabad, Bahar, Benares, Calcutta, Patna, Allahabad, and Murshedabad. Navigation extends a distance of nearly 1,250 miles from the Bay of Bengal, which makes it an important avenue for commercial and passenger intercourse, though within late years several railroad lines have been constructed in various directions through and along the valley. In the hot season of the year the volume of water is decreased slightly, while in the rainy season great floods cover the lower country, when the water extends over a region about one hundred miles wide. The floods recede about the middle of August, leaving rich alluvial deposits to greatly fertilize the soil. The river is held sacred by the Hindus, who either bathe in it or partake of its waters. From this custom a considerable industry has arisen, and the water is bottled and carried as an article of commerce to



the remote interior districts. Bathing in the Ganges is considered necessary in order to exempt the dead from returning to the earth to recommence life anew. The Hindus think that those who partake of the water have assurance of eternal bliss. Throngs of pilgrims visit various points annually, especially at Allahabad, where a great fair is held periodically.

**GANGES CANAL**, an artificial canal of India, constructed to overcome the obstructions of the Ganges River above Allahabad. It was commenced in 1848 and cost about \$25,000,000. The total length is about 700 miles, 400 miles of which are navigable, while the remainder and a large number of branches are used to irrigate the country which lies between the Ganges and the Jumna.

**GANGLION** (gǎŋ'glī-ōn), in anatomy, an enlargement of the nerves, consisting of a small rounded or elongated nervous mass, usually of a reddish-gray color. Two kinds of nervous ganglia are recognized, those of the sympathetic system and those of the cranial system of nerves. They serve to strengthen nervous impulse, or act as centers for communication with distinct sets of nerves.

**GANGRENE** (gǎŋ'grēn), or **Mortification**, the loss of life in any of the soft parts of the body, without extinction of the vital powers in the rest of the organism. It is either partial or complete. In the former case it does not completely destroy the sensibility of the nerves, hence the local loss of action may be recovered, while in the latter it results in the death of a part. Gangrene is fatal in case it affects a vital part, such as the stomach, but amputation may be resorted to when it attacks a limb or an exterior wound. Modern methods of applying aseptic remedies have overcome the danger of gangrene in wounds, though formerly many deaths resulted from this cause.

**GANNET** (gǎn'nēt), a web-footed bird related to the pelican and classed with the sea fowls. The bill is longer than the head, the beak is strong, and beneath the throat is a small pouch. The plumage is white, except the top of the head, which is yellowish, and some species have gray and black markings. Gannets swim well and have a powerful flight. They capture fish by plunging several hundred feet through the air, striking headlong downward to the surface of the water. They are migratory, passing from the Gulf of Mexico in the spring to breed on the northern coasts of the United States and in Southern Canada. In Europe they breed as far north as the coast of Norway and in autumn move southward to the Madeira Islands.

**GAPES** (gāps), a disease common to fowls and other birds, due to parasitic worms. The gapeworm causes the bird to choke and induces inflammation. It may be removed, after treating the throat with spirits of turpentine, which is done by thrusting a moistened feather into the windpipe. Mammals are affected by similar organisms lodging in the air passages, but their presence is not easily detected, hence no effective treatment can be given.

**GAR**, or **Gar Pike**, a fish of the ganoid family, found in the fresh waters of North America. It has an elongated body, is somewhat cylindrical in form, and is covered with bony scales. The teeth are sharp and set in the jaws of a prolonged bill. The garfishes range from Canada to Texas and live by preying upon other fishes. They are sometimes called *billfishes*, or *bony pikes*, and are not considered good for food. The marine garfishes are larger, from three to five feet long, and are widely distributed. They often leap high out of the water in pursuit of the flying fishes, which they pursue for food. These fishes are numerous in the Gulf of Mexico and the West Indies.

**GARBAGE** (gār'bāj), the discarded remnants of materials which accumulate in cities. Within recent years the authorities of the great centers of population have turned their attention to utilizing garbage in fertilizing and increasing the productiveness of the soil. In New York, Boston, Montreal, and other American cities these wastes are removed by vehicles. Usually they are classified as waste and usable, after which portions are utilized and the remainder is disposed of in a manner best calculated not to impair public health. In many of the cities of Europe garbage is transported by convenient and well-protected means to outlying districts, and, as a result, large areas of waste and unproductive lands have been reclaimed and rendered valuable. This process of utilizing offal and sewage has largely improved the sanitary conditions, lessened the liability of breeding trichinae in hogs fed with refuse matter, and tended to maintain the purity of the city water supply. Many cities maintain garbage furnaces, which were first installed in Great Britain, and they are utilized to burn the class of waste matters that are considered dangerous to public health. It is not difficult to realize how sanitary conditions may be improved by lessening the amount of decaying litter which is often found in cellars and other places throughout many cities. The garbage disposal of New York City, not including the ashes and light wastes, is estimated at about 300,000 tons per year. In Chicago much of the



garbage materials has been used in filling and grading, both in the low lands and in making land along the lake front.

**GARDA** (gär'dà), a lake of Italy, the largest in that country. It is 35 miles long, about 8 miles broad, and covers 190 square miles. The lake is fed by the melting of the Alpine snows and by the inflow of the Sarca River, and its surplus is conveyed by the Mincio to the Po River. It is a beautiful sheet of water and is traversed by numerous steamers. On its shores are many villas and towns, including Salò and Gardone-Riviera.

**GARDEN CITY**, a village in Nassau County, New York, about eighteen miles east of New York City, on Long Island, on the Long Island Railroad. It was laid out by A. T. Stewart as a model villa town, intended for residential purposes, and is beautified by numerous boulevards and avenues of trees. Among the buildings are a fine Gothic cathedral, a memorial school for boys, a female seminary, and other extensive structures. The Protestant Episcopal bishop of Long Island has his residence in Garden City. It is a popular residence of many New York business men.

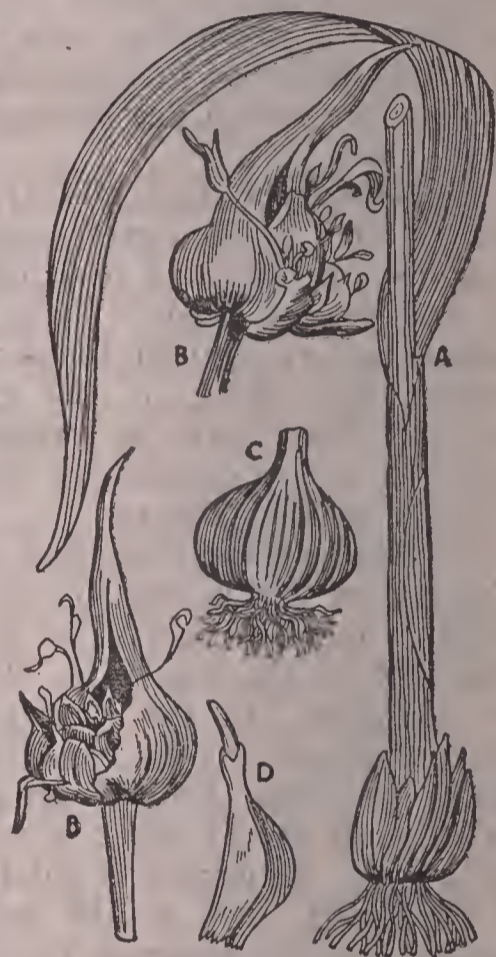
**GARDEN OF THE GODS**, the name of a region in Colorado, near Colorado Springs. The name applies to a tract of 500 acres, remarkable for the grotesque forms of huge red and white sandstone, many of which bear local names, such as Seal Rock and Cathedral Spires. Near the entrance is the gateway, formed of bright red rocks fully 325 feet above the surrounding surface.

**GARDINER** (gärd'nēr), a city of Kennebec County, Maine, at the junction of Cobbossee and Kennebec rivers, six miles south of Augusta, on the Maine Central Railroad. An abundance of water power facilitates the operation of numerous manufacturing establishments, including sawmills, machine shops, and flouring mills. It has a public library and a number of fine schools. Among the municipal improvements are electric lights, waterworks, pavements, and a system of sewerage. It was settled in 1760 and chartered as a city in 1849. Population, 1900, 5,501.

**GARDNER**, a town of Massachusetts, in Worcester County, on the Otter River and on the Boston and Maine Railroad. The surrounding country is fruit growing and agricultural. An almshouse, the Levi Heywood Library, a home for the aged, and Crystal Lake Park are noteworthy. Among the manufactures are furniture, ironware, implements, clothing, and machinery. It was incorporated as a town in 1785. Population, 1905, 12,012.

**GARFIELD** (gär'fēld), a borough of New Jersey, in Bergen County, on the Erie Railway. It is located on the Passaic River, opposite Passaic, and is important as a shipping and manufacturing center. Among its chief industries are chemical works, machine shops, and cotton and woolen mills. It has electric lights, waterworks, and a considerable trade in merchandise. Population, 1905, 5,092.

**GARLIC** (gär'lik), a perennial plant allied to the onion, composed of a compound bulb of ten or twelve smaller ones, called *cloves*. The plant has long pointed leaves, quite narrow and flat, and whitish or pinkish flowers, similar to those of the onion. It is indigenous to the southern part of Europe. In some countries it is cultivated extensively, especially in Portugal, where peasants eat slices of it with bread. Most species have a highly pungent taste and a disagreeable odor. In medicine it serves as a stimulant, expectorant, and diuretic, but its mildness renders it useful as a diet rather than as a medicine.



GARLIC.

A, Stalk; BB, Flowers; C, Bulb; D, Clove.

**GARNET** (gär'nēt), a class of minerals, including various species that are prized highly. They occur usually in mica slate or in gneiss, but sometimes in limestone and granite, or in serpentine and lava beds. The three species of garnet which bring the highest prices are known as *alumina garnet*, *iron garnet*, and *chrome garnet*. These vary in color, such as red, brown, green, black, and yellow, according to the amount of coloring oxides contained in them. Some iron garnet contains enough metal to be attracted by the magnet. Garnets are found in Brazil, Peru, Ceylon, Bohemia, Siberia, and in many mountainous districts, the finest being the Syrian. Garnets which are transparent scarlet and crimson are known as *carbuncles*. A black variety is known as *melanite* and a green kind is called *demantoid*. Common garnet is often



powdered and used for cutting and polishing other stone.

**GARNISHMENT** (gär'nish-mənt), a process of attachment whereby a creditor levies upon money or property of his debtor in the possession of a third person. By this process such property is held subject to the payment of a debt, and advantage may be taken of it at the time of beginning a cause or after a judgment has been rendered. The person who is notified to hold such property subject to the order of the court is called a *garnishee*. This process is commonly used in cases where the wages of a debtor are seized to secure payment of a debt.

**GARONNE** (gá-rôn'), a river in the southwestern part of France, rises in the Pyrenees at an altitude of 6,142 feet above sea level and flows toward the northwest, discharging into the Atlantic. It receives numerous tributaries, among them the Save, Lot, Baise, Ratz, and Dordogne, and, after forming a junction with the last-mentioned, is called the Gironde, a distance of about fifty miles, where it constitutes an important estuary. The basin of the Garonne includes 22,050 square miles, is fertile, and contains numerous thriving commercial centers. The Central Canal joins the Garonne at Toulouse and unites it with the Mediterranean Sea, thus forming an important connection between that and the Atlantic. Several other canals join it, one of which crosses the river at Agen by a viaduct.

**GARROTE** (gär-rôt'), a method of execution practiced by the Spaniards. It is a form of strangulation and was originally performed by placing a heavy cord around the neck of a criminal, who was seated on a stool fastened to a stake, and the cord was twisted by inserting a stick between the rope and the back of the neck, then twisting until strangulation took place. Another method was by means of a brass collar placed around the neck, and pressure was obtained by means of a screw. The garrote was used extensively during the Inquisition. The name is sometimes applied to a species of robbery in which the victim is surprised by the highwaymen, who produce temporary strangulation by drawing a cord or handkerchief about the neck, when the pockets are rifled.

**GARTER, Order of the**, one of the most celebrated and ancient orders of knighthood. It was probably originated by Edward III., about Jan. 18, 1334, and served to reward the distinguished military personages who assisted in the struggle against France, though its founding is sometimes assigned to Richard I. It is

related that Edward III. was dancing with the Countess of Salisbury when her garter dropped, and, after putting it around his own leg, restored it with the expression of "Dishonored be he who thinks evil of it," which was afterward changed slightly to form the motto of the organization. Numerous revisions of the statutes of the order were effected in the reigns of Henry V., Henry VIII., Edward VI., and in 1805 under George III.

Originally there were 26 knights, inclusive of the sovereign, who was the recognized head. The statute passed in 1786 recognized and maintained this number, but admitted as supernumerary members certain of the princes. The common title of the order was *Order of Saint George* prior to the reign of Edward VI., and the same term is still applied synonymously with that now used. A dark blue ribbon, edged with gold, is used to represent the garter as the emblem. On it the motto appears, *Honi soit qui mal y pense* (Shame to him who thinks evil), together with a buckle and pendant. It is worn below the knee of the left limb. However, there are other marks of distinction, such as a hood, mantle, gown, plume, star, ribbon, golden collar, and a figure of Saint George on horseback in contact with the dragon. The members use the initials K. G. to designate the order, which are written after their names. From some authorities we learn that ladies were members prior to the reign of Edward IV. The Prince of Wales is a member by virtue of his title.

**GARTER SNAKE**, the name applied to various small snakes of North America. The common garter snake is found widely distributed from Mexico to Canada, but in appearance the species vary somewhat. Most of them are brown or black, and those of the warmer section have spots or crossbars, while the species common to the colder regions are striped with greenish color. They retain their eggs until they hatch, bringing the young forth alive, frequently as many as fifty at a time. The mother defends the young by rushing at the enemy with extended mouth, though the bite is not poisonous. In the winter they find shelter in the ground, where they lie dormant until spring. They subsist on worms, frogs, and other small forms of animal life.

**GAS**, one of the three forms of matter, the other two being *solids* and *liquids*, and which constitutes a fluid that cannot be liquefied nor solidified at ordinary temperatures and pressure. Air was practically the only gas known to the ancients, but artificial gas was referred to as *spiritus* by writers as early as the 14th



century A. D. The term gas soon came to be applied to all elastic fluids that differ from common gas, and which were thought to be permanent. However, Faraday liquefied various gases by reducing the temperature and increasing the pressure, and since then the term has been applied generally to all substances in an elastic aëriiform state. Experiments in liquefying gases have established the fact that none is permanent, and that even air may be reduced to a liquefied state, this being first demonstrated in 1878. To reduce a gas to a liquid state it is necessary to make application of cold or pressure, or a combination of both. The point at which the distinction between a gas and a liquid is lost is called the *critical point of temperature*, and there is a particular temperature for any given pressure at which the critical point of temperature can be reached. It is only at or below this particular temperature that pressure converts a gas into a liquid.

Gases are generally distinguished from liquids by the term *elastic fluid*, while liquids are termed *nonelastic fluids*, this being due to the circumstance that liquids have comparatively little or no compressibility. Though all liquids have elasticity, they expand after compression is removed to their former state, while gases expand to an indeterminable extent and in every direction when left unconfined. As a general rule the density of a gas depends upon the pressure to which it is subjected, or, in other words, an increase of pressure reduces the volume of gases proportionally. This is in accord with the law announced by Edme Mariotte (1620-1684), a French physicist, which is substantially as follows: *The volume of a given mass of gas varies inversely with the pressure to which it is subjected.*

Two or more gases brought into contact mix in any proportion and diffuse themselves uniformly regardless of their gravities. This may be verified by filling a bottle with hydrogen and another with oxygen, whose specific gravity is sixteen times that of hydrogen, or with carbonic acid, whose density is twenty-two times as great, and connecting the two bottles with a glass tube about ten inches long. Diffusion of the gases will begin at once, and within a few days they will be found to have the same proportion to each other in both bottles, even if a porous substance, as a thin membrane, be placed in the tube. The kinetic theory of gases accounts for the power of motion inherent in all parts of aëriiform matter. According to it a gas consists of molecules sparsely distributed through space, but which move about with much velocity. An increase of temperature has the

effect to greatly increase the molecular energy, when the pressure within the vessel will be increased correspondingly, while lowering the temperature has an opposite effect.

Gas is a valuable agent in lighting, heating, and for various other purposes in the arts and industries. Large quantities are derived from natural sources, but the greater supply is obtained from coal, wood, resin, peat, water, coke, oils, and fats. In many localities gas issues from the surface of the earth, as in Pennsylvania, Texas, Ohio, New York, and various parts of Eurasia, especially at Baku, and is now used very extensively for illuminating and heating purposes. The Chinese have utilized gas for centuries in various industries and even transported it to different parts of their own country, which they did in ancient times by confining it in bamboo tubes. It may be said that the artificial manufacture of gas in Europe dates from 1739, when an inflammable gas was obtained in England by subjecting coal to heat in a closed vessel and conducting the fluid through a small tube into bladders. A simple experiment consists of placing particles of bituminous coal in the bowl of a tobacco pipe, then closing the top with moist clay and heating to a red heat. When reaching the point of distillation, a yellowish smoke issues from the stem of the pipe, which yields a bright flame when lighted.

In the manufacture of coal gas the coal is placed in an iron or clay retort, in which it is heated until it expands to twice its bulk and forms coke, while the gas generated is conducted by a pipe into a receiver. The tanks used in factories have a large capacity, some having storage room for 3,000,000 cubic feet of gas. In distilling the coal it gives off heat, steam, ammonia, tar and gas. The ammonia and tar are run off into cisterns, while the gas is passed over lime before running it into gas storage tanks for the purpose of freeing it from acids.

In an analysis made by Robert W. Bunsen (q. v.) it was found that the products of the destructive distillation of bituminous coal include the following: Coke, sixty-eight per cent.; tar, twelve; water, eight; marsh gas, seven; carbonic oxide, one; and carbonic acid, one. In addition to these are generated small quantities of olefiant gas, hydrogen, ammonia, and nitrogen. Coal gas is used largely for heating and lighting, and for that purpose is passed to houses and factories by pipe lines. Small pipes carry the gas to lamps and burners in different parts of the buildings. A gas meter, through which the gas passes, is usually in each building,



and the quantity consumed is measured quite accurately.

*Wood gas* contains more illuminating power than olefiant gas and its specific gravity is greater than coal gas, hence, it requires burners with larger orifices. *Resin gas* has a high illuminating power, but the supply is necessarily limited. *Peat gas* is distilled in retorts similar to those used in wood gas. *Water gas* is made by forcing steam and the vapor of crude petroleum into retorts, which are subjected to a high temperature. This product is cheaper and more satisfactory for illuminating than coal gas. *Oil gas* is obtained by dry distillation, or by running oil or petroleum through tubes which have been raised to a red heat. This gas, stored in cylinders and subjected to pressure, is used generally in lighting railway cars. Crude petroleum is used extensively in making gas for illuminating purposes. See **Natural Gas; Acetylene**.

**GASCONADE** (gäs-kō-nād'), a river in Missouri, rises in Wright County, and flows in a general course toward the northeast. It discharges into the Missouri River at Gasconda, about 35 miles below Jefferson City, after a course of 250 miles. The basin includes a large portion of the slopes of the Ozark Mountains and the course of the river is quite tortuous.

**GASCONY** (gäs'kō-nī), or **Gascogne**, a former duchy in the southwestern part of France. It was bounded by the Bay of Biscay, the Pyrenees, and the Garonne River, corresponding to the present departments of Gers, Landes, and Hautes-Pyrénées and portions of four other departments. The inhabitants were generally known as Gascons, who descended from the Goths and the Basques. They submitted to the Franks in 1602, but maintained a semi-independent government, and later were conquered by Pepin. The region was a possession of England from 1152 until 1453, when it was reconquered by France.

**GAS ENGINE**, an engine in which the motion of the piston is produced by the combustion or sudden production or expansion of gas. Machines of this kind now in extensive use receive their motion by an explosive mixture of gas and air being forced into the working cylinder and ignited there by a gas flame or an electric spark. The largest number are *gasoline engines*, in which gasoline gas produces the motion, but natural gas, illuminating gas, and gas from naphtha or other petroleum products are employed. These engines vary in construction and efficiency, ranging from very small machines to those having a capacity of 650 horse power. Besides having valves for the admis-

sion and escape of gas from the cylinder and igniting apparatus, they possess the essentials of the steam engine, having a piston within the cylinder, a connecting rod, a crank, and a fly wheel. Motion is induced by admitting gas into the cylinder, where it is exploded by an electric spark, causing the piston to be thrown forward, which acts to cause a partial vacuum within the cylinder, into which more gas is admitted, which, on being exploded, causes another forward movement of the piston. The burned gas escapes at the return of the piston, when the exhaust valve is thrown open. The movement would be irregular and ineffective without a fly wheel, which moves rapidly and maintains uniformity in the rate of speed. The inflow of gas, as the intake valve is thrown open, is regulated by a governor attached to the fly wheel. Gas engines are used extensively where power is required periodically, especially in such structures as motor bicycles, automobiles, hoisting machines, yachts, etc. See illustration on following page.

**GASTRIC JUICE** (gäs'trik), a colorless liquid secreted by the stomach, containing 98.5 per cent. of water. It has a salty, acid taste, the active principle being pepsin. The function of gastric juice is to dissolve the nitrogenous elements of food, such as albumen, fibrin, and casein. It affects portions of the vegetable food and all animal food, except fat, converting them into what is known as *peptones*. The acid in some cases seems to be largely of a hydrochloric nature. In others hydrochloric and lactic, or even butyric and acetic acids are present, but they are thought to be due to the change undergone by the food in the process of digestion. When the food has been thoroughly mixed with the liquid of the stomach, it is known as *chyme*, which passes into the intestines as a thick but sticky substance. About fourteen pounds of gastric juice are secreted daily in the human adult. Artificial gastric juice can be made by extracting pepsin from the coat of the stomach of animals by means of glycerin, and adding water to the filtered liquid, with a small per cent. of hydrochloric acid.

**GASTRITIS** (gäs-trī'tis), an inflammation of the stomach, especially of the mucous membrane of that organ. The early symptoms include a pain in the stomach and a severe headache, which are usually followed by fever and nausea. A common form is known as acute catarrhal gastritis, which is usually due to careless dieting. Toxic gastritis is caused by an excessive use of stimulants, especially alcohol. An acute and persistent form is known as chronic gastritis, which causes a general decline



of health. Wholesome exercise and careful dieting are recommended in all forms of this disease.

**GASTROPODA** (gäs-tröp'ä-dä), a class of mollusks that have distinct head, bearing eyes and tentacles, and movement is by means of

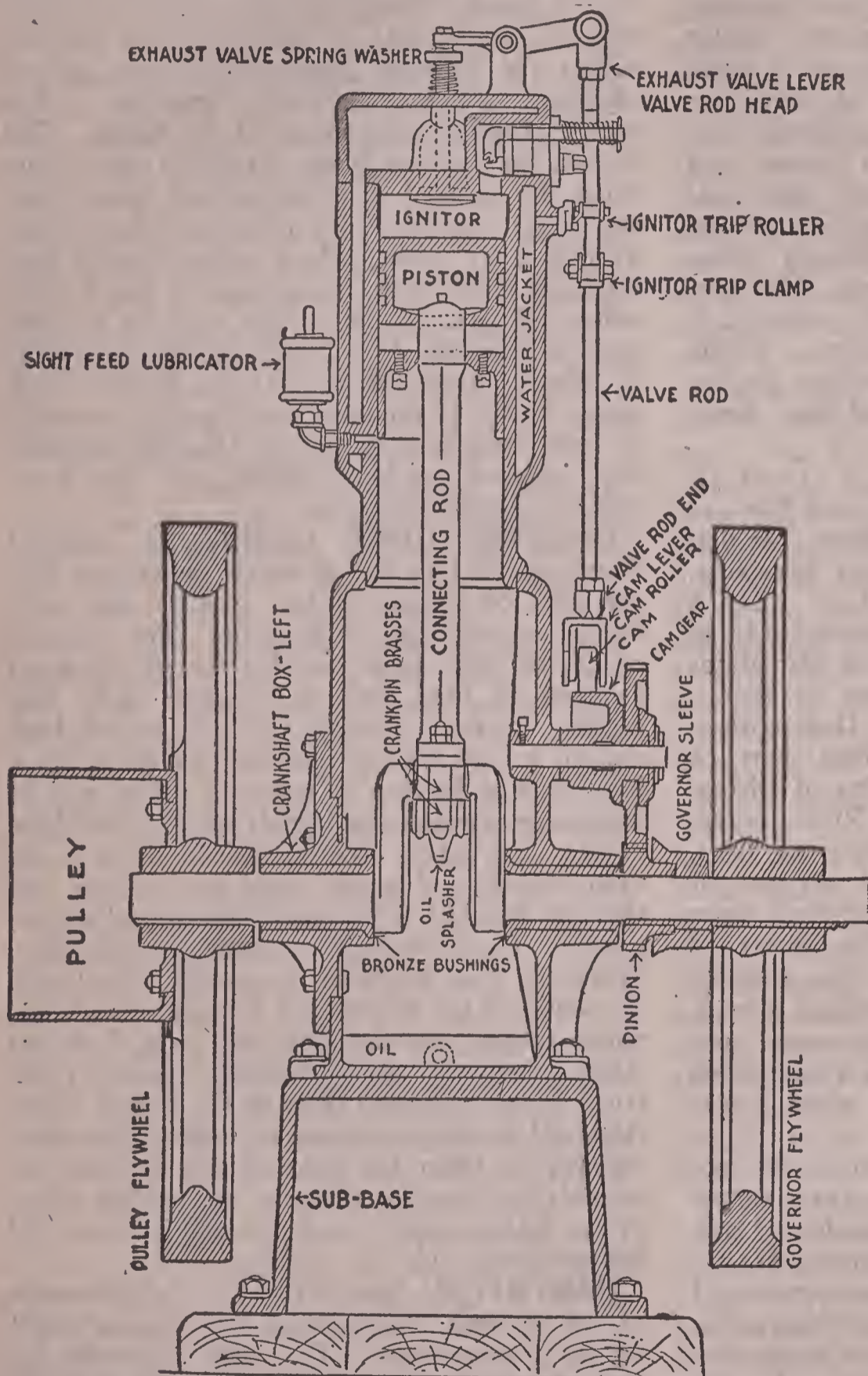
cerebral masses, including the stomach, circulatory organs, and the glands of reproduction. The shell is single or univalve, usually coiled in a spiral. The greater number of mollusks with univalve shells belong to this class, but it also contains some species with multivalve shells, such as the chitons. Among the species of gastropods are the limpets, snails, slugs, and cowries.

**GATH**, one of the five chief cities of Philistia, frequently mentioned in the Bible in connection with David and the Jews. Goliath, who was slain by David, lived in Gath. It was alternately independent or under the power of the Jewish Kings, except for a short period when it was under Syrian rule. The Philistines defended it against David and Solomon, and it still remained a center of influence until the time of Jerome. It is not known where Gath was, but it is thought to have been located between Ashdod and Ekron.

**GATINEAU** (gä-të-nō'), a river in the province of Quebec, Canada, the largest tributary of the Ottawa. It has its origin in a number of lakes, flows in a general southerly direction, and enters the Ottawa River about a mile below the city of Ottawa. It receives a number of tributaries and is about 400 miles long. Only a short distance is navigable, but it is utilized extensively in rafting timber and lumber.

**GAUCHOS** (gou'chōz), the name of a nomadic class of people in South America, confined largely to Argentina and the Pampas in the basin of the La Plata River. They descended from whites and Indians, are tall and handsome, and engage chiefly in stock raising. They are skilled in using the lariat. The Gauchos are good horsemen and are independent and warlike.

**GAUGE** (gāj), or **Gage**, the name of many instruments used in the mechanical arts. The distance between the inner sides of the rails of a track is known as the gauge of railways and to ascertain it an instrument known as a *gauge*



Sectional view of a Vertical Gas Engine, showing working parts.

a large creeping disk or foot. In most species the body is not symmetrical, but the head and foot are usually well formed. All the species have a more or less clearly defined hump upon the back, which is extended in some to a considerable size, and in it are contained the vis-



is used. It serves to set the rails to the proper space apart and to measure the distance when the rails require adjustment. An instrument known as a *steam gauge* is fixed to the boilers of engines, serving to register the force of the steam. It consists of a cylindrical box of metal furnished with a dial and the force is indicated by a needle, which is moved by a spring according to the pressure of the steam, which acts through a tube upon a movable piece of metal attached to the spring. The spring is compressed according to the pressure of the steam, and the needle indicates on the dial the pressure per square inch in pounds. A *water gauge* is one to indicate the level of the water in a boiler. It consists of a vertical glass tube, which communicates at both ends with the boiler, hence the water in the tube will rise to the same level as that in the boiler. Some boilers are provided with *gauge cocks* in addition to the vertical gauge.

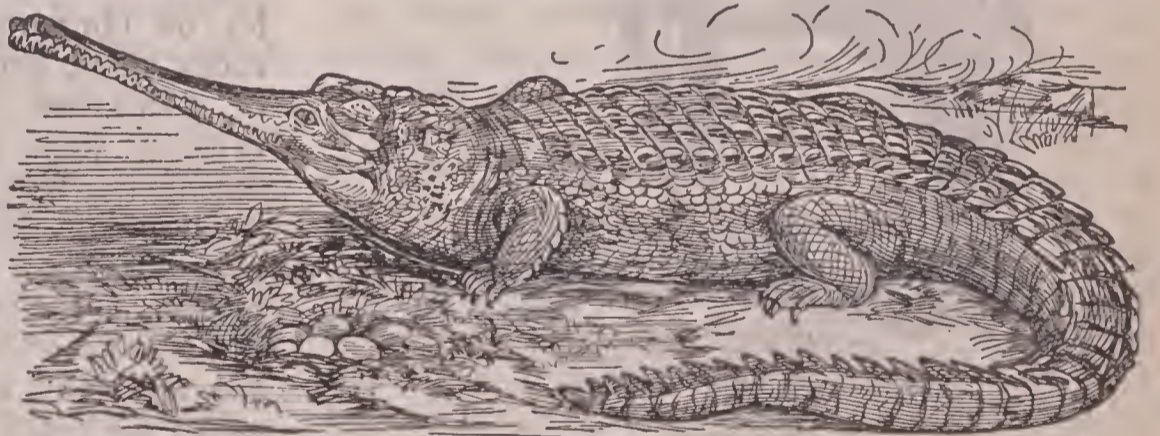
**GAUL**, or **Gallia**, the name applied anciently to the country situated between the Rhine and the Pyrenees, which was the region occupied chiefly by the Gauls, the most numerous branch of the original Celts. The principal divisions of the region consisted of the district on the Roman side of the Alps and the one beyond the Alpine Mountains. In the course of time the former became known as *Gallia Cisalpina*, and the latter as *Gallia Transalpina*, though each was variously modified in extent by the fortunes of war and insurrectional disturbances. The Gallic people were first brought into history about 397 B. C., when they crossed the Alps and engaged in a series of wars with the Etruscans and Romans. In 390 B. C., they inflicted a defeat upon the Romans at Allia, burned a large part of Rome, and planted their authority far toward the East.

In 280 B. C., the Gauls conducted successful campaigns into Greece, penetrated across the Hellespont into Asia Minor, and made important settlements under the name of Galatians, with which the early Christian teachers came in contact. Their foothold along the Danube was lost as a result of the conquest of the Germanic peoples, who occupied the entire region tributary to the Rhine. The Cisalpina Gauls were prominent factors in contending against Roman power until the first Punic War, when an armed conflict of six years' duration compelled them to submit to the Roman authority, in 220 B. C.

The march of Hannibal across the Alps to reduce Rome gave them an opportunity to again rise with prospects of success, but, when the Carthaginians were defeated by the Romans, the Gauls were again reduced to submission. A Roman invasion in 128-122 B. C. reduced and made them tributary, the Romans establishing *Provincia*, a name since perpetuated as *Provence*. Later the successful incursions of Germanic and Cimbrian armies tended still further to reduce the Gallic tribes, and they were ultimately subdued by the Romans in a war lasting nine years, conducted under the proconsulship of Julius Caesar, from 58 to 50 B. C.

**GAUR** (gär), or **Gour**, a wild ox native to Southern Europe, found chiefly in India. It stands about five feet high at the shoulders, has strong and much curved horns, and is one of the largest species of the ox tribe. The color is brown or blackish, except the legs below the knee, which are white. The hide is very thick and is used in making shields.

**GAVIAL** (gā'vī-äl), or **Gharial**, a species of crocodile native to Southern Asia, found chiefly in the region of the upper Ganges and its tributaries. It is peculiar for its long and narrow jaws, which have numerous sharp and slender teeth. The food consists principally of fish and small reptiles. An adult gavial is



GANGES GAVIAL.

about twenty feet long. The male has a large hump upon the snout, formed of cartilage, and in this the nostrils open. Though closely allied to the crocodile and alligator, it has a much narrower and feebler jaw.

**GAZA** (gā'zà), a town of Syria, three miles from the Mediterranean, and fifty miles southwest of Jerusalem. It occupies an important position on the caravan road between the desert and the Mediterranean, hence has been important as a trade center from remote antiquity. The Egyptians were an important factor in extending its commercial influence, but it was conquered by the Philistines and became their most important city. Alexander the Great captured



it after a siege of two months, in 332 B. C., and its final destruction, which occurred in 96 B. C., is referred to in Acts viii., 26. The Romans rebuilt it, but it was more distinctly a Greek city, and for a long time rivaled Athens and Alexandria in culture. Omar captured and destroyed it in 634, but it was rebuilt by the Crusaders and defended by the Templars. The modern city is known as Ghazze. It has a considerable trade, but the buildings are poorly constructed. A large majority of the inhabitants are Mohammedans. Population, 1906, 38,530.

**GAZELLE** (gà-zěl'), the type of antelopes, including about twenty species, most of which frequent desert and mountain regions. They are found mostly in North Africa, Persia, and



GAZELLE.

Arabia. The various species are gentle in disposition, light fawn colored, and have lustrous eyes. Both sexes have horns. The gazelle is preyed on by the lion and hunted for its flesh and hide. Though gregarious in habits, they are shy and difficult to approach. The *admi*, or mountain gazelle, is a familiar species of the Sahara highlands. Other well-known species include the *dama* of the Sudan, the *Loder's* of Algeria, and the *common gazelle* of Arabia.

**GEARING** (gēr'ing), the name applied to a set or system of wheels in machinery, constructed so motion is communicated from one part of the machine to another. A gearing usually consists of a train of friction wheels, screws, or toothed wheels, and frequently of a

series or combination of them. A machine is said to be *out of gear* when all parts are not adjusted for communication and *in gear* when it is set ready for use. The velocity of a machine depends upon the construction of its gearing, which may be so adjusted as to increase or diminish the speed of the part which does the work. Gear wheels are of various forms, depending upon the velocity desired and the nature of communicating motion. A *beveled gear wheel* has teeth set radially in the face of a cone, while a *spur gear wheel* is one in which the teeth are parallel to the axis of the wheel. In a *worm wheel* the teeth are cut spirally, hence have the effect of a screw.

**GECKO** (gěk'ō), the common name of an extensive family of lizards. They are small animals, seldom exceeding eight inches in length, and the body is covered with numerous round warts. The head is flattened, the body is short and thick, and the eyes are large. The species vary greatly in color, which is usually quite dull. Formerly it was thought that their bite is poisonous, but such is not the case. On the other hand, they are entirely harmless, and are useful in feeding upon insects and worms. They are found quite frequently in cellars and under wet boards and logs. Species closely related are common to all the continents.

**GEHENNA** (gē-hēn'nà), in Hebrew, the valley of Hinnom, a gorge with precipitous and rocky sides, situated a short distance southwest of Jerusalem. The Jewish kings made it a favorite place for the celebration of religious ceremonies and idolatrous rites. When the pure religion of the fathers was restored in the reign of King Josiah, he defiled the valley in making it a charnel district by covering it with the sewage of the city. It was common to burn the offal and carcasses of animals in order to make the place one of disagreeable repute and thereby destroy it as a resort for idol worship.

**GELSENKIRCHEN** (gěl'zēn-kērk-ēn), a city of Germany, in the province of Westphalia, five miles north of Essen, with which it is connected by electric and steam railroads. It is surrounded by a productive coal-mining region and is noted chiefly as an industrial center. The noteworthy buildings include the townhall, the public library, and a number of fine schools and churches. Among the principal industries are machine shops, iron works, flour mills, and soap factories. The rapid growth of the city dates from 1855, when coal was discovered in the vicinity, and it was incorporated in 1875. Population, 1905, 147,005.

**GEM**, a precious stone, especially one intended for an ornament. Gems are sometimes



found with a natural polish and crystallized in regular shapes, but more commonly with a rough surface and of irregular form. The term is applied particularly to a stone cut and finished ready for setting and wearing as an ornament, as the ruby, sapphire, diamond, and emerald. Other stones are used for ornament to which the term does not properly apply, such as carnelian and agate. The manufacture of artificial gems has made notable progress in recent times. A kind of glass known as *paste* or *strass*, which contains about fifty per cent. of oxide of lead and is peculiar for its brilliancy and hardness, is a common base for artificial gems. Recently some progress has been made in producing gems artificially. These consist largely of rubies, sapphires, and others of the corundum class. Genuine diamonds have been made by a chemical process, but the expense and labor is too great to make the production profitable. Another product of value is obtained by fusing small chips or imperfect stones in an electric furnace. When the fused product is cut and polished, gems of good size and color are obtained.

**GEMINI** (jēm'ī-nī), the twins, a constellation of the zodiac, containing the two stars Castor and Pollux. The former star is a double one. The constellation may be seen in the Northern Hemisphere during the evenings of December and January. Gemini is a sign of the zodiac, which is entered by the sun about May 21, and the sun passes from it June 21.

**GEMSBOK** (gēmz'bōk), the name of a large antelope in South Africa, called *kookam* by the natives. It is a stout animal, about four feet high and five feet long, and has straight horns about two feet in length. It has a dark gray color above, white on the under part, and markings of white and black on the head. The gemsbok frequents the mountainous districts and usually congregates in small groups when upon the open plain. It is found in many barren desert tracts, where it appears to subsist a long time without water. Its inability to run with great speed is partly compensated for by its strength, which enables it to withstand the attacks of the lion. The flesh is esteemed highly.

**GENDARMES** (zhän-därm'), meaning men at arms, the name formerly applied in France to the corps of cavalry that formed a body-guard to the kings. At present the name refers to a military police composed largely of soldiers taken from the army. About 21,000 men make up the gendarmes at the present time. They include both cavalry and infantry, receive higher pay than other men in the army, and form a

national police in the departments and colonies of France. Similar forces are maintained in Russia and Germany, where they serve both as soldiers and national police officers.

**GENERALIZATION** (jĕn-ēr-äl-ĭ-zā'shŭn), in psychology, the act of bringing individuals or particulars under a class, or deducting a general principle from particulars. Some writers use the word *generalize* to mean the forming of logical concepts, while others employ it to signify scientific classification. It may be defined as the power of grasping the common qualities of objects and uniting them into a single notion comprehending them all. From this it will be seen that generalization is the power of combining the individual with the general, of uniting the manifold into one. See **Conception**.

**GENESEE** (jĕn-ĕ-sĕ'), a river of western New York, which has its source in Potter County, Pennsylvania, and, after coursing northward into New York, discharges into Lake Ontario, seven miles north of Rochester. The total length is 140 miles. It passes through a fertile valley, has falls at Portage and Rochester, and is navigable for small craft about fifty miles.

**GENESIS** (jĕn'ĕ-sĭs), meaning creation or origin, the name of the first book of the Bible. It is one of the most ancient of existing books, giving an account of the creation, of the original happy state and the fall of man, of the Deluge, and of the dispersion of mankind, ending with the calling of Abraham and the rise and progress of the Jewish nation. Moses is regarded the author of the book of Genesis, but it is supposed that he derived a large part of his materials from written documents coeval with the events recorded, being infallibly guided by inspiration in the entire work. Some writers think that a few additions were made to Genesis after the death of Moses, probably by Ezra. See **Pentateuch**.

**GENET** (jĕn'ĕt), a carnivorous mammal native to Europe and Africa. Only one species is found in the southern part of Europe, whence it extends into Western Asia. Five species are found exclusively in Africa, ranging from the Mediterranean to the Cape of Good Hope. The common genet has a dark gray color, thickly spotted with black, and is nearly allied to the civet. It has retractile claws and a faint smell of musk, and the pupil of the eye is narrow and vertical. The fur is valuable as an article of commerce. It is easily domesticated and is employed in many places to destroy rats and mice.

**GENEVA** (jĕ-nĕ'vā), a city of Ontario County, New York, on Seneca Lake, about fifty miles southeast of Rochester. It is on the



Seneca and Cayuga Canal and on the Lehigh Valley, the New York Central, and other railroads. Among its municipal facilities are pavements, street railways, electric lights, waterworks, and a library. Besides having a good system of public schools, it contains Hobart College, the State agricultural experiment station, the Delancey Divinity School, and the Delancey School for Girls. Among the manufactures are steam heating apparatus, clothing, scientific instruments, machinery, engines, and boilers. The surrounding country is agricultural and contains many thousand acres cultivated in nurseries. Geneva was incorporated as a city in 1898. Population, 1905, 12,250; in 1910, 12,446.

**GENEVA**, a city of Switzerland, capital of the canton of the same name. It is situated on the western shore of Lake Geneva, at the point where the Rhone issues, and is connected with European cities by extensive railroad systems.

The city is located on both sides of the lake, though the larger portion is on the south bank of the Rhone, over which several bridges are maintained and facilitate free public intercourse. The two portions of the city are known as the upper and lower, the former containing excellent edifices and beautiful hotels. On the other hand, the lower city is the seat of the commercial institutions and manufactories and the residences of the poorer classes. Among the manufactures are gold, silver, and other metal wares, silk, cotton and woolen goods, leather, calico, hats, musical instruments, clocks and watches, machinery, and chemicals. Of these jewelry, musical instruments, and watches are the most important.

Communication is facilitated by steam navigation on Lake Geneva, the Rhone, and numerous canals, besides by many electric railway lines that center in the city. As a seat of science and literature Geneva takes high rank, its institutions of learning, libraries, museums, and galleries of art ranking with the most famous of Europe. Among the eminent men who resided at Geneva and influenced its learning are Calvin, Knox, Necker, Rousseau, Beza, Sismondi, and Huber. Its cathedrals, public parks, electric lighting system, and statuary take high rank. The university was founded in the 12th century. It carries advanced courses of study and is attended by 1,150 students.

Though originally a Gallic city, it was afterward included in the Roman Provincia, and later passed to the Burgundians and Franks. In the 12th century it witnessed the controversies between the bishops, who were feudatory to the German Empire, and the counts of Savoy, each striving for supremacy. During these con-

tentions the citizens secured numerous advantages, among them religious and political liberties and commercial independence. An alliance was concluded with Freiburg in 1518 and subsequently with Berne, thus making Geneva an important member of the Swiss Confederation. In the Reformation it was a seat and stronghold of Protestantism, becoming so largely under the preaching of William Farel and Calvin. Besides impressing the people with rigid morality, these teachers awakened a taste for the exact sciences. The aristocratic party continued to oppress the people for centuries, although in the 18th century the popular party gained much strength, but the contests that followed might have ended even more dangerously to the people if France and the adjacent cantons had not interfered. France annexed the canton of Geneva in 1798 as the department Du Lemane, but, with the overthrow of Napoleon in 1815, it became independent and formed the twenty-second canton of the Swiss Confederation. Population, 1907, 116,387.

**GENEVA ARBITRATION.** See *Alabama Claims*.

**GENEVA CONVENTION.** See *Red Cross Society*.

**GENEVA LAKE**, or **Lake Lemane**, a beautiful fresh-water lake between France and Switzerland, though the larger part of it belongs to the latter country. It is formed as a crescent, has a length of 48 miles from east to west, and is 1,215 feet above sea level. The area is 225 square miles; the greatest breadth, nine miles; and the maximum depth, 980 feet. It is rich in fish, especially trout, pike, salmon, and German carp. The lake is valuable in navigation, being never entirely frozen over in winter. It is entered from the upper end by the Rhone, which pours its turbid and silt-laden water into it, but passes from it clear and transparent. Near the lake are the mountains of Savoy, while Mont Blanc is visible, though sixty miles distant. The city of Geneva is situated at the point where the Rhone River flows from the lake. Many adjacent localities are celebrated in literature, among them the places treated by Rousseau and Schiller. Byron in "Childe Harold" and "The Prisoner of Chillon" has added interest to the lake.

**GENNESARET** (jĕn-nĕs'ă-rĕt). See *Galilee*, *Sea of*.

**GENOA** (jĕn'ō-ă), a seaport city of Italy, capital of the province of Genoa, on the northern shore of the Gulf of Genoa, an inlet from the Mediterranean. It occupies a fine site at the foot and on the slope of the Ligurian Alps. Extensive fortifications surround the city and



crown the heights near it. The older portions have narrow streets with lofty buildings, while those of the newer part are spacious and regularly platted and beautified by tall edifices and fine palaces. Orchards and groves of pomegranate and orange trees cover the hills adjacent to the city, and above them rise lofty ranges of towering mountain peaks. The harbor is protected by piers and moles, and is studded with innumerable vessels that carry on an important navigation trade in fruits, cereals, minerals, and manufactured articles produced in the city and surrounding region. Among the manufactures are Italian marble, macaroni, paper, ironware, machinery, cheese, flour, jewelry, gloves, textile fabrics, and scientific instruments.

Many of the buildings are famed in history, among them the Cathedral of San Lorenzo, built in the 10th century; the churches of Santo Stefano and Santa Maria di Carignano; the university, with 1,425 students; and the ducal palace (Palazzo Ducale), built in the 13th century. Other noted buildings include the Theater Carlo Felice, the palaces of Balbi, Doria, Serra, and several others, the town hall, the Plazzo Reale, and the central railway station. The city has a well-organized public school system, schools of fine arts, a military school, the Royal Marine School, a theological seminary, and numerous parochial schools and hospitals. In the public parks are numerous statues, among them several fine marble memorials of Columbus. The Saint George bank building is used as a customhouse and was anciently one of the most stable banks of deposit and circulation in Europe. Its celebrated cemetery, known as Campo Santo, is remarkable for its beauty and the large number of eminent men whose graves it contains. The city is beautified by modern lighting, has electric street railway service, important railroad connections, and is noted for its large commercial and passenger traffic.

Genoa was famous as a seaport under the Romans. It was organized as an independent republic and presided over by doges subsequent to the division made by Charlemagne. Saracen incursions in 935 led the Genoese to form an alliance with Pisa, though in 1119 the two cities engaged in wars and continued hostile until 1294, when Pisa was given a crushing defeat. In the meantime Venice had risen as a successful rival, which led to periodic wars from the 12th to the 14th centuries, and, after discordant strife internally, it became subject to Milan and later to France. Napoleon secured permanent possession of Genoa after the Battle of Marengo, in 1800, and formally annexed it in 1805. In 1815

it became a part of the kingdom of Sardinia, and with it was annexed to Italy. Historically, the Genoese are noted for their spirit of liberality and enterprise. They fostered learning, encouraged industrial arts, established civil reforms, and built internal improvements. The annexation to Italy within recent times has given the city its present prosperity. Population, 1906, 241,617.

**GENTIAN** (jěn'shan), a genus of plants native to all the continents, but found chiefly in the temperate regions. The *common gentian*, or



ALPINE GENTIAN.

*yellow gentian*, is native to the mountains of Southern Europe and is found in the meadows of the Alps and Pyrenees. It has opposite leaves, a stem from three to four feet high, and whorls of yellow flowers. The root is employed for medicine to increase the appetite and promote digestion. It is used as a stomachic tonic and is given in the form of a solid, a tincture, an infusion, and as fluid extract. The dried root is a spongy texture with a faint odor, and is intensely bitter to the taste. A species known as the *blue fringed gentian* is found in the southern part of Canada and the northern part of the United States, and other species are more or less widely distributed in North America. The root of the *Alpine gentian* of Europe, which has cup-shaped, blue flowers, is considered the best in medicine, but similar medical properties are contained in other species.

**GENTILE** (jěn'til), the name applied by the Jews to all who were not of their own nationality. The Jews and Gentiles had an aversion



for each other, and the latter were generally regarded in the same spirit as the Christians regard the heathens, though the Jews did not extend to the Gentiles the privileges accorded to pagans by the Christian people. The court of the Gentiles about the temple was the outer space, marked off by a wall or balustrade about four feet high, within which strangers were forbidden to enter, though they might come as far as the barrier to present their offerings. Paul refers to this when he says that "the middle wall of partition" between Jews and Gentiles was broken down by the Gospel.

**GENUS** (jē'nūs), in scientific research, a classification of plants or animals which embraces one or more species, closely agreeing in certain characteristics by which they are distinguished from all others. The term applies to forms subordinate to order, tribe, and family. A genus may be constituted of a single species, as the giraffe, which possesses certain characteristics belonging to no other species. In others there are several or many species. To illustrate, the *Mus* constitutes a genus containing such animals as the mouse and the rat, which differ in size and are clearly distinct species, but still have a similarity of structure obvious to all. Among plants the *Rosa* includes the various species of the rose.

**GEOGRAPHICAL DISTRIBUTION** (jē-ō-grăf'ī-kal dīs-trī-bū'shūn), the term applied to the diffusion of animals and plants in the different regions by natural and artificial means. For centuries the view was held that all species of both the vegetable and animal kingdoms were created within the geographical regions to which the different forms originally were common, but, when the idea came to be held that species are allied and that they originated from a common source, the implication gained widespread foothold that the ancestral stock had a definite birthplace, and from this the various kinds were distributed widely to different provinces and regions. In studying the distribution of plant and animal life it is essential to investigate the means for diffusion and the natural barriers that offer effective obstacles against migration. Animals possessing much power of locomotion, such as fishes, birds, and many land animals, may become easily dispersed to the most remote regions of the continents, and in many cases to adjacent grand divisions.

It is of interest to note that with one exception the mammals of North America are allied to those of the West Indies. From this we may infer that the ancestors of the West Indian animals inhabited the American continent, and that, by some means, they secured passage to

those islands. It is likewise interesting to note that the marsupials are confined wholly to America and Australia, that the tapirs are found only in South America and the Malay Islands, that there is a greater difference in the flora of the Pacific coast of North America and Japan than between that of the latter country and the Atlantic coast plain, and that the birds of North America are more closely allied to those of Europe than to the species which are common to South America. Similar notable instances of distribution may be alluded to in relation to various regions of the continents and oceans, each showing a remarkable dispersment in latitude and longitude of the different forms of life, all, of course, being attributable to some natural cause either clearly known or inferred.

The means to facilitate distribution are quite various and their effectiveness depends more or less upon divers circumstances. In the scope of this article it is possible to call attention only to the more important, since the subject is one which may be treated more properly in works especially designed to throw light upon the various phases, such as Wallace's "Geographical Distribution of Animals," Engler's "Distribution of Plants Since the Tertiary Period," and Darwin's "The Origin of Species."

Besides the normal facilities to disperse which are found in the different species, various other means must be taken into account. Seeds of many classes of plants become widely diffused by winds carrying them to regions remote from their native locality, especially those provided with feathery appendages, while animals, insects, and the movements of water by waves, currents, and streams largely transport and disperse them. Oceanic currents likewise carry animals to remote regions, especially in the polar vicinities by ice floes and icebergs. The branches and trunks of trees frequently carry animals and seeds long distances down streams, across straits, and even over extensive bodies of water. Fur-bearing animals often disperse seeds that cling to the fur, and birds of plumage likewise carry them to distant regions. Aquatic birds transport the spawn of amphibian animals and the seeds of plants to remote districts and fresh-water bodies of inland waters. In like manner they distribute shellfishes, seeds of marine plants, and various forms of marine life. It is certain that wide distribution has been effected by seeds clinging to the hoofs of animals and to insects driven by strong winds, and often unintentionally by man.

Among the barriers against rapid and wide diffusion are climatic conditions, elevated mountain ranges, and vast expanses of water surface.



It is quite certain that a large per cent. of the general distribution, as occurring in recent times, was effected by the sinking of islands and continents, thus detaching a portion of the land masses and with it its proportional share of animal and plant life, such as was likely effected by the detachment caused by the sinking of large areas of the Pacific, thereby forming the great archipelago southeast of Asia and other island groups equally noteworthy. The more recent diffusions, however, were effected by migration, which doubtless occurred in the usual manner by marine life passing over isthmuses, and land forms, including both plants and animals, being carried across straits and narrow channels of water. The most important and widespread distribution of the higher animal and plant life is due to the commercial designs of man. As a source of profit the various domestic animals and highly cultivated cereals, vegetables and other plants have been carried to climates and latitudes agreeable to their production and use.

**GEOGRAPHICAL SOCIETIES**, the organizations formed to obtain and disseminate geographical knowledge. In 1821 the first important association to promote and extend geographical knowledge was organized in Paris, known as the Society of Geography, which founded the *Bulletin of the Society of Geography* in 1822. The celebrated German society, the Berlin Association of Geography, was founded in 1828, and its proceedings are published annually in *Reports of the Berlin Association of Geography*. The Royal Geographical Society, founded in 1830, is the leading organization of this kind in Great Britain. Among the societies devoted to the study of geography is the American Geographical Society, founded in New York in 1852; the National Geographical Society, organized at Washington, D. C., in 1888; and the Geographical Society of Philadelphia, established in 1891.

**GEOGRAPHY** (jě-ōg'ra-fÿ), the science that treats of the earth. As a study it is pursued under four departments or branches—mathematical, political, physical, and commercial. *Mathematical geography* is that branch of general science which treats of the earth in its relation to the solar system, and forms the true basis for accurate geographical knowledge, since by means of it we are enabled to form clear conceptions of the laws governing terrestrial phenomena. Through its agency we learn of the location of the earth in space; its form, size, and movements; its divisions by lines and circles imagined to be drawn; and the method of representing portions of it on maps.

*Political geography* embraces the description

of the earth in relation to government and societies of mankind. It treats of the manner of life of the people, and of their civilization and government. *Physical geography* is a treatise of the physical condition of the earth, its relation to nature and the natural laws by which it is governed. It treats especially of the atmosphere, the natural divisions of land and water, the aërial currents and movements of oceanic waters, and the distribution of animate and inanimate objects found upon the surface of the earth. These are described not only in a given locality, but the causes of their existence and the natural results are discussed with a view of learning their causes and effects. *Commercial geography* includes an investigation of the products of merchantable commodities, the migrations of plants and animals, the routes of travel and transportation, and the natural laws that govern or facilitate commerce and commercial relations. In the scope of geographical institutions the student is brought in contact with various other branches, such as geology, history, astronomy, and zoölogy, though these are all separate sciences, the relationship serving principally to facilitate general advancement and to broaden culture in basic principles.

In ancient times geographical knowledge was necessarily limited, owing to the insufficient means to navigate the vast expanse of ocean and proceed with any degree of rapidity across the continents. Besides, the absence of powerful offensive weapons of war prevented exploring parties from making material progress against the hostile peoples occupying distant and unexplored regions. The expanse of geographical knowledge is coördinate with that of explorations and discoveries effected by expeditions and vast cruising enterprises. Among the ancient geographers was Eratosthenes, who flourished about 240 B. C. Greater, however, were Strabo, who lived in the reign of Augustus and Tiberius, and Ptolemy, who flourished at Alexandria about 139 A. D. As a people the Phoenicians made the greatest geographical progress in early history. They not only explored the Mediterranean, but passed through the Strait of Gibraltar, cruised along the Atlantic coast of Africa and Europe, and made voyages as far south as the Tropic of Capricorn and north to the British Isles.

Various views were held by early geographical writers in regard to the universe. They regarded the earth a disk with their own country forming the center. The poems of Homer lead to the conclusion that the Greeks in the 9th century B. C. thought the earth to be a circular plane bounded by water and from which the



various streams had their source. In the time of Alexander the Great geographical knowledge was extended by his famous expedition to the interior of Asia, and subsequently by cruises on the Indian and Mediterranean waters. Eratosthenes considered the earth a sphere and was the first to use lines to indicate latitude and longitude, and to employ mathematical principles in the construction of maps. Strabo, also mentioned above, wrote extensively regarding geography as understood in his time, and furnished valuable descriptions and drawings of the countries adjacent to the Mediterranean. Ptolemy prepared a geography of a large portion of Eurasia and Africa, including the British Isles, Germany, large parts of Russia, and all the region between the last mentioned country and the Mediterranean. His geography embraced Northern Africa and large regions of Western Asia.

The ancient geographers remained standard authority during the Middle Ages, and new material of note was not added until the extensive voyages of Marco Polo in the 13th century, who published the first accounts of Japan and the East Indies. However, the discovery of America in 1492 by Columbus, the doubling of the Cape of Good Hope in 1497 by Vasco da Gama, and the discovery of Tierra del Fuego in 1520 by Magellan, with contemporary discoveries and explorations, gave geography an enlargement and interest not previously known. Other achievements worthy of note in this connection are the extensive explorations of Vasco da Gama in Eastern Africa and Southern Asia, the expeditions of Frobisher in 1576, of Davis in 1585, of Hudson in 1607, and of Baffin in 1616, all of which led to the enlargement of accurate knowledge. The Dutch navigators Tasman and Van Diemen made fruitful explorations in the Pacific about the middle of the 17th century and added Australia to the explored portion of the earth. Subsequently Captain Cook explored innumerable islands in the Pacific.

The explorations of the 19th century were devoted more largely to discoveries in the polar regions and the interior of Africa. Exploring expeditions were sent to the Antarctic regions from America, England, and France in 1840, when Victoria Land and the Antarctic continent were discovered. Another important discovery was that of the northwest passage around North America by way of Bering Strait and Baffin Bay. It was made in 1850 by an expedition under McClure. Among the most celebrated explorers to add knowledge of the interior of North America are Lewis and Clark, Humboldt, Spix, and Frémont, while the interior

of Asia and Australia likewise became known largely in the latter part of the last century. The explorations and discoveries of interior Africa by such eminent men as Livingstone, Schweinfurth, Stanley, Bruce, Barth, and Rohlfs have led European nations to occupy practically the entire continent. They not only claimed the regions as colonial possessions, but constructed canals, founded cities, and built vast railroad enterprises. Interior Asia is now in a fair way to become similarly controlled by European peoples. Not satisfied with their successes, the more ambitious are still making venturesome exploits to the polar seas, and are promoting extensive excavations to determine complicated questions in physical geography. School textbooks are assuming scientific completeness and institutional instruction is becoming of greater pedagogic worth. The schools of Germany have long led in both these important lines.

**GEOLOGICAL SURVEY** (jē-ō-lōg'ī-kā-l sūr'vā), the name of a bureau maintained by most governments, which has charge of investigations of the mineral resources and geological structure of the country. Bureaus of this kind are under the supervision of a director, who is controlled directly by a cabinet or ministerial officer. In Canada the Geological Survey Department is under the Minister of the Interior and the work is divided into two divisions, known as (a) Geological Survey and (b) Mines Branch. The direct supervision is under an officer known as assistant director, chemist, and mineralogist, while each of the two divisions is supervised by a director.

The United States Geological Survey was organized as a bureau in 1879, when a plan for unifying the four independent surveys that have been maintained was adopted by Congress. It is under the control of a director, who submits an annual report of plans and operations of the department to the Secretary of the Interior. Among the duties of this department are the making of surveys in regard to the geological formations, the classifications of public lands, the surveys for the irrigation of arid regions, the examination of mineral deposits, the survey and mapping of the areal geology, and detailing information of the rock formations. Maps prepared by the department indicate the character of the surface, the distribution of ores, and the character of the soil. Many pamphlets are published to distribute information in regard to physical and chemical research, mining and mineral resources, and various other subjects of interest coming under consideration of the department.

**GEOLOGY** (jē-ōl'ō-jy), the department of



natural science that treats of the present constitution and structure of the earth and the operations of its physical forces. It investigates the history of geological formations in past ages, together with the causes and modes of physical changes, and the formation of inorganic and organic structures. The study of geology received attention many centuries ago, but it has taken high rank among the studies only since the beginning of the last century. Herodotus gave the subject much careful thought. He devoted studious consideration to the formation and fertility of the soil in Egypt, and traced their cause to the silt-laden waters of the Nile that overflow the delta and Lower Egypt periodically. Strabo flourished in the 1st century A. D. and ranked as the greatest of early geologists. He took up the discussion of the origin of fossils (q. v.), which long formed the subject of much controversy, and maintained that they were organic when entombed.

Dr. Abraham G. Werner (1750-1817), professor in the school of mines at Freiburg, Germany, in 1775, gave modern geology its widespread interest. He held that a series of universal deposits had been formed by the action of a chaotic fluid, which evaporated and fell on the earth's crust in periodical succession and otherwise operated to erode and deposit silts. He thought this action aided in cooling and thickening the crust, and that it had a marked influence upon the distribution of materials which exuded or were thrown from volcanic craters. In 1788 James Hutton published his "Theory of the Earth," in which he directed attention to the causes that now exist in producing formations. He held a contrary view to Dr. Werner in that he thought granite and basalt are of igneous origin.

At present there are three recognized schools of geology, those known as catastrophism, uniformitarianism, and evolutionism. Those holding to *catastrophism* maintain that there have been a series of creations and catastrophes, life forms springing into existence and after a great lapse of time meeting with universal destruction, as in the deluge of Noah. Of this school Sir Roderick Murchison is a representative. Those holding to the theory of *uniformitarianism* think that causes now in operation alone constitute the reasons of all geologic phenomena. To this theory Sir Charles Lyell holds, and he exemplifies it in his "Principles of Geology." He cites in support of his opinion the action of rivers, tides, currents, and ice as the causes of stratified rock and other formations, directs attention to the action of volcanoes and earthquakes as agencies in producing igne-

ous and metamorphic results, and states his belief that collectively they are sufficiently potent to cause nearly every phenomenon witnessed in studying the earth's crust. Those holding to *evolution* (q. v.) accept all the theories of the uniformitarians, except those referring to the development of life forms. Of this school Darwin and Huxley are representatives, the latter assigning from 1,000,000 to 300,000,000 years as the time required for the production of the present conditions in geological phenomena.

It is probable that both the surface and interior of the earth were once highly heated, a condition probably still existing within the earth, and after cooling gradually formed a thin layer or crust at the surface. The lowest rocks, being of igneous or heat formation, are called igneous rocks, of which granite is an example. Owing to the presence of intense heat while forming, life could not exist, hence fossils do not abound. At that time the waters which now cover a large portion of the earth hung over the surface as dense vapor, but, as soon as a thin crust had formed, the cooling atmosphere tended to bring the vapor to the dew point and it fell to the surface in the form of rain. By continued cooling the crust became thicker, while contractions wrinkled the surface and caused portions to form dry land by emerging from the ocean. By the action of the water and that of heat and cold vast quantities of materials were broken up and ground into sand, clay, gravel, and other forms, which were carried to particular locations and stratified into strata of slate, sandstone, shale rock, and other common forms. These rock formations are known as aqueous or sedimentary, and contain more or less fossil remains. The heated interior long remained the seat of volcanic disturbances, which formed channels through the crust, and still give evidence of internal action and general contraction by occasional, though diminished, eruptions. The rocks modified by the action of heat are known as metamorphic.

Geologists make subdivisions of time based on the main rock systems, in each of which peculiar characteristics and organic remains, if present, have been studied and classified. These are shown in an ascending order in the following table:

LIFE PERIODS.	ROCK SYSTEMS.
Post-Tertiary or Quaternary . . . . .	{ Recent—Alluvial. Peat, etc. Pleistocene.
Tertiary or Cenozoic . . . . .	{ Pliocene. Miocene. Oligocene. Eocene.



LIFE PERIODS.	ROCK SYSTEMS.
Secondary or Mesozoic.....	{ Cretaceous. { Jurassic } Oölitic. { Liassic. { Triassic. { Permian or Dyas. { Carboniferous. Primary or Palaeozoic..... } Devonian and Old Red Sandstone. Silurian. Cambrian. Archaean, Laurentian, or Eozoic } Fundamental Gneiss.

The five principal periods or times are divided into ages in which the forms of life are classified in an ascending scale as follows:

Quaternary.....	{ The Age of Man.
Cenozoic.....	{ The Age of Mammals.
Mesozoic.....	{ The Age of Reptiles.
	{ The Age of Coal Plants.
Palaeozoic.....	{ The Age of Fishes.
	{ The Age of Invertebrates.
Archaeon.....	{ The Lifeless Age and Dawn of Life.

The Archaeon time witnessed the dawn of life. It included an extensive era, and the temperature was so extremely high that life could not have existed. However, the simpler forms began to be created toward its close. The rocks of this period resulted from cooling of the molten mass of the earth and became the covering of the entire surface, including the regions below the ocean. On the older archaeon rocks sedimentary rocks less ancient were deposited. At this period North America was largely submerged. Only portions in the vicinity of Lake Superior, the Iron Mountains of Missouri, the Blue Ridge range, the Wind River Mountains, the ranges farthest east in Colorado, and the New Jersey Highlands projected above the highly heated water. These portions constitute the oldest part of North America. It was within this time that iron was formed, the rocks of this period containing a large per cent. of iron ore. The Laurentian and Huronian are among the North American rocks that then existed, the former in the vicinity of the Saint Lawrence and the latter near Lake Huron, from which they were named.

In the Palaeozoic time the animals and plants but slightly resembled those now living. Fossil remains are mostly those of mollusks, protozoa, radiates, and articulates. The rocks were made under water and consist of vast deposits of limestone, sandstone, and shales, which are either largely or entirely formed of the remains of shellfish, clams, oysters, and other similar forms of life. This is known as the Silurian or Age of Invertebrates. The Devonian Age followed, in which the first vertebrates appeared in the form of fishes. Plants became abundant and vast swarms of insects appeared. In the Carboniferous Age the surface was covered with

many fernlike and other plants which were of gigantic size and ultimately formed beds of coal (q. v.) by the remains decaying under water. The period was characterized by alternated elevations and subsidences, thus forming in some regions two or more coal veins by being tilted, as in many regions of the Allegheny Mountains. In this period all the animals of the subkingdoms lived and reptiles began to appear.

In the Mesozoic time, known also as the Age of Reptiles, the plants and animals began to resemble existing species. The reptiles were greatly in preponderance and included many species of snakes, turtles, and crocodiles. The ichthyosaurus, an animal that swam in the sea or paddled in the mud, and the plesiosaurus, a large reptile with a snakelike neck, were common in this period. Great birds, such as the archaeopteryx (q. v.), lived at this time and left their foot imprints as fossil remains by walking over the forming rocks.

In the Cenozoic time North America was largely above the sea, though numerous large lakes with fresh water were abundant, the largest of which extended from Texas northeasterly to Nebraska. This period bears evidence that vegetation was still abundant in the Arctic zone, where fine forests of redwood, magnolia, and other species native to warm climates extended over vast regions. Large animals, including elephants, were abundant in the Rocky Mountains, of which fossil remains are not uncommon. The glacial period swept over the northeastern portion of the continent of North America at that time with its destructive effects upon life forms, causing vast drifts and carrying great boulders, reaching south to about the 40th parallel. The glacial period was followed by the Champlain period, in which alternating floods and varying climates followed in succession. Subsequently the climate was again tropical, when many animals inhabited the forests, while slowly through long periods of time the temperature gradually fell. In the Quaternary Age the present animals and plants appeared and man was created. Geologists differ as to the length of the creation period measured in years, and many do not undertake to assign any given number of years. They commonly call all time before life appeared Azoic and the appearance of life Eozoic, and classify all subsequent time as exemplified above.

**GEOMETRY** (jê-ôm'ê-trÿ), the science that relates to the measurement of definite portions of space, such as lines, angles, surfaces, and volumes. The various divisions of geometry include plane and solid geometry, analytical geom-



etry, descriptive geometry, and higher geometry. *Plane geometry* and *solid geometry* treat of right lines and plane surfaces, and of circles and spheres. In *higher geometry* are treated the conic sections, curved lines, and bodies generated from them. In *analytical geometry* are involved the various calculi in algebraical forms, while *descriptive geometry* embraces an extension of the principle of projections.

The origin of geometry is traced to the Hindus, but the Egyptians appear to have possessed a knowledge of it at the times the pyramids were built. Thales, who flourished in 639-548 B. C., is among the first of the Grecian geometers, and to him is attributed the discovery of the properties of triangles. Pythagoras was a disciple of Thales. He greatly extended the knowledge of the geometry of polygons by discovering the theorem of the square of the hypotenuse. He demonstrated that the area of a circle is greater than that of any plane figure having an equal perimeter, and that the sphere has the greatest volume of the bodies which are bounded by an equal surface. Many other Greeks followed in adding to the science, among them Anaxagoras, Hippocrates, Plato, and Euclid. The last mentioned founded a school of mathematics in Alexandria, Egypt, some time in the reign of Ptolemy I., in 323-284 B. C. He published a treatise on "Porisms," a book on "Data," and his "Elements of Geometry." Most of his works are lost, but his "Elements" are still in use in many schools and colleges. Among the celebrated geometers of recent times are Kepler, Descartes, Pascal, Newton, and Carnot.

**GEORGE, Fort**, a small fortress of Canada, near Queenstown, Ontario, on the Niagara River. General Brock took up his headquarters at Fort George in 1812, where he was attacked on May 27, 1813, by a force of Americans, who landed their troops under cover of the guns of the fleet. The Americans were under General Dearborn and the British were defeated, after which the fort was abandoned. Forts Erie and Chippewa were abandoned soon after, and the whole Niagara frontier passed into the hands of the Americans.

**GEORGE, Lake**, a beautiful lake in northeastern New York, extending from southwest to northeast. The length is thirty-five miles, breadth, from one to three miles; and greatest depth, 400 feet. The surface has an elevation of 310 feet above sea level. On its northern shore are the ruins of Fort Ticonderoga. The shores are beautified by lofty hills, on which picturesque forests abound. The outlet is into Lake Champlain, which is a short distance to-

ward the north. Lake George is a popular resort for many artists and tourists.

**GEORGE JUNIOR REPUBLIC**, the name of a community maintained for boys and girls near Freeville, N. Y., about eight miles west of Ithaca. It was established by William R. George in 1895. The purpose is to afford employment and training for unfortunate children, most of whom are obtained from the cities. This community has a constitution modeled after that of the United States, which provides for the election of legislative, judicial, and executive departments. Mr. George was the first president, but this and all other offices have been filled by boys since 1896, though the power to veto is retained by Mr. George. It is incumbent upon the members of the community to work at some occupation, such as carpentry, printing, blacksmithing, farming, or domestic science. The buildings include a store, a library, a bank, and a school, and several hotels, restaurants, and workshops. Primary and grammar schools are provided for all children under sixteen years of age and the courses fit the students for academic or college work. The trustees of the enterprise control about 400 acres. At present the average attendance is about 225 children.

**GEORGETOWN** (jôrj'town), the capital of British Guiana, situated near the mouth of the Demerara River, in Demerara County. It is the most important city of the Guianas. The streets are regularly platted, with fine shade trees and buildings, and the city is connected with adjoining trade centers by railways. Among the public buildings are the town hall, the Parliament building, the Episcopal cathedral, Queen's College, a mariners' hospital, a public library, and a museum. Besides its public school system, there are a number of flourishing historical and scientific societies, and divers religious and economic associations. The streets articulate with several canals which furnish convenient connection with the harbor. Most of the buildings are placed on piers to elevate them above the low site. The principal exports include coffee, sugar, fruits, and rum. Among the imports are machinery, fabrics, and manufactured articles. The city is the center of the export and import trade of the colony, has a good harbor, and is well fortified. Three-fourths of the inhabitants are Negroes and people of native birth. Population, 1906, 54,692.

**GEORGETOWN**, a city of South Carolina, county seat of Georgetown County, 55 miles northeast of Charleston, on the Georgetown and Western Railroad. It is located at the head of Winyah Bay and is important as a seaport. The trade consists chiefly in rice, fish, turpentine,



cotton, and machinery. It has electric lights, waterworks, and a number of fine school and county buildings. The first settlement was made on its site about 1700 and its incorporation dates from 1805. Population, 1900, 4,138.

**GEORGETOWN UNIVERSITY**, an educational institution in Georgetown, D. C., which is now included within the limits of Washington. The university was founded in 1799 and later, in 1815, it was empowered by Congress to grant academic degrees. It is under the auspices of the Society of Jesus, an order of the Roman Catholic church, and carries courses in dentistry, medicine, law, philosophy, and theology. Degrees are conferred in arts, dentistry, law, medicine, and philosophy. About 750 students attend the different departments. The library contains 90,000 volumes.

**GEORGE WASHINGTON UNIVERSITY**, an institution of higher learning located at Washington, D. C., the origin of which dates back about ninety years. It was originally the Columbian College of the District of Columbia and was chartered by a special act of Congress on Feb. 9, 1821, with all the powers commonly granted to American colleges. By a special act of March 3, 1873, Congress changed the name to the Columbian University. By another special act of Congress on Jan. 23, 1904, the Columbian University was authorized, on compliance with certain formalities, to take a new name, the name chosen to be approved by the Secretary of the Interior and the Commissioner of Education. These formalities were complied with, and on Sept. 1, 1904, the present name was adopted. On March 3, 1905, Congress recognized the George Washington University by this name and conferred upon it additional powers of the most comprehensive nature for carrying on higher education. It may, under its charter, apply in whole or in part the English system of carrying on undergraduate work through colleges which are educationally under its jurisdiction. Such colleges are organized by permission of the university under a special incorporating act contained in the university charter. Each college has its own trustees, faculty, and financial foundation, separate and distinct from the university. All are, however, so under the jurisdiction of the university that they must conform to the standards set by it and can only present to it their candidate for degrees, all degrees being conferred by the university. It carries on graduate work directly through its special university lectures. All the existing university systems may thus be applied by it in carrying on its work; and by this composite plan of organization, combining the ad-

vantages of a federal and a unitary system, the work of the university is standardized and coördinated, the time of the student is economized, and the institution is kept at the highest point of efficiency.

In addition to its power to permit the incorporation of colleges in the District of Columbia which are educationally under its jurisdiction, the university is authorized to affiliate with itself institutions of learning outside the District, which may desire to have the benefit of university affiliation at Washington. This feature enables colleges to enter into arrangements whereby their students may do some of their work in the national capital and receive credit for it towards the degree given by the college, while these students may, at the same time, be pursuing graduate or professional studies and taking their graduate or professional degree at the university.

A provision of the charter reads as follows: "Persons of every religious denomination shall be capable of being elected trustees; nor shall any person, either as president, professor, tutor, or pupil, be refused admittance into the university or be denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion." The board of trustees is organized so that no religious denomination has a control. The charter provides for a board of visitors, which may be representative of the interests of the country at large, and which will assure the observance of every provision of the charter.

The university has, in its various faculties, over two hundred professors and teachers. It has fourteen hundred students, every State in the Union being represented, as well as foreign countries. It gives full day instruction in all its colleges and departments. Undergraduate work in arts and sciences is done by Columbian College, which is a corporation recently organized under the provisions of the charter, a College of Engineering, and a College of Pharmacy. The possibility of giving undergraduate instruction through colleges under the jurisdiction of the university, on the broadest as well as on the most specific and practical lines, is thus illustrated. The graduate work of the university is done through a graduate department of the arts and sciences. It has a department of medicine, a department of law, a college of the political sciences, and a teachers' college.

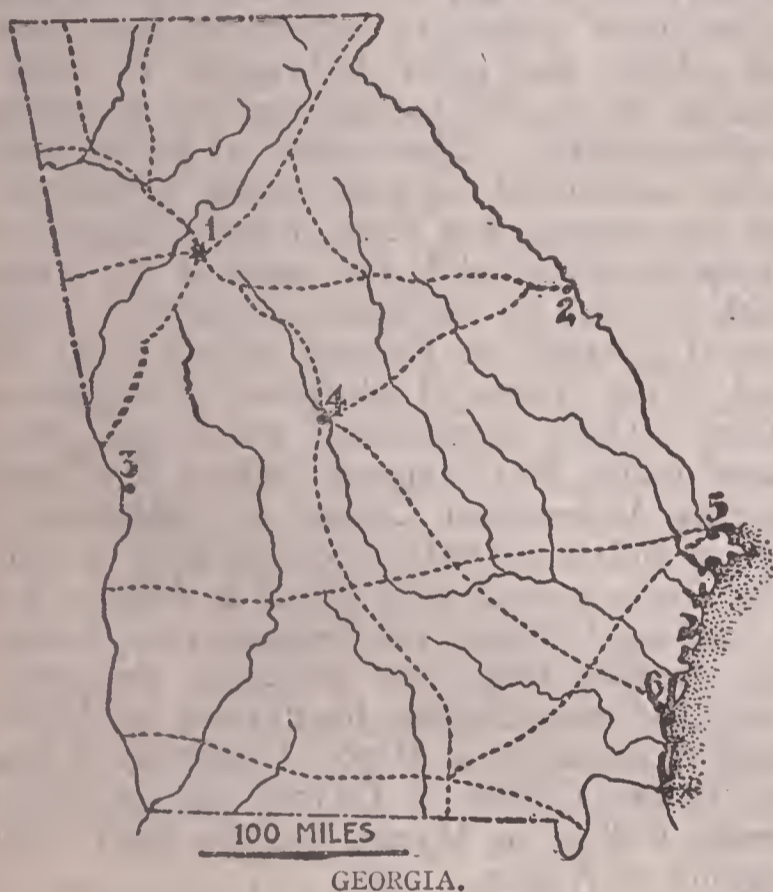
The college of the political sciences carries on undergraduate, graduate, and professional instruction in American history, politics, economics, finance, international law, and diplomacy. It has distinguished teachers and lecturers and



has graduated many young men who now hold important positions in the civil and foreign service of the United States.

**GEORGIA** (jôr'jĭ-à), a State of the United States, one of the original thirteen, popularly called the Empire State of the South. It is bounded on the north by Tennessee and North Carolina, east by South Carolina and the Atlantic, south by Florida, and west by Alabama. Its length from north to south is 330 miles; width, 253 miles; and area, 59,475 square miles, including 495 square miles of water surface.

**DESCRIPTION.** The State lies partly in the coastal plain and partly in the Appalachian highlands. In the eastern part are the Blue Ridge Mountains, which cross into the State from North Carolina and terminate in the northern



1, Atlanta; 2, Augusta; 3, Columbus; 4, Macon; 5, Savannah; 6, Brunswick. Chief railways are shown by dotted lines.

part of Georgia. These mountains have a general elevation of from 3,000 to 5,000 feet, culminating in Sitting Bull Mountain, which has an elevation of 5,046 feet above sea level. In the western part is the Cohutta group, which is a continuation of the Unaka Mountains of Tennessee, and the Lookout and Sand Mountain ranges are in the northwestern corner. A broad plain characterizes the coastal region, where the surface is slightly elevated above the sea, but it rises quite uniformly toward the interior. Between the coastal plain and the mountains is a broad area known as the Piedmont plateau, which extends over about one-third of the State. Numerous swamps prevail in the low region of the coast, but the largest marshy tract

is the Okefinokee Swamp, which is 30 miles wide and 45 miles long, and a small part of it extends into Florida. Off the coast are numerous islands, including Ossahaw, Saint Catherine's, Sapelo, Saint Simon's, and Cumberland.

The rivers form a valuable network of drainage and furnish considerable transportation facilities. Much of the northeastern boundary is formed by the Savannah River, which is navigable to Augusta. A large part of central Georgia is drained by the Altamaha, which receives the inflow from the Oconee and Ocmulgee, and is navigable to Macon. Other rivers that flow into the Atlantic include the Ogeechee, the Satilla, and the Saint Mary's, the last mentioned forming a part of the northern boundary of Florida. The Coosa and several of its tributaries, which belong to the Alabama River basin, drain the northwestern part of the State. A number of rivers flow southward into the Gulf of Mexico, including the Appalachianicola, which is formed at the southwestern corner of the State by the junction of the Flint and the Chattahoochee, the latter forming a large part of the western boundary. No lakes of importance are located within the State, but a number of lagoons and sounds characterize the coast.

The State has a wide range of climate. On the coast in the southern part the annual average temperature is 70°, while in the valleys of the mountain regions it falls somewhat below 40°. In the northern part the climate is quite equable, no season of the year being severe or marked with extremes. Snow and frosts are very rare in the southern part, where the summers are long and the climate is similar to that of Florida. Brunswick has a mean temperature of 69°; Athens, 63°; and Atlanta, 61°. The State has an average rainfall of 48 inches, being greatest in the northern and smallest in the southern part. Fevers and malaria are not infrequent in the marshy region, but all other parts are healthful the entire year. Far toward the interior extend beautiful forests of palmetto, oak, beech, magnolia, elm, and other useful species of timber. The wild animals include alligators, wildcats, bear, opossum, and many species of birds and waterfowl.

**MINING.** Many minerals are found in the mountainous region of the northwestern part. Both coal and iron are obtained in considerable quantities, hence supply a considerable share of the material used in manufacturing. Gold has been produced in paying quantities for about a century, and the State yields nearly one-half of the manganese produced in the United States. Georgia marble is a peculiarly valuable product,



both for monuments and the construction of bridges and buildings. It is especially valuable for finishing stone. Other materials include silver, bauxite, limestone, granite, amethyst, and beryl.

**MANUFACTURING.** Within recent years the manufacturing interests have been greatly enlarged and diversified, and the State takes a high rank in this respect among the southern states. The forests yield vast quantities of turpentine and tar, and a large part of the lumber products is utilized in making furniture and machinery. However, in the value of the output, the first place is held by textiles. In the manufacture of cotton products Georgia is surpassed by only three of the New England states. These products include textiles, hosiery and knit goods, cottolene, and cotton-seed oil and cake. The manufacture of fertilizers has made rapid progress, which is true likewise of railway cars, machinery, flour, clothing, and rosin.

**AGRICULTURE.** About seven-tenths of the surface is in farms, hence agriculture is the leading industry. A larger acreage of land is improved at present than at any former period, and the farms average a smaller size. This is accounted for by the fact that many of the large plantations have been subdivided and are worked by Negro farmers, though fully 65 per cent. of the land is worked by the whites. Cotton and corn are the chief crops, and the value of the product of these is about equal, though formerly cotton held a much larger place than corn. Sea-island cotton of a fine quality is grown extensively along the coast and on the islands, and the upland species thrive in all parts of the State. In 1900 the State had 3,343,083 acres in cotton and 3,477,684 acres in corn. Oats and wheat, which are grown on about an equal area, have an acreage of less than one-tenth of either corn or cotton. Other farm products include rice, hay, potatoes, peanuts, and sugar cane. Cattle are grown both for meat and dairy purposes, each of which receives marked attention. Other domestic animals are mules, swine, horses, sheep, and poultry. Fruits of all kinds can be grown profitably. The State has very large interests in the culture of oranges, lemons, pineapples, peaches, pears, apples, and garden vegetables.

**TRANSPORTATION.** The State has a coast line of 128 miles and a large mileage of navigable streams. In 1900 the railroad lines aggregated 6,125 miles, exclusive of the many interurban lines of electric railways. All of the counties have railway or river transportation facilities, hence every section can be reached conveniently.

Atlanta, Savannah, Albany, Macon, Columbus, Rome, Athens, and Waycross are among the principal railway centers. Savannah is the chief export city, being located near the mouth of the Savannah and on a number of railways. Brunswick and Saint Mary's have a considerable foreign commerce. The chief exports include cereals, cotton, turpentine, granite and marble, machinery, manganese, and textiles. The fisheries, especially shad and oysters, furnish considerable material for exportation.

**EDUCATION.** Educationally, Georgia has attained to an enviable position among the states of the South. Common schools are maintained throughout the State and are instrumental in causing illiteracy to decrease rapidly. Funds are supplied liberally to maintain high schools in the larger centers of population, while normal schools and other institutions of higher learning are rapidly multiplying and increasing in effective value. The number of higher institutions maintained for white pupils include several universities, and about forty colleges and private institutes, while the needs of the Negro youth are met by six higher institutions. The State University of Georgia, which is at the head of the system of education, is situated at Athens. Other institutions which are maintained under State support include the North Georgia Agricultural College at Dahlonega, a normal and industrial school for girls at Milledgeville, a technological school at Atlanta, and an industrial college for Negroes near Savannah. Besides these are numerous denominational and nonsectarian institutions of higher learning, among them Mercer University at Macon, Emory College at Oxford, the Wesleyan Female College at Macon, and the Lucy Cobb Institute at Athens.

**GOVERNMENT.** Georgia is governed by a constitution which was ratified by the people in 1877. It confers the right of suffrage to all male citizens 21 years of age, with the requirement that they shall have been citizens of the State one year and of the county six months, and that they have registered and paid assessed taxes. The Governor is elected for a term of two years and is ineligible for four years after having served two terms. He has the power to veto bills passed by the Legislature, but his veto may be overcome by a two-thirds vote of each house. Representation in the Legislature depends upon a population basis, and bills appropriating money must originate in the house of representatives. The legislative branch consists of two houses, the senate and house of representatives, and the members of each are elected for a term of two years. A chief justice and five



associate judges make up the supreme court, in which the terms of service are six years. Each judicial district has a superior court judge, who is appointed for four years by the General Assembly. The justices of the peace, who are elected for four years, have local jurisdiction in the militia districts.

**INHABITANTS.** The State has eleventh rank in the number of inhabitants and next to Texas is the most populous southern State. In some counties the Negroes greatly outnumber the whites, especially in the southern part of the State, and the whites are most numerous in the mountainous regions. Atlanta, the capital, is the largest city. Savannah, on the Atlantic coast, is the chief seaport. Other cities of importance include Augusta, Macon, Athens, Rome, Brunswick, Thomasville, and Columbus. In 1900 the State had a population of 2,216,331. This number included 1,035,122 colored persons, or 46.7 per cent. The total Negro population was 1,034,199; in 1910, 2,609,121.

**HISTORY.** The history of Georgia begins in 1540, when De Soto visited that region with 600 Spaniards in search of gold. However, not until 1733 were permanent settlements made. At that time James Oglethorpe founded a colony for the refuge of poor debtors and the persecuted Protestants of Germany, and named the colony in honor of George II. The settlement founded developed into the city of Savannah, but in 1752 the charter granted Oglethorpe was surrendered to the British and Georgia became an English province. During the Revolution the people of Georgia entered into the struggle for liberty with much enthusiasm, but many were compelled to leave their homes by the invading armies of England. The first constitution was framed in 1777, and on Jan. 2, 1788, the Constitution of the United States was ratified. In 1838 the Creek and Cherokee Indians were removed to Indian Territory, now Oklahoma, after prolonged troubles and local wars.

In the Civil War Georgia sided with the South, seceding in 1861, and furnishing an effective force for the Southern army. Its own capital, Atlanta, was for a brief time the capital of the Southern Confederacy. Sherman marched through the heart of the State when on his famous expedition to the sea. The recent history is one of large agricultural, manufacturing and mining development. Several industrial exhibitions have attracted attention to the superior resources of the State, such as the National Exposition held at Atlanta in 1881. The State enacted a law in 1907 which forbade the sale of liquor after Jan. 1, 1908.

**GEORGIA**, formerly a kingdom of Europe,

but now a part of the Russian Empire. It comprises the territory lying south of the Caucasian Mountains, between the Caspian and the Black seas, and is bounded on the south by Persia and Asiatic Turkey. The region is divided into the Russian governments of Kutais, Baku, and Tiflis. Anciently it comprised the kingdoms of Albania, Colchis, and Iberia. The Georgians trace their history back to Japhet, but little is known of them until the time of Alexander the Great, who conquered their country, and after his death they established a government of their own. In the 4th century they became Christianized, but many of them are now Mohammedans. Georgia prospered until the 13th century, when it was conquered by the Mongols, and Timur laid it waste in the 14th century, but it was liberated in the 15th century by George VII. He was succeeded by Alexander I., who divided the territory among his three sons. It was invaded a number of times by the Persians and Russians until 1802, when Paul, Emperor of Russia, proclaimed it a part of his royal dominion. The Georgians speak a language that is regarded a link between the tongues of Eastern Asia and those of the Indo-European peoples.

**GEORGIA, Strait of**, a large inlet from the Pacific Ocean, in the northwestern part of North America, which separates Vancouver Island from the mainland. It is about 250 miles long, in a direction from southeast to northwest, and has an average width of 25 miles. The Fraser River discharges into it. It is connected with the Pacific Ocean at its northern end by Queen Charlotte Sound and at its southern end by the Strait of Juan de Fuca.

**GEORGIA, University of**, a State institution of higher learning at Athens, Ga., chartered in 1785. It was formally opened in 1801 and is the oldest State institution of the United States. In 1872 it received the proceeds arising from the sale of lands granted to Georgia under an act of Congress passed in 1862, and since that time it has greatly increased its facilities. The institution comprises the State College of Agriculture; Franklin College; North Georgia Agricultural College, situated at Dahlonega; the law school; the medical college, situated at Augusta; the Normal and Industrial School for Girls, situated at Milledgeville; the School of Technology, situated at Atlanta; the State normal school, and the industrial college for colored persons. It has a library of 35,000 volumes, a faculty of 165 members, and an attendance of 2,250 students.

**GEORGIAN BAY**, an inlet from Lake Huron into Canada, extending into the south



part of the Province of Ontario. It is about 120 miles long and 50 miles wide. The deepest water, which is in the southwestern part, is about 300 feet. Manitoulin Island and the peninsula of Cabot's Head partly separate it from Lake Huron, with which it is connected by North Channel and a short channel south of Manitoulin Island.

**GERA** (gǎ'rá), a city of Germany, capital of the principality of Reuss, on the White Elster, 44 miles southeast of Weimar. It is regularly platted and well built. The chief buildings include the post office, the palace of the prince, the theater, and a number of schools. It has manufactures of woollens, carpets, jewelry, cigars, brick, leather, and machinery. The streets are well paved with stone and macadam. It has extensive systems of waterworks, sewerage, and electric urban and interurban railways. Gera dates from the 12th century and became a possession of the house of Reuss in the 14th century. Population, 1905, 46,909.

**GERANIUM** (jê-rā'nî-ŭm), the name of a flowering plant, popularly called *crane's bill*, which constitutes the typical genus of the order



GERANIUM.

*Geraniaceae*. A number of species are cultivated for their flowers, of which the *spotted crane's bill* is the largest. It has a stem about two feet high and bears light purple flowers. Most species have a bitter rootstock, which is used in medicine, when it is known as *alum root*. They thrive best in rocky places, on sandy

shores, and on the slopes of mountains. By cultivation a large number of plants with beautiful flowering qualities have been originated. The geraniums commonly cultivated are grown as flowering plants and are known in botany as *Pelargoniums*. They are native to the southern part of Africa, especially to Cape Colony. These have been widely acclimated and are popular for window culture and greenhouse decoration. They are easily propagated by cuttings, and bloom almost continuously under proper care.

**GERMAN EAST AFRICA**, the largest colony of Germany, on the east coast of Africa, with a coast line of 620 miles. It is bounded on the north by British East Africa, east by the Indian Ocean, south by Portuguese East Africa and British Central Africa, southwest by Rhodesia, and west by the Congo Free State. The northern boundary crosses Lake Victoria Nyanza, the western boundary passes through the middle of Lake Tanganyika, and the northeastern part borders on Lake Nyassa. It includes the Island of Mafia, in the Indian Ocean. The area is 384,176 square miles.

A narrow coastal plane extends along the Indian Ocean, whence the surface rises gradually toward the interior, where the country assumes the aspect of a wide plateau with an altitude of from 3,000 to 4,000 feet. A range of highlands extends through the central part, trending north and south, where some of the mountains have a height of 6,000 feet. The highest elevations are in the northern part, where the volcanic peak of Mount Kilimanjaro rises to a height of 19,720 feet, forming the highest point in Africa. Many streams water the country, most of which is drained into lakes Victoria Nyanza and Tanganyika, which have their outlet through the Nile and the Congo. Few of the rivers, such as the Rufiji and the Panzani, are navigable by small boats, but many streams are available for irrigation. The climate is tropical and plant life is numerous and luxuriant. Malaria prevails in the lowlands, but the more elevated regions are healthful. The annual temperature is 78° along the coast, although it is somewhat higher in the lowlands of the interior. Rainfall is excessive in some parts.

The colony has extensive deposits of coal, salt, iron, and petroleum. Gold and silver are found in the southwestern part, but mining has not been developed to a large extent. Agriculture is the chief occupation. The products include coffee, rice, wheat, tobacco, maize, cotton, and tropical fruits. Sugar beets are grown successfully in many parts of the colony. The domestic animals include cattle, horses, sheep, and goats. Timber, India rubber, tobacco, and



live stock are the leading exports. Textiles, hardware, and machinery are imported. The principal ports are at Dar-es-Salaam, Lindi, Tanga, Kilwa, and Pangani. Several lines of railroads have been built, including one from Dar-es-Salaam inland, and the Cape-to-Cairo Railway is projected through the east central part.

The administration is under a governor, who is appointed by the crown and assisted by a legislative council. Dar-es-Salaam is the capital and leading seaport. Schools are maintained under the government in the leading towns, with higher instruction at Tanga, Bagamoyo, and Dar-es-Salaam. The first German settlement was made on the eastern coast of Africa in 1884, but the territory was turned over to the German East Africa Company the following year, under which trade and colonization were promoted. The Sultan of Zanzibar renounced his claims to the coast in 1891, when the colony came under the control of Germany. About 1,500 of the inhabitants are Europeans. The natives belong chiefly to the Bantu race. Population, 1905, 7,365,500.

**GERMAN OCEANICA** (ô-shê-ăn'ê-kâ), the portion of the Pacific Ocean which lies between the Coral Sea and the Marianne Islands and extends from the northern part of eastern New Guinea to the Gilbert Islands. It includes the northeastern part of New Guinea, or Kaiser Wilhelm's Land, Dampier Island, Long Island, the Bismarck Archipelago, part of the Samoan or Navigator Archipelago, two chains of the Lagoon Islands, the Eastern Carolines, part of the Solomon Islands, the Pelew Islands, the Western Carolines, part of the Marianne Islands, part of the Gilbert Islands, the Admiralty Islands, and a number of others. These islands have a considerable trade, but their administration requires imperial aid. In recent years the revenues have been improving and they will likely soon yield returns to the government.

**GERMAN SILVER**, an alloy of nickel, copper, and zinc in varied proportions. This alloy was first made at Hildburghausen, Germany, of 2.6 parts iron, 25.4 parts zinc, 31.6 parts nickel, and 40.4 parts copper. The proportions commonly used at present are one part zinc, one part nickel, and two parts copper. It is whiter and harder than silver and takes a high polish. Strong acids attack it and some organic acids, such as vinegar, affect it materially. It is used largely in the manufacture of forks and spoons, knife and fork handles, candlesticks, and watch cases.

**GERMAN SOUTHWEST AFRICA**, a

colonial possession of Germany, bounded by Portuguese West Africa on the north, British South Africa on the east, and by Cape Colony and the Atlantic Ocean on the south and west. The area is 322,450 square miles. Among the chief rivers either wholly or partly in the region are the Orange, Cubango, Cunene, and Zambezi. Walfisch Bay receives the water of the rivers draining the interior. It contains the most important harbor, besides which are Swakopmund, Lüderitz Bay, and Sandwich Harbor. About 480 miles of railroads are in operation. The mission schools are attended by 5,650 students.

The coast region is sterile, but the interior is susceptible to cultivation and yields agricultural products, cattle, horses, hides, and ostrich feathers. Deposits of copper and other minerals are found in paying quantities. Since the war between the Boers and British a considerable number of Boer agriculturists settled in the fertile regions of the interior and are aiding in rapidly developing its productive resources. German merchants established trading posts on the coast in 1883. Several insurrections have been raised by the native Hereros, but they were finally subdued in 1906. Other native tribes include Hottentots, Bushmen, and Bechuanas. Windhock, on Wolfisch River, is the seat of local government and is connected by a railway with the harbor at Swakopmund. Population, 1908, 246,800.

**GERMANTOWN**, a town which was annexed to Philadelphia, Pa., in 1845. It was the scene of an important battle between the American army under Washington and the British under Howe, on Oct. 4, 1777. Howe occupied Philadelphia and sent a detachment to seize forts Mercer and Mifflin, which caused Washington to make an attack at Germantown, where he hoped to crush the British. Early in the morning two columns of the American army advanced upon the village under Sullivan and Greene, but the Americans were thrown into a state of confusion on account of a heavy fog which occasioned a mistake and led Greene to charge upon the left center of the American army, causing a panic and the loss of the battle. Washington conducted a retreat in good order before the advance of Cornwallis, who had hurried from Philadelphia with two battalions. The American loss was 673 men and the British lost 575. Germantown was settled by Palatinate Germans in 1683. They established the first paper mill in America at this place in 1690 and published the first American edition of the Bible in 1743. At present it is a pleasant part of Philadelphia, about six miles



north of the center of the city, and has fine gardens and superior buildings.

**GERMAN UNIVERSITIES**, the term applied to the more important institutions of learning founded in the German-speaking countries, but located principally in Germany, Austria, and Switzerland. These institutions are the most efficient and constitute the greatest organizations of institutional learning in the world. Twenty-one of these institutions are in Germany, of which thirteen are Protestant, four are Roman Catholic, and four have mixed faculties. This system includes 4,820 instructors and professors and about 48,500 students, and numbers among the alumni some of the leading thinkers and writers, both living and dead. The institutions maintained in Berlin, Munich, Leipzig, Bonn, Freiburg, Halle, Breslau, and Göttingen are the largest. However, the University of Heidelberg is the oldest, having been founded in 1386. Those classed as Roman Catholic are at Freiburg, Munich, Münster, and Würzburg and those having both Protestant and Roman Catholic faculties are at Bonn, Breslau, Strassburg, and Tübingen. All the courses of study articulate with those of preparatory schools, though foreigners are admitted to membership without examination on certificates from foreign institutions of recognized merit.

The discipline is rigid and expulsion from one university constitutes a bar to admission to the others. In the higher courses are included medicine, philosophy, theology, and law, though the natural sciences, civics, higher pedagogy, music, political economy, civil and electrical engineering, architecture, and other departments are maintained. The studies are largely elective, which gives students the privilege of pursuing such advanced work as seems best adapted to their needs, while they may enroll contemporaneously in different institutions for the purpose of taking additional and supplementary work. These universities are under the control of appointees of the government, who constitute, with the minister of public instruction, the managing, directing, and guiding officers for particular institutions.

The expense of maintaining these universities is borne largely by the state, only about ten per cent. being paid by students in the form of fees. Among the university museums, libraries, and publications those of Germany take high rank. In all the great centers of learning are adequate requirements to facilitate references and home reading, while the scientific societies, especially those which foster original research, are represented by a wide

range of organizations. Instruction is mostly by lectures, the preparatory work being done largely in laboratories and during private hours. Students may secure lodging and board in private families, but ample facilities are provided at the dormitories and may be utilized at small expense. Most of the courses cover four years of work, though in medicine it is often five. The class of degrees issued depends largely upon previous preparation. A large proportion of the students are from foreign countries, including many from America, for whose accommodation advanced and special post-graduate courses are maintained in some of the institutions.

The leading German universities of Austria-Hungary are at Vienna, Graz, Innsbruck, Czernowitz, and Prague, but the last mentioned maintains a faculty in Bohemian. Basel, Bern, Geneva, Lausanne, and Zurich have the chief German universities of Switzerland. The alphabetical list of the universities of Germany is as follows:

Berlin,	Kiel,
Bonn,	Königsberg,
Breslau,	Leipzig,
Erlangen,	Marburg,
Freiburg,	München,
Giessen,	Münster,
Göttingen,	Rostock,
Greifswald,	Strassburg,
Halle,	Tübingen,
Heidelberg,	Würzburg.
Jena,	

**GERMANY** (jěr'mà-nĭ), or **German Empire**, one of the great powers, situated in the north central part of Europe. From east to west it extends through 17° of longitude, about 750 miles, and its breadth is 600 miles. Its northern boundary is formed by Denmark and the North and Baltic seas; eastern and southern by Russia, Austria-Hungary, and Switzerland; and western by France, Belgium, and Holland. The coast on the North and Baltic seas has a length of 1,200 miles, which is equal to about one-third of the entire frontier. The position occupied by it brings it in closer touch with the leading nations of Europe than any other country and the leading highways of the continent pass through it. It has a total area, exclusive of the colonial possessions, of 212,028 square miles, about one-sixteenth of that of all Europe.

**SURFACE.** The northern one-third is a low plain and the remainder of the empire may be classed as highland. In the southwestern part, on the boundary of Switzerland, are the high





WILLIAM II.

William II., King of Prussia and Emperor of Germany, eldest son of Frederick III., was born January 27, 1859. He studied in the Gymnasium of Cassel and the University of Bonn. In 1881 he married Augusta Victoria of Schleswig-Holstein. He succeeded his father as Emperor in 1888. His eldest son, Frederick William, the crown prince, was born in 1882.







elevations of the Alps. Toward the north of these, extending far into central Germany, are the Mittelgebirge, or Secondary Mountains, and north of these are the low plains. No great elevations exist, the highest being the Bavarian Alps, of which Zugspitze, in Bavaria, is the culminating peak. It has an altitude of 9,675 feet. Other elevations include the Vosges, 4,710 feet, and Feldberg, in the Black Forest, 4,910 feet. The Harz Mountains are near the central part, forming the northern elevations of the highland. Toward the south of these are the Black Forest, the Bavarian Forest, and the Swabian and Franconian Jura. Connected with them by lower ranges are the ridges of the Erzgebirge, the Böhmerwald, the Riesengebirge, and the Fichtelgebirge. All of these elevations have rounded summits and in and through them extend broad valleys of great fertility. Numerous streams water the highland and fine grasses and forests are abundant. Many inlets characterize the shore, but the good class of harbors are confined to the mouths of rivers, where the streams have worn channels through the rather shallow sea. The lowlands form a somewhat sandy plain, which is diversified by elevations attaining heights of about 750 feet. In the northeastern part are many lakes, including a number of inlets known as Haffs, of which Kurisches Haff and Frisches Haff are the most important. In the southern part are Chiem See, Ammer See, and Lake Constance, the last mentioned forming a part of the boundary with Switzerland.

**DRAINAGE.** Three drainage basins characterize the surface: those of the Danube, of the North Sea, and of the Baltic Sea. They are penetrated more or less by tributaries of navigable streams and the valleys are formed of loam mixed with sand. The greater portion is drained toward the north into the North and Baltic seas by the Vistula, Oder, Elbe, Weser, Ems, and Rhine, each of which receives the inflow from numerous tributaries. Its southern part, especially Bavaria, is drained by the upper Danube and its numerous affluents into the Black Sea. The Memel and the Pregel drain the extreme northeastern part, and the Vistula, which rises in Russia, flows through the eastern section into the Gulf of Dantsic. The Rhine, in the western part, has its lower course in Holland and is the most important highway of commerce. The rivers are largely connected by canals and furnish a vast network of means to navigate the interior, while many jetties have been constructed to deepen and improve the rivers.

**CLIMATE.** Germany has a temperate climate and the high elevations of the southern part render it quite equable. The colder section is in the northeastern part, bordering on the Baltic, and the warmer region is in the basin of the Rhine. Ice obstructs navigation a part of the year at the ports of the Baltic, but those of the North Sea are open practically the entire year, where the climate is influenced noticeably by the warm winds from the Atlantic. The mean temperature for the year is about 70°, ranging somewhat above that in the southern part and a little below it in the northern part. All sections of the empire have an abundance of rain for the germination and growth of all classes of plants common to the Temperate Zone, though it varies considerably according to locality and season. The heaviest precipitation is in the vicinity of some of the mountain ranges, where it reaches 40 inches, while the northern section has from 25 to 30 inches. Heavy storms and winds do not prevail, but the northern part has a heavy snowfall.

**FLORA AND FAUNA.** Nearly one-fifth of the empire is covered with forest, consisting chiefly of deciduous trees, and these receive as much care as the cultivated fields. Among the chief species are oak, elm, beech, fir, and pine. Coniferous trees are most abundant in the eastern part, and the beech may be said to be the most prominent tree in the eastern section. More than seventy per cent. of the entire area is under cultivation, either for agricultural or horticultural purposes.

Small game is abundant in the forests and wolves and wild boars are found in reservations and some of the mountains. The wild goat, marten, fox, otter, deer, chamois, and badger frequent the Alpine region, and the elk and fallow deer are protected in the preserves. The region of plains in the north is frequented by aquatic birds, such as the duck, snipe, and goose, which migrate there from the northern seas. Storks are abundant and are frequently found in the high buildings of cities, where they are protected by government regulations. The coast and stream fisheries are very valuable and produce merchantable quantities of the clam, eel, trout, salmon, carp, tunny, and oysters.

**MINING.** The geological formations are diversified, the principal characteristics being the recent sand loam deposits of the northern portion, Jurassic rocks in the central part, and Palaeozoic rocks in the southern section. Mining is an important enterprise, especially in coal and iron, in which Germany takes third rank, being exceeded only by Great Britain



and the United States. These minerals are widely distributed over the country, especially in the southwestern part, and the output comes largely from Bavaria, Baden, and Alsace-Lorraine. A large number of the mines are owned and operated by the government. Formerly bituminous and anthracite were mined exclusively, but the larger demand for fuel in the manufactories has caused a large output of lignite coal. Prussia is a heavy producer of copper, lead, zinc, nickel, and cobalt, though these minerals are distributed more or less over the empire. The silver mines take rank as the richest in Europe. Rock and other salts and potash salts are abundant. Other minerals include limestone, granite, sandstone, petroleum, and ocher. The quarries yield a large output for building purposes and monumental work.

**AGRICULTURE.** About two-thirds of the surface is in a high state of cultivation and is used either for pasturage or the growing of crops. Though one-third of the people engage in agriculture, the products are not sufficient to supply the demand. Great care is exercised in cultivating the soil, and many of the hillsides and mountain slopes are terraced to make husbandry possible. A large majority of the farms are small, ranging in extent from five to twenty acres, and the number that exceed 300 acres is comparatively insignificant. Modern methods are employed in all departments of farming, and a large number of steam plows, seeders, self-binding harvesters, and steam threshers are in use. This is accounted for largely by the increase of manufacturing enterprises, which have been the means of producing and introducing newer methods.

Rye is grown most extensively of the cereals, and is cultivated on about three times more land than either wheat or barley, though these can be raised profitably in all sections of the empire. Oats take second rank among the cereals. Corn is grown chiefly in the southern part. The acreage of hay is about equal to that of rye, being an important crop on account of the extensive interests in dairying. Germany has first place in the production of sugar beets and in this product has made greater progress than any other country, the enterprise being encouraged by bonuses paid by the government. The vine is a staple product along the Rhine, Main, Moselle, and in Swabia and Brandenburg, and the Rhine wines are famous in the markets of the world. Garden vegetables of all kinds, flax, tobacco, hops, barley, spelt and rape are cultivated extensively. All classes of domestic animals thrive, but the largest share of attention is given to raising

cattle for their meat and dairy products. Next in the order of importance are horses, sheep, swine, and goats. The Prussian studs and the Holstein cattle have a wide reputation.

**MANUFACTURING.** Germany ranks as the third manufacturing country of the world, being exceeded in the output only by Great Britain and the United States. About forty per cent. of the entire population are engaged in manufacturing enterprises, which include about 275 distinct industries. In the production of beet sugar it takes first rank, and it is classed among the leading nations in the output of steel and iron manufactures. However, the largest per cent. of persons engaged in any of the manufacturing industries are employed in making clothing, and those next in order are the building trades and the manufacture of foods. The textile industry furnishes a very large share of the commodities exported, especially the preparation of flax and the weaving of linen fabrics, although the output of cotton and woolen goods takes high rank. Other enterprises of this class include those of the velvet, silk, carpet, lace, and damask industries. Large interests are vested in the manufacture of toys, scientific instruments, armor plate, hardware, sailing vessels, spirituous liquors, earthenware, leather, paper, and heavy artillery pieces and projectiles. Large shipyards are located at Hamburg, Stettin, Bremen, Kiel, and Dantzic. Germany has extensive interests in the manufacture of rubber and gutta-percha goods, carved wooden specialties, clocks and musical instruments, and glassware.

**TRANSPORTATION.** Germany had an extensive system of transportation even before steam and electricity came into use, which consisted of well-improved highways, canals, and navigable streams. The Rhine, Elbe, Weser, Oder, and Vistula are navigable, and these and others have been materially improved by the construction of jetties and canals. Among the principal canals are the Finow, 40 miles long, in Brandenburg; the Ludwig's, 110 miles, in Bavaria, which unites the Black Sea and the North Sea by connecting the Danube and the Main; and the Kiel and Ider Canal, 21 miles, which unites the North and Baltic seas. The Great Canal extends from Kiel to the Elbe, facilitating the movement of the largest vessels, and is now used extensively for commerce between the North and Baltic seas. The Kaiser Wilhelm Canal affords a short outlet from the Baltic to the Atlantic.

Germany has 36,943 miles of railway lines and is exceeded in railroad mileage only by Russia and the United States. These lines are



owned principally by the national government, or by that of the states, and they are operated as public enterprises. Berlin is the most extensive railroad center in the empire, but lines penetrate every section of the country. In addition there are a large number of electric railways, both in the cities and throughout many parts of the country. The government maintains an efficient mail service and systems of telephone and telegraph lines. Stone and macadamized highways are numerous and in good condition.

**COMMERCE.** The foreign commerce of Germany is of vast importance and is exceeded only by that of Great Britain. At present the annual imports aggregate \$1,750,000,000 and the exports, \$1,500,000,000, being larger than the combined exports and imports of the United States, which aggregate \$2,750,000,000. Textiles, chemicals, coal, machinery, scientific instruments, leather goods, and clothing are the chief exports, while the imports consist principally of breadstuffs and raw materials. The greater share of trade is with Russia, Great Britain, the United States, Austria-Hungary, France, Argentina, India, Belgium, the Netherlands, Italy, and Switzerland.

**COLONIES.** The development of colonial possessions and commercial interest is a national policy. Its colonies include Kamerun, German East Africa, Togoland, German Southwest Africa, Kaiser Wilhelm's Land, the Ladrões, the Carolina Islands, the Marshall Islands, Kiauchua in China, the Bismarck Archipelago, the Pelew Islands, the Marianne Islands, the Solomon Islands, and part of the Samoan Islands. These possessions have an area of 1,027,950 square miles and a population of 12,500,000, and are governed through a centralized bureaucracy. Trade with the colonies has increased steadily the past decade, the imports amounting to \$12,500,000 and the exports from the colonies being \$7,500,000, of which the mother country received about fifty per cent. The expenditures on account of the colonies have been somewhat larger than the receipts, though the burden has been lessened materially by the development of a growing trade.

**EDUCATION.** The educational affairs of Germany are in a prosperous and effective condition, its schools, colleges, and universities taking the highest rank among the nations of Europe. For many years it was the land of pedagogy, in which teachers flourished who gave impulse and enthusiasm to its educational arts, promulgated basic principles vital in the education of man, and paved the way for progress in other lands. Elementary schools,

or *Volkschulen*, are supported in all communities, while institutions disseminating knowledge of industry, arts, sciences, and higher education are established and maintained under state and national supervision. The elementary schools include 61,500, in which 125,500 teachers give instruction and 8,980,000 pupils attend. Higher education is centered in 21 universities, at the head of which is the University of Berlin (q. v.), and the Lyceum Hosianum at Braunsberg, which has faculties in theology and philosophy. The institutions of secondary learning are numerous, including scientific schools, academies, and gymnasiums. The universities carry courses in medicine, law, theology, and philosophy. Many of these institutions are equipped to teach political and domestic economy, civil and electrical engineering, the natural sciences, and the trades, and all have museums, libraries, and collections of art. The scholars of Germany are renowned for faithful research, patience, and thoroughness, and have given the world many authorities on the important sciences and for professional reference. Newspapers, magazines, and periodicals have a wide circulation and are made up of superior educational, scientific, and intellectual material. Attendance at school is compulsory from six to fourteen. The number of normal schools for the training of teachers is reported at 185.

**GOVERNMENT.** Germany may be considered the successor of the Holy Roman Empire, which came to an end in 1806. However, Austria does not belong to the present confederation. The states included at present are the four *kingdoms* of Bavaria, Prussia, Saxony, and Württemberg; the seven *grand duchies* of Baden, Brunswick, Hesse, Mecklenburg-Schwerin, Mecklenburg-Strelitz, Oldenburg, and Saxe-Weimar; the four *duchies* of Anhalt, Saxe-Altenburg, Saxe-Coburg, and Saxe-Meiningen; the seven *principalities* of Lippe, Reuss-Greiz, Reuss-Schleiz, Schaumburg-Lippe, Schwarzburg-Rudolstadt, Schwarzburg-Sondershausen, and Waldeck; the three *free cities* of Bremen, Hamburg, and Lübeck, and the *crown land* of Alsace-Lorraine.

The government is a constitutional monarchy, based upon the constitution adopted in 1871, which recognizes the *Kaiser*, or emperor, as the highest executive officer. It provides that all the states of Germany are to "form an eternal union for the protection of the realm and the care of the welfare of the German people." The office of emperor is hereditary and in it is vested the power to represent the empire in concluding treaties and



alliances, declaring war, and concluding peace, and the emperor has chief command of the army and navy. Internal trade is free, while a high protective tariff is in force in relation to other countries, which, with the revenues from railroads, telegraphs, the postal system, and excises, constitutes the chief source of government receipts. The legislative power is vested in the upper and lower houses, which are known as the Bundesrath and the Reichstag. In the former are 58 members, appointed by the several states, and the latter has 397 members, elected by a universal ballot. The term of office in each branch is five years. The chancellor is appointed by the emperor and is the president of the Bundesrath. He has a seat in the lower house by virtue of his office, where he represents and defends the government in public measures and policies. In his general duties he is assisted by eleven secretaries, who are at the head of the several departments of the government. The proceedings of the legislative branch are public. A bill, to become a law, must have a majority vote in both branches, be assented to by the emperor, and receive the signature of the chancellor.

The political parties are organized similarly to those of Canada and the United States and include the liberal, conservative, and clerical. The liberal party advocates a united Germany on constitutional lines, the conservatives constitute the imperial party proper, and the clerical, known also as the ultramontane, is the Roman Catholic Party. These, besides the social democratic and several other parties, comprise the leading factors and are maintained by aggressive organization-work. The 25 states and the crown land of Alsace-Lorraine are pledged to a perpetual union, none of which has the power to secede or withdraw from the confederation. The laws of the empire are fundamental and all others must harmonize and conform to them.

Every male citizen of sound health and constitution is required to serve three years in the imperial army, in the reserve four years, and in the militia or landwehr five years. No one may be represented by a substitute, but the three years' compulsory service may be reduced one year by the completion of a course in the gymnasium. The navy has been enlarged within recent years, especially since the war with China in 1900, and now comprises one of the most powerful in the world. It includes 30 first-class battleships, 45 cruisers, 125 torpedo boats, 18 dispatch vessels, and numerous others. The peace footing is 510,350 men and 23,500 officers;

the war footing, 3,450,000 men. As a whole the army and navy are well organized and thoroughly disciplined and constitute an effective and mobile force.

**INHABITANTS.** The people of Germany are classed as Low German and High German. This classification includes, respectively, the people of North and South Germany, the term being applied on account of the difference of elevation in the different sections. Emigration from Germany has exceeded that of any other country, except Ireland. The number of Germans in the United States is about 8,000,000, exclusive of the American descendants who have lost the identity of language. The total number of German people residing in other countries is about 50,000,000, of which the greater number reside in the United States, Austria, Switzerland, Belgium, Russia, and Australia, and they are otherwise distributed to various sections of the world and in colonies. About 65 per cent. of the population of the empire are Protestants and 35 per cent. Roman Catholics, the latter being resident most largely in Alsace-Lorraine, Bavaria, and Baden.

In 1905 the population was officially reported as 60,641,278, and in 1909 it was estimated at 65,003,500. It ranks next to Russia in population of the European countries, but its density is greater, being about 310 to the square mile.

Nineteen cities have a population of over 200,000. These include Chemnitz, Charlottenburg, Stettin, Düsseldorf, Essen, Magdeburg, Bremen, Hanover, Nuremberg, Frankfurt-on-Main, Cologne, Dresden, Breslau, Leipzig, Königsberg, Munich, Hamburg, Stuttgart, and Berlin. In 1905, Berlin, the capital, had a population of 2,040,148, and Greater Berlin, which includes a number of suburbs, had a population of 2,870,000. The remarkable growth of German cities within recent years is accounted for by the vast increase in the manufacturing enterprises.

**LANGUAGE.** The German language is a branch of the Indo-European group of languages. It is commonly divided into three parts, known as Old High German, Middle High German, and New High German. In this classification the word "high" has a mere geographical distinction, and is used to distinguish from the German spoken in the low countries, which is known as *Plattdeutsch*. As to time the periods are classified to include the years 600-1100, from the rise of the Franks to the Crusades; 1100-1500, from the Crusades to the Reformation; and from 1500 to the present. While the different provinces still have a somewhat variant dialect, the official language and that taught in the schools



is universal, and there is a constant tendency to unify the spoken tongue in all parts of the region where the German language is officially recognized. The language is especially rich in synonyms, making it prolific in words to express emotion and adapting it to the purposes of the orator and poet. There is little difference between the German alphabet and that of the English, but the orthography and pronunciation differ considerably. While the grammar is more complicated by the fuller inflection and conjugation of words, it is notable that the orthography is much more in line with natural sounds, and as a result spelling and pronunciation are less difficult.

**LITERATURE.** The year 600 A. D. is fixed as the time when Gothic influence began to decline and the Franks took the lead in German history. After gaining control of Middle and South Germany, they embraced Christianity. Collections of folklore and legends were made as early as the time of Charlemagne. That distinguished sovereign not only encouraged literary art, but also made a collection of popular German poetry, mostly songs. The age of the Minnesingers, or singers of love, began about 1200, when companies of poets visited the castles and courts of nobles, where they sang the story of King Arthur and the history of Troy. To this period belong the "Nibelungenlied" and "Gudrun," in which the story of the heroic combats of Siegfried is related, and in them is a detailed account of how Griemhild, the beautiful daughter of King Gunther, was won by the gallant Siegfried. They relate the story of sinking the Nibelungen treasure in the Rhine, detail the death of Attila the Hun, and give a glowing account of the death of Hagen at the hands of Griemhild.

Another epoch is marked by the introduction of the mysteries and passion plays. These plays attained to the height of popularity in the 15th century, and not only gave rise to the German drama, but still continue in such interesting exhibits as are periodically witnessed at Oberammergau. Though all these and Walther von der Vogelweide, the greatest of the Minnesingers, had an extended influence upon the language and literature, it remained for Martin Luther to institute the era known as that of the New High German. This he did by translating the Bible into the German, thereby giving the language a fixed literary value, and he also wrote many songs which still engage the attention of singers in many tongues. Hans Sachs (born in 1494) was a contemporary of Luther, and his permanent place in literature is due to the 6,048 poems from his pen.

Johannes Fischart (1545-1591) is the author of numerous works, including "Christian Education," "The Luckship," and "The Marriage Book," the last named depicting the joy and peace of home life. To this epoch belong the popular stories written by the same author known as "The Wandering Jew" and "Eulenspiegel." The 17th century witnessed a period of great revival in learning and culture. At this time were translated many of the classics, while biography, romance, history, and philosophical works received marked attention. Martin Opitz (1597-1639) is the author of "German Poetry," a work celebrated on account of its purity in language and diction. Other writers of this period include Paul Gerhardt (1607-1676), one of the greatest hymn writers.

German literature in the 18th century, became quite free from foreign influence, and exercised a marked impression in Switzerland and the low countries. Johann Gottsched (1700-1766), is the most eminent literary man of the early part of the 18th century, and may be regarded the most eminent philologist prior to Grimm. His chief writings include the drama, "Dying Cato," while Johann Jakob Bodmer (1698-1783) translated "Paradise Lost" and published the "Nibelungenlied." Frederick Gottlieb Klopstock (1724-1803) is one of the noted poets of this period and the author of a religious epic entitled "Messias," while Christoph Wieland (1733-1813) takes high rank with the cultured poets. His best known productions include "Oedron," a tale of fairy lore, and he made numerous translations from Shakespeare. However, the most eminent poet of this period is Gotthold Lessing, who not only published comedies and tragedies of much value, but greatly benefited literature by elevating style through efficient criticism. His writings include "Nathan the Wise," "Hamburg Dramaturgy," and "The Young Scholar." J. G. Herder (1744-1803), a contemporary of Lessing, is noted chiefly for his searching criticisms. Among the eminent writers of the latter part of the 18th century are J. W. von Goethe and J. C. F. Schiller, two of the most distinguished characters in German literature. The names of these two writers are inseparably linked to each other, and their productions rank with the most eminent in the world's literature. See **Articles.**

The system of public schools and universities of Germany placed the literature on a high plane, a result to be expected from the fact that its scholars are recognized the foremost in the world. Among the philosophical writers are such eminent men as Schelling, Haeckel, Kant, Fichte, Hegel, Lotze, Schopenhauer, and von



Hartmann, whose productions have been widely translated. The historians include Niebuhr, Ranke, and Mommsen; the biblical writers, Strauss, Schleiermacher, Paulus, Neander, De Wette, and Baur, while Humboldt, Agassiz, and Max Müller, who wrote both in German and in English, hold eminent places as naturalists and scientific inquirers. Heinrich Heine, Ludwig Uhland, August von Schlegel, Ferdinand Freiligrath, and H. Fallersleben are classed with the later poets, Karl Gutzkow (1811-1878) and Gustav Freytag (1816-1895) are among the novelists, and George Ebers takes rank as an Egyptologist and general writer, producing among others "Cleopatra," "In the Blue Pike," and "Barbara Blomberg." The satirists include Jean Paul Richter; the humorists, Fritz Reuter; the dramatists, C. F. Heibel, and the miscellaneous writers, Gottfried Keller, Paul Heyse, and Wilhelm Jordan. The Grimm brothers are noted for their eminent services to philology.

German literature includes the best known authoritative works on music, and the master musicians have so fully touched the hearts of the people that their names are known in all civilized lands. These include such eminent composers as Mozart, Bach, Beethoven, Haydn, and Handel, in the 18th century, and Meyerbeer, Mendelssohn, Weber, Wagner, Schumann, Schubert, Liszt, and Franz Abt (1819-1885), in the 19th century. Among the eminent educational writers are Froebel, author of "Education of Man;" Henry Pestalozzi, writer of "How Gertrude Educates Her Children;" and Kant and J. F. Herbart, two well-known philosophers and writers of works on psychology. Among the eminent writers of the 20th century are Hermann Sudermann (born in 1857), who takes high rank as a novelist and dramatist, among his productions being "Dame Care," "Sodom's End," "Love in a Grove," and "Honor." Gerhart Hauptmann (born in 1862) is famous as a dramatist, his works including "Weavers" and "Sunken Bell." Other writers of this period include the historians, Ludwig Hartmann, Hans Prutz, Paul Hassel, and Johann Penzler; the literary critics, P. Schwanke, Karl Federn, B. D. Diederich, and M. Neckar; and the writers of fiction, Max Dreyer, Wilhelm Polenz, Hermann Stehr, William Armenius, and Paul Lindau.

**HISTORY.** The German people are descendants of the Indo-Germanic or Aryan race. In history they are first mentioned in the year 113 B. C., when they came in contact with the Romans. At that time they occupied a region east of the Rhine and north of the Danube, and were divided into numerous separate and

independent tribes, being bound together by language and racial ties. In the time of Alexander the Great the Germanic tribes of the Baltic coast were met with, but the first authentic history of them appeared in the "Commentaries" of Julius Caesar in 58 B. C. The Celtic name given to these tribes was *Germani* and was the name used by the Romans, but the term by which they designated themselves was the present name *Deutsch*, meaning people. There were about fifty tribes, most of which were united in the 1st century and succeeded in overthrowing Roman control, driving the legions of Varus from their possessions. In the year 200 A. D. the Germanic peoples invaded the territory of the Romans and threatened their capital. Later the different tribes formed numerous groups, the most powerful being known as the Frisians, Burgundians, Saxons, Goths, and Franks. Soon after the Huns, who were pressing them southward, caused them to cross into the Roman Empire, and for many years they controlled more or less of the former Roman possessions.

The Franks under Clovis defeated the Roman governor in 486 and established their seat of government near the present site of Paris. After subduing the Alemanni, Visigoths, and other minor tribes, Clovis became the ruler of Gaul, and, after his death, in 511, these possessions were divided among his four sons. The dynasty of Clovis was known as the Merovingian and controlled the destiny of the German tribes until the rise of Charlemagne, who became emperor in 800, founded the Carolingian dynasty, and gave rise to a long line of kings and emperors who for more than 1,100 years occupied the throne of Germany. The empire of Charlemagne, known as the Holy Roman Empire, was reared on the ruins of Rome. It brought about marked changes in the civilization and intellectual status of the Germans, and impressed them with a nationalism sufficient to endure, though it was suppressed at intervals. The vast empire was divided among the successors of Charlemagne and subdivided successively until many small principalities with potentates having absolute power came into existence. In 887 the French and Germans became finally separated, at which time there existed five powerful divisions among the Germans. These constituted the Bavarians, Saxons, Lorrainers, Swabians, and Franks, of whom the last were the most powerful, and in 911 succeeded the descendants of Charlemagne in the government of Germany. Duke Henry of Saxony is counted the founder of the German Empire, since he was the first



to establish a government distinctly German, and largely strengthened the five dukedoms by greatly reforming the military system, building fortresses, and providing for internal improvements. The Saxons reigned about one hundred years, during which time the Wends rose in rebellion in 928 and the Magyars in 933, and other local differences occurred. However, the Saxons maintained their sovereignty and were followed by the house of Franconia, which ruled until 1125.

Conrad II. was the first Franconian king. He ruled energetically in 1024-39 and succeeded in subduing the nobles and establishing an alliance with Canute, the celebrated Danish king. In 1138 the Hohenstaufen dynasty began its reign with Conrad III. (1093-1152), who ranks as one of the most celebrated kings of mediaeval history. The reign of this dynasty is noted because of prolonged conflicts between the imperial powers and that of the Pope and for the organization of the early Crusades, Frederick, surnamed Barbarossa, being the most celebrated in this line. The first Crusade was undertaken in 1095. In the second, organized in 1147, Conrad III. took a conspicuous part. He amalgamated the strength of his nation into a vast army, but both he and his soldiers perished in an attempt to reclaim the Holy City, his death occurring in the third Crusade, after a reign of fourteen years. The Hohenstaufens governed until 1273, when the Carolingian line became extinct, and the next king was chosen by the nobles, who, after long contests, decided upon Rudolph I., founder of the Hapsburg dynasty, which is still the ruling line in Austria. Within the period of his reign the royal authority was largely extended, important conquests were made in southeastern Germany, and the influence of the princes was curtailed largely.

In the reign of Albert of Austria, in 1298-1308, began the prolonged revolutionary movements for the independence of the Swiss cantons. Within the succeeding century occurred sanguinary contentions among rival claimants of the throne, and in 1415, in the reign of Sigismund, terminated the persecutions of the followers of John Huss, who was burned at the stake on a charge of heresy, but this event was only a forerunner of the Reformation. Luther began to preach the Protestant faith under Maximilian I., and the reign of Charles V., from 1519 to 1556, fully grounded that faith in Germany. The seeds of civil discord germinated during the great religious movements resulted in the Thirty Years' War, which began its depressing ravages in 1618.

The weakened condition of commerce, the stagnation of interior trade, and the heavy burdens of taxation occasioned by the prolonged war brought a desire for the cessation of hostilities, which was first secured by the Peace of Augsburg. However, the terms of the treaty gave offense to various adherents of Luther, Calvin, and the Catholics, and war soon broke out anew. In the meantime Wallenstein led the army against Bohemia for the extermination of the Protestants, and these movements continued until the Swedes, under Gustavus Adolphus, came to the rescue of the Protestants, when the latter obtained his memorable victory at Lützen in 1634. The ascension of Ferdinand III. to the throne, in 1637, made possible the Treaty of Westphalia in 1648, which adjusted religious matters, though Germany was divided into 203 independent states, and each gave only nominal support to the emperor. Besides, Switzerland and the Netherlands were separated from the empire, while Alsace was ceded to France. After the Treaty of Westphalia, Prussia gained strength and became the controlling power in Germany and the stronghold of Protestantism. This led to the rise of the house of Hohenzollern, as the house of Hapsburg was Catholic, giving Prussia marked advantage over Austria. In 1702-13 the war of the Spanish Succession brought marked glory to the rising power of Germany, but it did not operate to solidify and strengthen the internal affairs of the empire. Soon after, in 1756-63, occurred the Seven Years' War, which gave Prussia additional advantages over Austria. Frederick the Great of Prussia strengthened the power of the army, replenished the treasury, and made that country the center of German unity.

The power of Germany was almost destroyed by the wars immediately following the French Revolution. In 1806 Francis II. resigned the title of Emperor of Germany, having assumed that of Emperor of Austria, with which the Holy Roman Empire ended. In 1813 the allied forces of Prussia, Russia, Sweden, and England frustrated the plans of Napoleon to add most of the German states to France, at the Battle of Leipzig, and the vigorous assault of Blücher with 30,000 Prussians destroyed his last hope at Waterloo in 1815. The congress of Vienna now endeavored to restore order and organized a German Confederation, of which the Emperor of Austria was chosen president, Frederick William III. as ruler of Prussia, receiving one-third of Saxony. In 1848 the national assembly, which met in Berlin for the purpose of framing a national con-



stitution, was prevented from rendering material aid by the rivalry of Austria and Prussia, and was followed by a Revolution, but Frederick William IV. restored order by promising a constitution. The growing popularity of Bismarck and his firm rule led to a final union of many of the states.

In 1866 occurred the war between Austria and Prussia, known as the Seven Weeks' War, which was the last great struggle for German unity, and, under the leadership of von Moltke, the Austrians were utterly routed at Sadowa, in Bohemia, on July 3. The Prussians occupied Vienna on August 23, and the war terminated after seven weeks. In the peace treaty which followed Austria was shut out from the federation formed north of the Main River. France, jealous of the rising power of the house of Hohenzollern, found occasion to declare war when Leopold, a member of the family, was offered the crown of Spain. War was declared on July 19, 1870, and the South German states were enthusiastic from the first in supporting Prussia, while the northern states showed an equal degree of interest in the cause of unity. Two powerful armies invaded France and by a spirit of marked enthusiasm won battle after battle, captured Napoleon III. with an army of 90,000 men, and sent him to Germany as a prisoner. A siege of Paris caused that city to surrender on Jan. 29, 1871. The treaty which followed required France to pay \$1,000,000,000 as a war indemnity and cede Alsace and the German portion of Lorraine to Germany. The most important result of the war with France was the solidification of the German states, the development of a spirit of nationalism, and the restoration of the old empire. King William was proclaimed emperor with the title of William I. on Jan. 18, 1871, before leaving the capital of France, and was received on his return by his own people with signal demonstrations.

Among the subsequent events of the empire are its constant growth of influence, colonial expansion, the building of great railroads and canals, and vast improvements in economic and social life. The triple alliance formed by Germany, Austria, and Italy on March 9, 1888, strengthened the peace aspect of Europe and was renewed by Caprivi, the chancellor who succeeded Bismarck. William I. was succeeded by Frederick, his son, on March 9, 1888, but the new emperor suffered from a cancerous affection in the throat and died June 15, and was succeeded by his son William II. The latter at once adopted the policy

of William I. and Bismarck in extending the colonial empire, enlarged the army and navy, and vigorously supervised the internal conditions of his dominion. He visited many of the leading courts of Europe in 1889, two years later he appointed Chancellor Caprivi to succeed Bismarck, and in 1894 selected Prince von Hohenlohe for that position.

William II. visited Palestine in 1898, where he took a prominent part in consecrating an Evangelical church, the Church of the Redeemer, at Jerusalem. The empire became involved in a controversy with China in 1900, owing to the murder of the German minister at Peking, Clemens A. von Ketteler (1853-1900), and sent an army and warships for the purpose of securing to the empire an adjustment of important issues between the two nations. Other complications followed and led to an alliance of European powers and the United States, the allied army being commanded by Count Waldersee. The contentions resulted in an extension of foreign interests in China, Germany securing its share of the benefits, in addition to a payment for individual damages sustained. A disagreement between the emperor and Hohenlohe in regard to the policy relating to China caused the latter to resign, when Count von Bülow became chancellor.

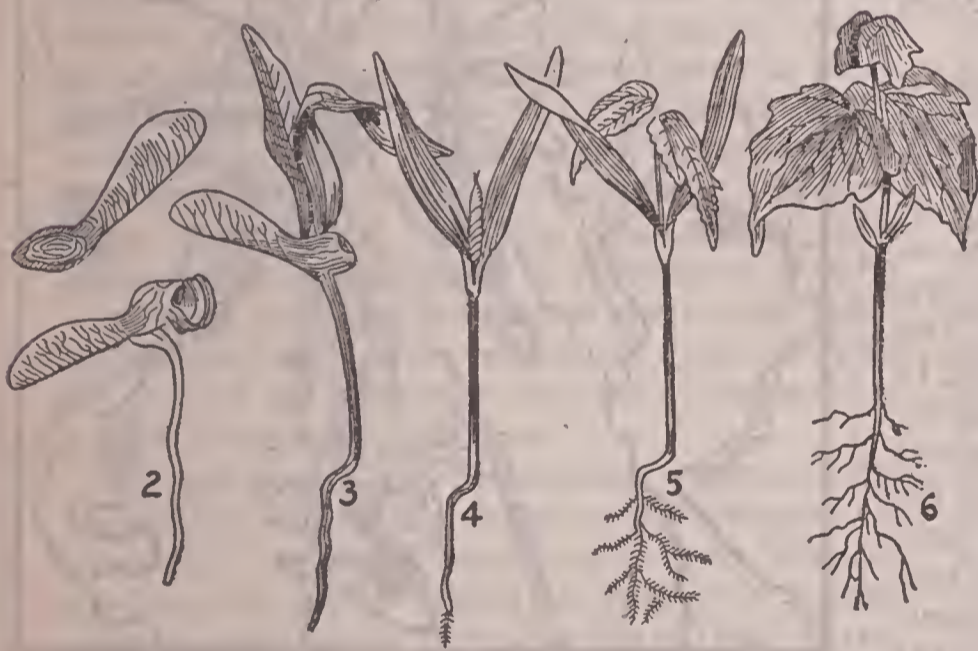
**GERMINATION** (jĕr-mĭ-nā'shŭn), in botany, the sprouting of a plant from a seed. It depends upon the seed coming in contact with moisture and warmth at the proper time. Few kinds of seeds will grow after keeping them for five or six years, while some must be brought in contact with the ground as soon as they ripen, and others may be kept safely for fifty or sixty years. It is impossible to tell whether the germ of a seed will grow, and this can be determined only by placing it in a condition under which it will germinate. The seed of the soft maple ripens in the spring and germinates in early summer, while corn and wheat can be kept several years, and the seed of the sensitive plants have been preserved over fifty years.

A seed consists of two parts, the *embryo* and the *cotyledons*. The former is a miniature plant and the latter is the food stored to promote its growth. Seeds differ in the number of cotyledons; corn and rye have but one, the bean and pea have two, while the pine and a number of others have more than two. When the seed is brought in contact with moisture and warmth, it swells a little and the tiny stem of the embryo begins to lengthen and soon bursts through the coats of the seed. Later the two leaves straighten and grow larger and the seed coats are thrown



off, leaving the plantlet stand in the soil. It must be observed that the little stem which first comes out of the seed turns downward and points into the earth, giving rise to the roots and rootlets, while the other end of the stem turns upward and lengthens into the stalk and leaves. It is not known why the roots grow downward and the stem turns upward, though some botanists assert that these phenomena are due at least in part to the rotation of the earth upon its axis.

The seedling plant is complete in all parts at the time of germination and it develops into a matured organism through growth. It has all the organisms of vegetation found in any plant before blossoming, and its life and development depend upon nutriment derived from the soil and the air. As the root begins to branch out into *rootlets*, a little bud called the *plumule* appears on the top of the stem, just between the stalks of the two seed leaves, and it enlarges and develops into a leaf. This leaf is soon raised upon a new piece of stem, which carries it upward a short distance, and another leaf soon appears on the summit of this joint of stem, and is likewise raised upon its joint of stem. At an early stage of growth the plant obtains food wholly from the cotyledon, later



Germination of a Maple Seed, showing successive stages from the seed to the plant with leaves and rootlets.

it is nourished partly by the cotyledon and partly by the soil and air, and in due time the nourishment is derived entirely from the soil and air and the cotyledon, which has now become useless, falls off, though in some plants it is consumed entirely by the young growth.

The nourishment in the cotyledon consists in its starch and albumen, but neither is available for use by the plant until it has been acted upon and made soluble. This takes place when it becomes moist, causing fermentation, through

which the starch is changed to dextrin and sugar. Chemical changes of this kind cause a rise of temperature, but fermentation does not set in unless the moistened seed is subjected to sufficient warmth. About 85° Fahr. is the best temperature, though it may vary according to the nature of the seed. Germination takes place in wheat in temperatures ranging from 41° to 108° and in corn from 48° to 115°, while the most favorable temperature for the former is 85° and for the latter 98°. Corn having one cotyledon, the cotyledon remains under ground and is absorbed by the plant. This is true also of the pea, both of which have a true leaf at the beginning. In the bean, which, like the pea, has two cotyledons, the cotyledons appear above the ground and there undergo certain changes, furnishing nutriment until they cease to be necessary, when they fall to the ground.

**GERMS.** See **Bacteriology; Germ Theory of Disease.**

**GERM THEORY OF DISEASE,** a view according to which a specific germ exists for each definite disease infectious to the various organs. The theory implies that these germs of living organisms are communicated from an infected person, principally by food, drink, or air, and grow and multiply in the body they come in contact with, producing the disease of which they are characteristic. The particles of contagious matter retain their vitality during definite periods; this, like their growth and promulgation, varies in the different forms. It has been demonstrated that they succumb when subjected to a temperature of 200° to 300° Fahr., and to a low temperature of from 30° to 75° below zero, though in each case the infectious matter must be exposed for a definite time. In the 17th century Hauptmann, a German physician, expressed the view that invisible germs existing in the air may cause epidemic diseases, and all the more important discoveries in relation to contagion have been made since that time.

The living germs are grouped as micro-organisms and vary greatly in size and form. They multiply largely by fission, especially the bacterium and micrococcus. The former is rod-shaped and about one ten-thousandth of an inch in length, and the latter is round in form and about one thirty-thousandth of an inch in length. Other forms are the vibrio, spirillum, and bacillus, the last mentioned being formed like rods, slightly larger than the bacterium, and multiply by spores and divisions. Animals having died from splenic fever contain blood



laden with swarms of bacilli, which multiply and throw off spores that can be cultivated, and the production may be continued through different classes of fluids. A rabbit or guinea pig can be inoculated with artificially developed contagion, and death ensues from the same disease as that of the animal from which the contagion germ was taken. For many centuries tubercles were known to be hereditary and were regarded noninfectious, but the tubercular bacilli have been discovered.

Dr. Koch, of Berlin, cultivated the bacillus organism and communicated it to animals, in whose bodies it was found after death. In 1876 he published an important treatise on the life history of this form of germ life, and in 1882 announced his discovery of a microorganism in tubercles which he regarded the principal, if not the only, cause of consumption of the lungs. Later he demonstrated that the expectorations of consumptive patients contain microbes which multiply by spores and infect other persons with the disease, even after having dried, in which form they are scattered in the air and breathed in the regular course of respiration. In 1883 Dr. Koch discovered peculiar bacilli in cholera patients. These organisms are formed like a comma and are found in large numbers in the intestines of persons who succumb to the cholera epidemic.

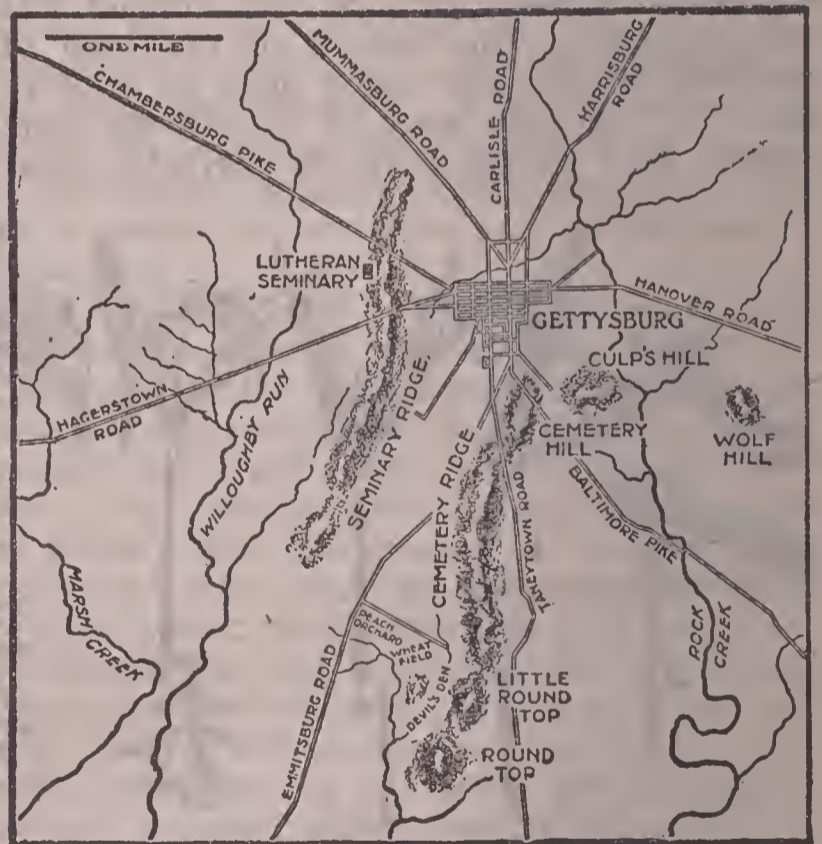
The germ theory of disease was investigated by Pasteur, who also supported it, and contributed much valuable information regarding several forms of bacilli. Germs enter the body and give rise to disease through various channels, particularly through the mouth, nose, eye, ear, and broken surfaces of the skin. The mucous membranes are especially susceptible to certain species of germs, as the mucous membrane of the intestine to the bacillus of typhoid fever and that of the respiratory tract to the bacilli of pneumonia and diphtheria. At first the effect is feeble, but the germs multiply rapidly and soon cause direct local and injurious results. A general knowledge of the conditions of life of the various kinds of organisms has greatly decreased the spread and harmful effect of contagion, while pending investigations promise valuable and specific discoveries of more particular and complicated forms.

**GETHSEMANE** (gĕth-sĕm'ă-nĕ), a place about three-quarters of a mile southwest of Jerusalem, at the foot of Mount Olivet, and contiguous to the garden noted as a favorite resort of Christ and his disciples. In this garden Christ retired the night before the crucifixion and suffered the agony mentioned in the New Testament. Its exact location is not

known definitely at present, but is pointed out to tourists in a locality where a number of olive trees stand in an enclosure.

**GETTYSBURG** (gĕt'tiz-bûrg), **Battle of**, a celebrated battle that occurred July 1-3, 1863, at Gettysburg, Pa., about 36 miles southwest of Harrisburg. It is considered the turning point in the Civil War. The Union army was under the command of General Meade and the Confederates were commanded by General Lee, each numbering about 80,000 men. The latter had invaded the Shenandoah Valley, crossed the Potomac at Williamsburg in the latter part of June, and was pressing forward to Harrisburg. General Meade had just superseded General Hooker in command of the Union forces, and his plan was to engage the enemy at Pipe Creek, but this was frustrated by the Confederates' attack on Reynolds' division at Gettysburg on July 1, when General Meade hastened forward to his assistance.

The battle raged for three days with fearful carnage. On July 3 the Confederates made



VICINITY OF GETTYSBURG.

their last charge on the Union army, but met with fearful slaughter and were repulsed. As a result, Lee was obliged to retreat with his shattered columns across the Potomac into Maryland. The Union army lost 23,190 and the Confederate nearly 30,000, the losses on both sides including many generals and officers. The successes for the Federals at Gettysburg and Vicksburg occurred at the same time. Both being decisive, they greatly added to the enthusiasm of the North. The national cemetery at



the town of Gettysburg was dedicated by President Lincoln, Nov. 19, 1863, and the government erected a fine monument in its center at a cost of \$50,000. In this cemetery are the graves of 3,580 Union soldiers.

**GEYSER** (gī'sēr), a word derived from the Icelandic name *Geysir*, meaning to burst or gush forth, and applied to intermittent hot springs in various portions of the earth. The most notable specimens include those in the Yellowstone region of the Rocky Mountains, New Zealand, Tibet, the Azores, and those of the southwestern division of Iceland, thirty miles northwest from Mount Hecla. About 100 separate geysers are active within a small area of Iceland, situated within a radius of two miles. They throw out jets of hot water through steaming apertures at intervals lasting five or six minutes, though some throw jets continuously for a half hour. However, the Great Geyser and the New Geyser are the largest. The former has an opening about eight feet in diameter, and throws up columns of hot water to the height of 75 to 100 feet. In the upper portion the opening is about 50 feet in diameter, which is gradually widening. Its action is preceded by subterranean noises resembling the firing of cannon, a slight movement of the earth's crust, and, after throwing up immense volumes of water, steam begins to take its place. After a time the fountain ceases to act, but the process is renewed after a short intervening period. The New Geyser, or *Strokkur*, as it is called by Icelanders, is supposed to be connected with Mount Hecla, which is, perhaps, true of all those in that region. The phenomenon is explained by Tyndall in that he thinks the water is brought to the boiling point under pressure, after which it explodes into steam, and this, occurring periodically, gives rise to the intermittent ejections.

The geysers in the Yellowstone region of the Rocky Mountains are the most picturesque and powerful yet discovered. About 50 distinct geysers are located within an area of 30 square miles in the vicinity of the Fire Hole River, and throw up water jets from 50 to 200 feet, though some jets rise to about 250 feet. Of these geysers Old Faithful is the most celebrated. It has an opening six feet in diameter, and at intervals of 50 minutes throws water to a height of from 75 to 150 feet. Another wonderful geyser is the Beehive, which acts once every 24 hours, and throws up a jet 175 feet. The geysers of New Zealand are situated in the hot land district of Auckland and present wonderful phenomena. In this vicinity are numerous natural terraces that form reservoirs for cisterns, and near them are thermal springs and

boiling geysers. Several are characterized by emitting continually dense volumes of steam. Geysers occur only in volcanic regions. They are connected more or less closely with earthquakes and volcanic disturbances. Geologists generally hold the view that their action tends to relieve the interior. It furnishes an outlet for matters under the action of heat or pressure, and in this manner counteracts and greatly modifies the more extensive volcanic disturbances.

**GHATS** (gāts), or **Ghauts**, the name of two chains of mountains in Hindustan, located in the eastern and western sections of that country. The chain of Ghats in the eastern part have an altitude of 1,500 feet and disappear at Cape Comorin. The Ghats in the western part are higher, ranging from 4,000 to 7,000 feet, and extend across India to the Bay of Bengal. They are important in that they form a great watershed and have gold deposits of considerable value.

**GHEBERS** (gē'bērz), or **Guebres**. See **Parsees**.

**GHENT** (gēnt), a city of Belgium, capital of the province of East Flanders, 31 miles northwest of Brussels. It is situated in a fertile plain at the junction of the Scheldt and Lys rivers, which are crossed by many bridges, and has communication by numerous canals and railroads. Several of the canals divide it into a number of islands, which are connected by 275 bridges. The city has well-organized public schools and is the seat of a university. Among the public buildings are the Cathedral of Saint Bavon, a Gothic structure built in the 10th century; the Church of Saint Nicholas, begun in the 10th and completed in the 13th century; and the Church of Saint Michael, which contains valuable paintings by Van Dyke. Other buildings include the town hall, the Hôtel-de-Ville, the Palace of Justice, and the Institute of Sciences. It has beautiful parks, gardens, and promenades. The university carries extensive courses of study. It has a library of 115,000 volumes and 750 manuscripts. The manufactures include sugar, hosiery, tobacco, paper, ribbons, vehicles, machinery, and cotton, linen, silk, and woolen goods. It has many flouring mills, machine shops, and railroad car works. The harbor is spacious and furnishes ample moorage for 450 vessels. It has had remarkable prosperity within recent years, owing to its conveniences in navigation and steam and electric railway transportation.

Ghent is first mentioned in history in the 7th century. Baldwin, the first Count of Flanders, erected a fortress on its site in the year 868 to defend it against the Normans. It was made



the capital of Flanders in the 12th century and in the 14th supported an army of 75,000 men. By reason of wealth and unity the people of Ghent were able to maintain their liberty and defend themselves successfully against the feudal lords, who came from Burgundy and Spain to encroach upon them. Jacob Van Artevelde led two revolts respectively in 1338 and 1369 against Burgundy, and in 1504 it was deprived of its privileges by Charles V. of Germany. This conquest caused its prosperity to decline, particularly during the reign of Philip II. of Spain. France conquered it in 1792 and made it the capital of the department of Scheldt. In 1814 it was added to the kingdom of the Netherlands, with which it was included until the separation of Holland and Belgium in 1830, when it became a part of the latter. The peace treaty between the United States and England, known as the Treaty of Ghent, was concluded and signed here in 1814. Population, 1906, 163,079.

**GHENT, Treaty of**, a treaty between Great Britain and the United States, concluded at Ghent, Belgium, on Dec. 24, 1814. It terminated the War of 1812 and was ratified on Feb. 17, 1815. The British commissioners for negotiating it were Henry Gouldburn, William Adams, and Lord Gambier, and those representing the United States were James A. Bayard, Henry Clay, John Quincy Adams, Jonathan Russell, and Albert Gallatin. The treaty, as signed, provided for the restoration of all conquered territory and for the appointment of commissioners to examine and report to their respective governments on certain boundary questions. Singularly it failed to settle the chief causes of the war, which were the impressment of American seamen, the rights of neutrals, and the participation of citizens of the United States in the Newfoundland fisheries.

**GHOST**, the name applied to an apparition, or the departed human spirit as seen or imagined by the living. The belief in ghosts is very ancient and has existed to some extent in all countries and in every age. Various religious theories are based upon the belief in ghosts, especially ancestor worship, witchcraft, and totemism. The conception of a ghost seems to originate with dreams, a state or condition in which the body is inert and unconscious while the mind is at least partially active. It is not hard to understand that a savage may be suddenly awakened from a sleep, and that his mind has a vivid impression of a dream in which some departed person was thought of, hence the conclusion that the person actually came in contact with the living. Besides, many have re-

garded death and sleep quite closely related, and instead of believing that the body has departed at the time of death, they look upon it as still existing somewhere in its living form, ready to pass unseen great distances, or to do superhuman acts when brought under the proper influence.

The ancient Egyptians taught that the soul has separate phases and that the *ka*, a phase of the soul, remains near the corpse. This belief was made plausible to them in connection with their art of embalming, since the bodies of the dead were to be preserved indefinitely under the watchful influence of the *ka*. To some a ghost acts with magic, while others look upon such a being as having the spirit manifested at the time the person died. Hence, when the deceased died in peace and contentment, the ghost was thought to have a peaceful disposition, but one who came to death by violence or under great mental agony was thought to have a spirit of the same kind. This caused fear to be felt by those closely associated with the deceased, a view still evident by those who believe certain houses or places to be haunted.

**GIANTS** (jī'ants), the persons having extraordinary large stature, size, and bulk. History mentions giants and races of giants, but the occurrence of nations of giants is assigned chiefly to the early stages of civilization. Among the races of giants mentioned in historical legendry are the Laestrygones and Cyclopes, while in the English folklore are mentioned the Cornish and Welsh giants. The Bible makes mention of giants in Genesis, vi., 4, in which the sons of Anak, who resided in the vicinity of Hebron, are described by spies as of such gigantic size and proportion that they themselves were relatively as small as grasshoppers. The Bible frequently mentions the Rephaim race of giants and the giants of Emim and Zuzim. In Greek mythology giants are regarded largely as personifications of natural force, and the term became applied to anything possessing unusual or superior power. The natives of Patagonia, South America, have an average height of six feet and are among the tallest of the living races.

While individual giants have lived at various times, there are at present persons who have a height, no doubt, fully as large as any that ever lived. Among the persons attaining to high stature may be named Maximinus, a Roman emperor, who was nearly nine feet tall. Queen Elizabeth had a Flemish porter who was seven feet six inches tall; Cajanus, a giant of Sweden, was nine feet; Patrick Cotter (O'Brien), who flourished in Ireland in 1783, was eight feet



eight inches; and the Swedish guard employed by Emperor Frederick William I., of Prussia, measured eight feet six inches. It has been found by careful investigation that giants die comparatively early and have a more feeble mind and body than persons of average stature. Their parts are usually out of ordinary proportion. Among the more prominent differences are broad shoulders and haunches, a small forehead and brain, a large lower jaw and a weak muscular system. The disproportion between the trunk and limbs is greatest. Though the cause for unusual growth in the different parts is not understood, it is known that some portions grow more quickly than others, and often continue to gain in size after other parts have ceased to grow.

**GIANTS' CAUSEWAY**, a promontory which extends into the North Channel from the coast of Antrim, Ireland. It is a portion of the basaltic formations found in Antrim County and near Londonderry. Large quantities of basalt appear to have been forced outward during the Tertiary period, since which time the intruding rocks have been dissected by erosion, leaving a line of perpendicular cliffs exposed. Some of the cliffs are 500 feet high. The Giants' Causeway is exposed for 300 yards, consisting of many thousands of vertical columns of largely six-sided formations, though many of them have five, seven, eight, or nine regularly formed sides. While the columnar structures vary in size, they range from 20 to 30 inches in diameter.

**GIBBON** (gib'bŏn), the name of an anthropoid ape native to the East Indies. It belongs to the same division as the oranges, gorillas, and chimpanzees, but is smaller and has a more slender form. The arms are sufficiently long to reach nearly to the ground when the animal stands erect. Several species have been studied. The active gibbon is remarkable for its power to swing itself from one tree to another. Other species include the lar, the hoolock, and the white-handed gibbon. These animals, while active in moving about among the boughs of trees, are not able to move rapidly on the ground.

**GIBEON** (gib'e-on), an ancient city of Palestine, about five miles northwest of Jerusalem. It was inhabited by Hivites at the time Joshua conquered Canaan, but they obtained safety and protection from Israel by professing to have come from a far country. When the deception was discovered, the Gibeonites were degraded to the condition of hereditary "hewers of wood and drawers of water unto all the congregation." The five kings of the Amorites besieged Gibeon because it had concluded an alliance with

Israel, but Joshua marched against them and it is said that "the sun stood still, and the moon stayed, until the people had avenged themselves upon their enemies." Saul persecuted and nearly exterminated the Gibeonites and their land was possessed by the tribe of Benjamin, but later it became a possession of the Levites. The sanctuary was at Gibeon in a part of the reigns of David and Solomon. The village of El-Jib, located on a summit of a hill characterized by massive ruins, is supposed to be the site of Gibeon.

**GIBRALTAR** (jĭ-bral'tēr), a town in the southwestern part of Spain, situated on the west side of a strongly fortified rocky peninsula of the same name, both belonging to Great Britain. The town occupies a site north of the place where the peninsula terminates in Europa Point, on Gibraltar Bay, and has a convenient and spacious harbor. It is a free port, has important commercial business, and is utilized by the British as a distributing station for their manu-



VICINITY OF GIBRALTAR.

factures. The principal street is about one mile long, with which others intersect at right angles. It has many large buildings, including barracks, two theaters, a naval hospital, the governor's building, several churches, and the admiralty. The chief export commodity from the town is wine, though there is a considerable trade in fruits, textiles, and machinery. Several remains of cathedrals of Moorish construction are in evidence, and near the town are the celebrated Alameda Gardens. The lighthouse, built in 1841, is situated on Europa Point, casting a light 150 feet above the sea, which can be seen fully twenty miles. The population of the town, in-



cluding the garrison of about 6,000 men, is 26,382.

The rocky peninsula of Gibraltar rises to an elevation of 1,410 feet. It is three miles long and three-fourths of a mile wide, and is connected with the mainland by a sandy isthmus known as the neutral ground. On the west is the Bay of Gibraltar, and its eastern and southern shore is washed by the open sea. Powerful artillery is planted on the entire rocky precipice. The south side is almost inaccessible, while the precipitous and rugged extremity on the west is made impregnable by powerful batteries. Caverns and galleries sufficient for the passage of carriages have been cut through the solid rock in various angular and parallel lines, and at intervals of twelve yards portholes have been drilled, which serve for firing heavy ordnance. Besides these are numerous caverns, of which the Hall of Michael is the largest, having a height of 70 feet, a width of 90 feet, and a length of 225 feet, with stalactite pillars supporting the roof. The entrance to this cavern is 1,106 feet above the sea.

This precipitous peninsula was known to the Greeks as Calpe. The Saracens, under their leader Tarik Ibn-Zeyad, first fortified it in 711-12, after whom it was called Gebel-al-tarik, from which its present name was originated. Later it fell into the hands of the Moors and was conquered by the Spaniards in 1462, who so strengthened the works that engineers considered it impregnable. After a vigorous bombardment by the Dutch and English forces in 1704, it was reduced and captured. The Peace of Utrecht conveyed it to the English in 1713, in whose hands it has since remained, though desperate efforts to dislodge them were made by the French and Spanish in 1779, but they were completely repulsed after battling in vain for six days. It is no longer the key to the Mediterranean, since modern warships are able to pass it without sustaining effective damages by the guns of the fortress, and, besides, it is not at all likely that the fortress would hold out against modern implements of war. The rocky eminence of Gibraltar and Abjla, now called Ceuta, a precipitous cliff across the Strait of Gibraltar, were anciently called the pillars of Hercules.

The Strait of Gibraltar is a narrow channel connecting the Mediterranean with the Atlantic. It is 36 miles long and has an average depth of 900 feet. At its narrowest point, west of Gibraltar, it is about ten miles wide. A strong and continual current flows in the center of the strait into the sea from the Atlantic, an opposite current passing at the bottom along the

coasts, into the ocean. The strait separates the Iberian Peninsula from Africa.

**GIBRALTAR, Strait of.** See Gibraltar.

**GILA** (hē'là), a river of the United States, rises in the northwestern part of New Mexico, flows westward through Arizona, and joins the Colorado at Yuma, about fifty miles from the mouth of the latter river. The length is 500 miles. Among its tributaries are the Rio San Pedro, Rio Santa Cruz, and Rio Verde. The Rio Santa Cruz discharges into the Gila only part of the year, being lost in the sand much of the time. Ruins of a prehistoric people are found in the Gila basin, and in its proximity are mines that yield gold and silver.

**GILA MONSTER**, a poisonous lizard, one of the largest in North America, found in the region of the Gila River and the sandy deserts of Mexico. It is inactive and stupid. The average length of the body is about one foot. At the base of the teeth, which are grooved like those of snakes, are large salivary glands. The bite is fatal to small animals and is considered somewhat dangerous to man. The gila monster is classed with the *heloderma*, a genus of North American lizards, which embraces only two species.

**GILBERT ISLANDS**, an archipelago in the Pacific Ocean, located on the Equator, almost south of the Marshall Islands. The group includes sixteen small islands, chiefly of coral formation, and the area is 166 square miles. Cocoanut, taro, and various tropical fruits are the chief products. The climate is favorable and the inhabitants are mostly semicivilized, but a number have been converted to Christianity. A part of the islands formerly belonged to Germany, but since 1892 they have been British territory. Population, 1906, 35,036.

**GILDING** (gild'ing), the process of applying a thin layer of gold to a surface, such as the surfaces of wood, paper, metal, leather, plaster of Paris, etc. While the processes of gilding differ with the nature of the substance to be gilded and the kind of effect required to be produced, they may all be classified under three heads: *mechanical gilding*, *chemical gilding*, and *encaustic gilding*. In a common method of mechanical gilding or oil gilding, from four to ten coats of whiting mixed with white glue are applied, each in turn being smoothed down with sandpaper and a pumice stone. This surface receives the gold leaf, which is put on by means of a brush. A false gilding, although an old invention, is now used extensively to make a cheap and quite durable gilding. The molding is first covered with silver leaf or tin foil and then is coated with a yellow paint.



Metals are usually gilded by a process of electrotyping (q. v.), but, besides this, various methods of chemical gilding are employed. Water or wash gilding consists in applying to metal a wash of an amalgam of gold and mercury and afterward evaporating the mercury by heat, leaving the gold firmly adhering to the surface of the metal. It is worth noticing that this process of gilding is the best form, being more durable than electro-gilding, and is now used in the more costly kinds of decorative work. Fully 30,000 buttons an inch in diameter may be gilded with one ounce of gold. Other methods of chemical gilding are cold gilding, Grecian gilding, and gilding by immersion. *Encaustic gilding* is applied usually to glass and porcelain. An amalgam of gold protosulphide with iron and turpentine, or other substances, is painted on the ware, and the whole is subjected to heat, which fixes the gold, the luster being brought out by burnishing.

**GILEAD** (gīl'ē-ūd), a mountainous region in Palestine, lying east of the Jordan. It became famous because of being allotted to the tribes of Gad, Manasseh, and Reuben, being of much pastoral value for their large herds. The Scriptures mention its fertility in producing grasses and forests, and names Jabesh, Ramoth, and Jazer as its important cities. Among its rivers were the Arnon and the Jabok. It was rich in aromatic plants.

Gilead was conquered from Sihon and Og and was held against the Midianites, Ammonites, and Syrians. However, it was finally captured by the Assyrians, who carried the people away in captivity. David found an asylum in Gilead during the rebellion of Absalom. Here Ishbosheth, the son of Saul, was proclaimed King by Abner. Jesus visited the region several times.

**GILLS**, the respiratory organs of aquatic animals, as fishes, amphibians, mollusks, and crustaceans, serving to breathe the air dissolved in water. In fishes they consist of vascular processes of mucous membrane on either side of the neck. Water is taken into the mouth and forced out through the gill slides, which act upon the blood as it circulates through the vascular fibrils. The gills in invertebrates are variously situated.

**GILOLO** (jē-lō'lō), or **Jilolo**, an island of the East Indies, the largest of the Moluccas or Spice Islands, and sometimes called Halmahera. It has an area of 6,350 square miles. The surface is mountainous, the coasts are irregular, and the climate is tropical. Much of the soil is fertile. Among the chief products are spices, sago, fruits, timber, and edible

birds' nests. Cattle, horses, and sheep are grown successfully. Galela and Potani are the chief towns. The island belongs to the Netherlands. Population, 1906, 120,108.

**GIN** (jīn), an alcoholic liquor distilled from grain and flavored with common salt, juniper berries, oil of turpentine, and various allied substances. In making gin, as in other beverages, each rectifier has his own recipe for regulating the quantities of flavor used. The most renowned article comes from Schiedam, Holland. Alcohol constitutes about fifty per cent. of high grade gin.

**GIN**, a machine used for raising weights. A common form of the gin consists of three long poles fastened together at one end, having a pulley attached, and the poles are set upright with the lower ends equal distances apart. A rope is passed through the pulley and fastened to a windlass, by the revolution of which the weight is raised. The gin for raising coal and other substances from mines is made by erecting a shaft with a large drum, to which is attached a transverse beam, having a horse hitched at one end. The horse is driven in a circle to raise the weight. The horse power is disappearing rapidly before the steam engine, but the drum is still in common use.

**GINGER** (jīn'jēr), a genus of plants indigenous to the East Indies, but now cultivated in the West Indies, South America and West Africa. The ginger of commerce is obtained from the rootstalk, which is about the thickness of a man's finger. A very noted grade of ginger comes from Jamaica. It is used as a medicine, especially in a powdered form, and in preparing mild drinks, such as ginger ale. In medicine it is used chiefly as a stomachic. Essence of ginger, which is properly a tincture prepared of alcohol and ginger, is of value for flavoring.

**GINGHAM** (gīng'am), a class of cotton dress goods woven of plain dyed yarn, usually in checks or plaids. Real gingham differs from calico in that the colors are woven with the cloth instead of being stamped on after weaving. Although gingham was first made in the East, especially in India, it is now an important article of manufacture in Europe and America.

**GINSENG** (jīn'sēng), the root of the *Panax ginseng*, which is native to Asia and North America. It is so named from a Chinese word which signifies *likeness of a man*, owing to the fact that specimens are sometimes found which resemble the human form. These are particularly valuable and often sell for their weight in gold. The ordinary prices range from \$2 to \$4 per pound. The Chinese employ ginseng for



aromatic purposes, but principally as a panacea in cases of bodily weakness, though its virtues are limited. Ginseng is collected in many parts of the United States for exportation. It is cultivated in some places, but not very profitably, since it requires about five years for the root to mature.

**GIRAFFE** (jĭ-răf'), or Camelopard, the tallest of quadrupeds, constituting a distinct family of ruminants and the only species of its genus. It is a native of Africa, ranging from Nubia to the Cape of Good Hope.



GIRAFFE.

Upper view shows prehensile tongue.

Giraffes are gregarious in habit, living in small herds, and feed on the leaves and small branches of trees. They stand eighteen feet or more in height, which is due to the long fore legs and neck. When browsing on grass, the fore legs are stretched apart as far as possible so as to permit the head to reach the ground. The body slopes back, the legs are slender, and the hoofs are cloven. On the head are two protuberances called horns, which are covered with skin, hair, and bristles. The tongue is very long and prehensile, being employed to grasp food, for which purpose it may

be protracted and retracted at will. The hair is short and smooth, of a reddish-white color, and is marked with rusty-brown spots. Their peculiar gait in running resembles a pace. Giraffes are inoffensive, seeking safety in flight, and in captivity become docile and playful. Their flesh is eaten, being quite nutritious, but is not esteemed as food by Europeans. They supply only a limited quantity of milk.

**GIRARD COLLEGE**, an institution of learning at Philadelphia, Pa., established in 1832 under a will made by Stephen Girard. It was founded for the purpose of providing facilities to educate and maintain poor white male orphans. Admission is open to students between six and ten years, and they may attend the institution until the age of eighteen years is reached, when they are to be bound out in the arts and trades. The founder provided that applicants for admission are to be given preference in the following order: those coming from Philadelphia; next, Pennsylvania; next, New York; next, New Orleans. Since then the courses of study and the regulations have been modified to provide for the newer conditions which resulted from industrial progress. The institution has 75 professors and instructors, 1,800 students, and a library of 18,000 volumes. The value of the property aggregates \$18,500,000 and the net income is \$1,150,000. Some of the ablest and most eminent men of America are included in the alumni.

**GIRONDISTS** (jĭ-rŏn'dĭsts), a political party of France during the Revolution. They were so named from the department of Gironde, whose deputies were the acknowledged leaders of this organization. Among the chief representatives were Guadet, Brissot, Pétion, Vergniaud, Dumouriez, and Roland. The Girondists were a party of moderate republicans, but their opponents, the Jacobins, charged them emphatically with plotting against the unity of the nation. In 1793 twenty-two of the leaders were arrested, including Madame Roland, who was an active supporter of the party. Most of them were taken prisoners and beheaded, or died by their own hands.

**GIZZARD**, a part of the alimentary canal of birds and some invertebrates, whose function is to grind up the food. In this respect it answers the purpose of the teeth in many animals. In birds the gizzard is the second, or true, stomach, in which the food is crushed after it is softened in the glandular stomach,





CREVASSE IN MUIR GLACIER, ALASKA, THE DEPTH BEING OVER 200 FEET.







or *crop*, which is situated in the lower part of the esophagus. The interior is lined by a horny epithelium, or shelly plates. The gizzard is assisted in grinding the food by small pieces of gravel and other hard substances, which are swallowed for that purpose by most birds.

**GLACE BAY** (glás), a city of Cape Breton Island, on the northeastern coast, fifteen miles northeast of Sydney. It is on the International Railway and has a good harbor. The surrounding country contains productive coal mines. It has a large trade in merchandise, machinery, coal, and produce. Among the principal buildings are several fine schools, a public library, and many substantial business blocks. Population, 1906, 7,845.

**GLACIAL PERIOD** (glá'shál). See **Glaciers**.

**GLACIERS** (glá'shērz), the immense masses of ice and snow which move almost imperceptibly from higher to lower levels, found chiefly in the more elevated valleys and slopes of mountains. In the upper parts they consist of soft snow, which is later pressed into compact masses, and at the lower portion the accumulations are constituted of clear, hard ice. The great quantities of snow which form above the snow line press in masses slowly down the slopes. By the pressure, due to the weight of the layers, the air confined in the snow is pressed out, and the lower part of the glacier is thus changed into a compact mass of pure ice. In some cases ice is formed from the snow by successive thawing and freezing, though this phenomenon more or less affects all glaciers below the snow line.

Glaciers resemble rivers, since the solid material which passes into them moves as drainage within their channel. However, the current is much slower, often imperceptible. The larger glaciers, like rivers, have numerous affluents, and peculiarities of flow and velocity. Where tributaries unite and flow on with the main mass, they do not intermingle as the waters of rivers, but the mass coming from each affluent may be distinctly traced throughout the remainder of the course. Owing to the diminished friction at the top and middle portions, these parts move more rapidly than those at the bottom or sides, and in this respect are similar to rivers. On the surface they are usually quite smooth, but at regular intervals in the direction of a valley and in the slope of the bed they are broken into deep fissures called *crevasses*. These occur most frequently at the bend of a valley, where one side is compressed and the other extended, and at such places the crevasses extend obliquely up the stream, and at abrupt descents in the bed directly across.

The crevasses vary from less than an inch to great chasms over one hundred feet in width, and in the larger openings the depth is generally greatest. On the surface the appearance is a dirty white, while down the walls of the crevasses the ice has an appearance of deep azure blue. Where glaciers flow from elevated mountains in the temperate climates, they usually melt in the warm months of the year as they proceed downward, and are thus transformed into streams of water. In this way they frequently give rise to rivers. Among the rivers that have their origin in glacier streams are the Rhine and Rhone of Europe and the Ganges of Asia. The velocity of the ice and the rapidity with which it melts govern the extent of the glacier below the snow line. They retreat up the mountain during an unusually warm summer, following a light snowfall in winter, and, on the contrary, advance further down the valley when heavy snows in the winter are followed by a cool summer.

Glaciers possess much transporting power, and carry to a lower level large volumes of stone and dirt which accumulate on the surface of the moving mass, after rolling down from adjacent elevations. The accumulations are called *moraines*. Generally the moraines are most abundant at the side of glaciers, where they are called *lateral moraines*. At the point where two glaciers unite the meeting edges are marked by a crevasse which is called the *medial moraine*, and at the end of the glacier a *terminal moraine* extends across the valley in a wide curve. Medial moraines one hundred feet in height are not uncommon, while terminal moraines attain to several hundred feet. The erosive power of glaciers is very effective and tends to greatly deepen the valleys through which they move. Evidences of extinct glaciers are found in many localities, and their former existence is attested by deep grooves cut in the bottom and sides of the valleys, and by deposits formed of rock, mud, and boulders carried by their moraines. When glaciers extend into the sea, like those of Greenland, the base is undermined by the warmer waters of the ocean and the waves break off great fragments, which form floating mountains of ice called *icebergs*. These are carried into warmer latitudes by ocean currents, where they drop their load of moraine by melting. Icebergs appear most numerous in the north Atlantic, into which they descend from the extensive Arctic glacier region.

The total number of glaciers in the world is not less than 1,100, of which one hundred are of large size. In the tropical and temperate

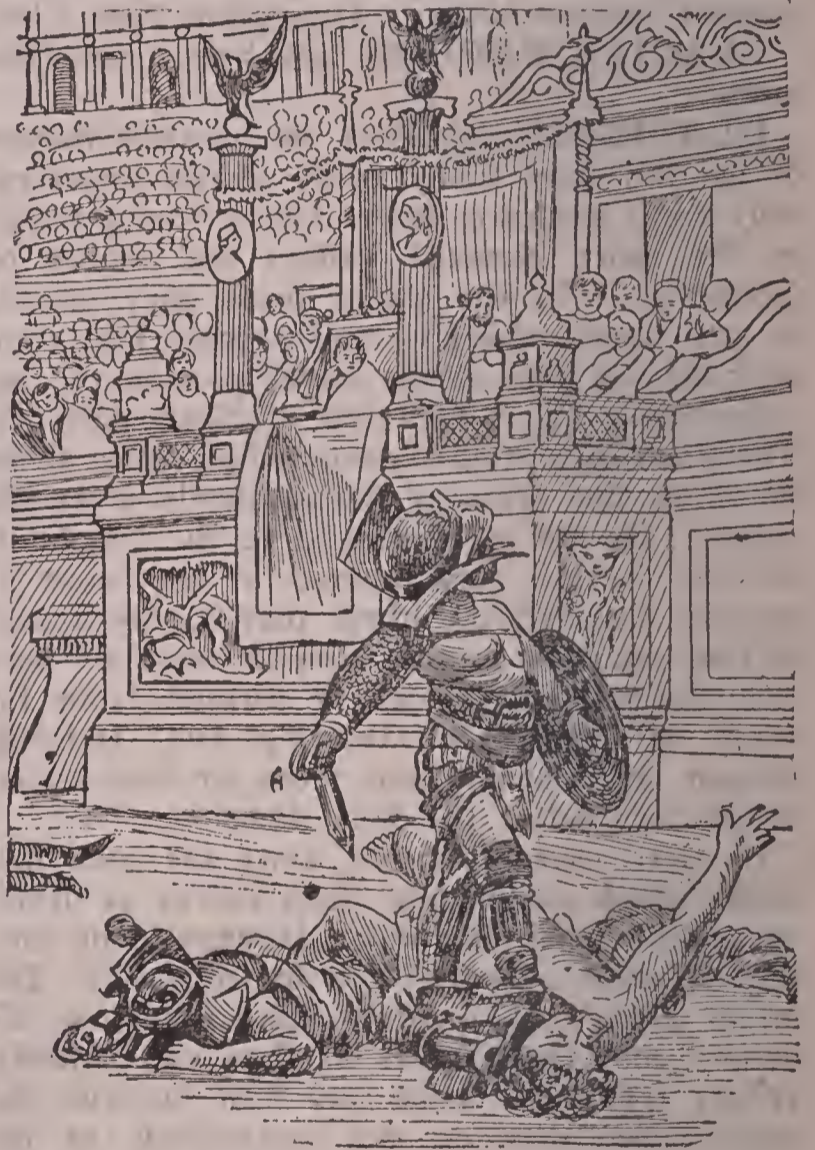


climates they abound only in the more elevated portions of mountains, while whole continents and islands are apparently covered by them at the poles. Those of the Antarctic regions are probably sheets of ice fully 10,000 feet thick. The Muir glacier, in Alaska, is about 150 miles long and 500 feet deep, and is probably the largest in the world. In the north polar region they abound extensively, but those of Greenland and the islands north of North America are the only ones known to any extent in that region. Others are more or less widely distributed in the continents. Those of the central Alps of Europe have been studied with the best results. The most widely known of these is the Mer de Glace, which rises on the slopes of Mont Blanc and has three large branches, descending into the vale of Chamouni. The longest glacier of the Alps is Aletsch, which has a course of fifteen miles, while the Aar glacier has an estimated depth of 1,515 feet, being regarded the deepest.

The Glacial period, or Age of Ice, is so named from the climatic conditions which prevailed in the Northern Hemisphere at a time when intense cold and sheets of ice prevailed in what are now temperate latitudes. It began in the Newer Pliocene period and terminated before the close of the Post Pliocene, though Arctic conditions prevailed only at intermittent times. The occurrence of great glacial action is evidenced by numerous traces in North America and Eurasia. In the Alpine regions evidences of early glacial action are common, and it is certain that the plants now found on the summits of these mountains were brought down from the Arctic regions at that time. Man existed during the latter part of the two distinct glacial periods traceable in the Alps. The cause of these phenomena in past ages is explained by Sir Charles Lyell by assigning to the north polar regions vast elevations, from which the streams of ice moved southward. Sir John Herschel attributes astronomical reasons, which seem the more probable. The chief cause assigned is the varying eccentricity of the earth's orbit. In 1800 A. D. it was .0168, but 210,000 years prior to that time it was .0567, making the difference of 10,250,000 of miles and the winter days 27.8 in excess. However, the possibility of astronomical causes is militated against by the absence of glacial periods prior to the Newer Pliocene time.

**GLADIATOR** (glăd'ī-ā-tēr), in Roman antiquity, a man who fought with deadly weapons against another gladiator or wild beast, especially in the amphitheater, for the amusement of the people. The first gladiatorial fight occurred at

the funeral of Brutus in 264 B. C. between his sons, Marcus and Decius. Originally, a gladiator was a prisoner, a slave, or criminal; later the performance became a mere spectacle, and knights, senators, and even women and emperors entered the arena. The gladiatorial exhibits were announced by private circulars or proclamations. Gladiators marched to the arena on the day of the performance, where they were matched in pairs and their weapons were formally examined. In many cases the combats were fought between a man without arms, but provided with a net in which to ensnare his op-



ROMAN AMPHITHEATER.

ponent and a three-pronged fork with which to spear him when caught, and an opponent in full armor, who sought safety in evading his enemy while seeking to pursue and kill him. The audience witnessing the combat became frantic with excitement, and yelled and applauded while rising in their seats, shouting their approval when ghastly blows were dealt, followed by blood spouting forth. In most places the arena was protected from the rays of the sun by a gorgeous awning, while strains of music floated in the air, drowning the cries of death. It was not uncommon to distribute Syrian perfumes to



overcome by their odor the scent of blood, and the spectators were delighted by the most brilliant scenic decorations.

The gladiatorial battle opened at the sound of a bugle and a shout of command. A gladiator dropped his weapons when severely wounded, and as a plea for life held up his forefingers. This was sometimes in the gift of the people, but more often was vested in the vestal virgins. During the empire the power to spare life was lodged in the sovereign. Mercy was signaled by waving handkerchief or by a turned down thumb, while all hope was forbidden by a clenched and upright fist. Only the brave were accorded mercy. In the time of Julius Caesar it was common to give exhibits by couples fighting. He gave a show in which 320 were engaged. Titus provided an exhibition that continued one hundred days. In it the gladiators fought with wild beasts. The great gladiatorial exhibition of Trajan engaged 10,000 men, who fought with each other and wild beasts, continuing 123 days.

The wild beast fights were the most revolting, and by them many Christian martyrs lost their lives. Among the animals engaged were elephants, rhinoceroses, camelopards, hippopotami, tigers, lions, and many others of a ferocious nature. During naval fights the arena was flooded with water. A naval fight given by Augustus engaged 30 vessels, and during the combat 36 crocodiles were pursued and killed. The combatants were classified according to the arms they carried. Thus, one carrying a shield, helmet, sword, and breast armor was called *sammite*; those carrying a lasso or noose, the *laquearii*; those armed with Thracian buckles and a short sword were known as *secutores*. Gladiatorial games were forbidden in the reign of Emperor Honorius, about 404 A. D.

**GLADIOLUS** (glă-dī'ō-lūs), a genus of ornamental plants of the Iris order. They have bulbous roots, a tubular two-lipped corolla, a trifid stigma, and ensiformed sheathing leaves. Many species are native to South Africa and Eurasia. The flowers are beautiful and richly colored, and many species have been improved by intercrossing. In color they are greatly variegated and include pure white, violet, crimson, scarlet, and yellow. Each of these is variously modified and shaded. As house plants they are popular, the majority of those cultivated in America coming originally from Cape Colony.

**GLANDERS** (glăn'dērz), a contagious disease which affects certain domestic animals and which may be communicated from them to man. It is especially harmful to the ani-

mals that have an undivided hoof, such as horses and mules, but swine, cattle, and sheep are subject to it. The disease is due to a specific microbe discovered in 1882. At present no treatment is known under which a cure can be effected, though in rare instances the affected animal may recover. It makes its appearance in swellings of the submaxillary glands, accompanied by a dry cough and discharges from the nose. These discharges cause the disease to spread, especially when left in contact with the harness, stables, vehicles, or the watering places. As the disease advances small bunches or nodules form under the skin, which afterward break open and form ulcers. It is recommended that animals affected with the glanders be killed and that the places frequented be carefully disinfected.

**GLANDS**, in anatomy, the organs of the body that secrete or separate some particular fluid from the blood. Anatomists divide them into two great classes, known as true secreting glands and ductless glands. *Secreting glands* are special organs, such as the liver, kidneys, and pancreas, and the mammary, lachrymal, and salivary glands. The *ductless glands* include the spleen, the thyroid, the thymus, and the parotids. An ordinary secreting gland consists of a number of follicles, all of which open into a common duct by which the glandular product is discharged. The follicles are contained in the interior cells, which are the active agents in the secreting process, while their exterior is surrounded by a network of capillaries, from whose contents the materials of secretion are extracted.

In the lower class of animals the glands are quite simple as compared to the same or similar glands in the higher forms of animal life. The *mammary gland*, which is quite complex in the higher mammal, presents a very simple arrangement in the lower types of this class, being merely a cluster of follicles, each of which discharges its contents by its own orifice. The *thymus gland* is located partly behind the sternum and partly in the lower part of the neck, and is largest in infants, disappearing at or about maturity. Its function is to form colorless corpuscles in the blood, and it likely supplies a need in the infant that is cared for by other organs at maturity. Hibernating animals have this gland, which is enlarged by the presence of fat during activity, and appears to supply nourishment and maintain temperature during the period of hibernation. The *sudoriferous* are the sweat glands; the *parotid glands* are the seat of the disease known as mumps; and the *submaxillary, parot-*



*id*, *buccal*, and *sublingual* secrete the saliva. Inflammation and solid swelling are among the diseases that affect the lymphatic glands.

**GLASGOW** (gläs'kô), the largest and most important city of Scotland, situated on the Clyde River, in Lanark County. The southern part of the site is level, while the northern portion is situated largely on convenient elevations of varying heights. Many of the streets are platted at right angles, being both wide and straight, and the buildings are mostly of freestone. For architectural beauty Glasgow ranks among the best cities of Great Britain. A Gothic cathedral in the northeastern part of the city is the most historical structure. It was commenced in 1240 and completed within 200 years. The length is 320 feet; breadth, 63 feet; and height, 90 feet, with a spire from the center 225 feet high. Among the buildings of modern construction are the Bank of Scotland, the general post office, the Merchants' House, the Royal Exchange, the Stock Exchange, and the Central Station and the Saint Enoch Station hotels. The institutions of learning include the University of Glasgow (q. v.), Free Church College, Glasgow and West Scotland Technical College, Saint Mungo's College, Saint Margaret's College for Women, and Anderson's College of Medicine. The Mitchell Library, which receives a grant from the city and serves the purposes of a public library, has 125,000 volumes.

George Square, the finest public place in the city, contains many monuments of great beauty, including those of Queen Victoria, Sir Robert Peel, Sir Walter Scott, and the Prince Consort. It has many fine public parks, numerous boulevards, electric lights and street railways, telephone and telegraph connections, and is the junction of numerous railroads. Among the manufactures are woolen, cotton, silk, and linen goods, calico prints, dyed and bleached textiles, iron and steel, machinery, chemicals, pottery, tobacco, sugar, glass, beverages, jute, and leather. In 1895 a central underground railroad was opened for traffic, which affords rapid transit to many parts of the city. Since 1894 it has owned and operated the system of street railways. Practically all of the public utilities, such as the waterworks, meat markets, harbor ferries, and systems of gas and electric lighting, are owned by the municipality.

The importance of Glasgow is due largely to its location near the mouth of the Clyde, which permits navigation by the largest vessels. The interior highlands and adjacent districts are reached by means of canals, railways,

and electric lines. Its harbor and docks are very extensive and near them are vast marine-engineering and shipbuilding yards, which are noted for their large output of vessels. In the vicinity of the city are deposits of coal and iron, through which the manufacturing enterprises have been largely facilitated. Glasgow was founded in 560 A. D., when the Celts that populated the region were induced by Saint Kentigren to embrace Christianity and a small church was erected on the site of the great cathedral. However, its prosperity began in 1707, when its commerce became widened and shipbuilding took on large proportions. At present it has seven representatives in Parliament. Population, 1907, 847,584.

**GLASGOW, University of**, an institution of higher learning of Great Britain, located at Glasgow, Scotland. It was founded by Bishop Turnbull in 1451, but was reorganized by acts of Parliament in 1858 and in 1889. The university is governed by a special court, which consists of the principal, the rector, the lord provost of Glasgow, and a number of representatives of the city and university. The chancellor is elected by the general council and holds his position for life, while the rector is appointed for three years by the students. The departments include those of science, art, law, medicine and surgery, and theology. It has a fine botanical garden, an observatory, and a library of 215,000 volumes. The attendance averages about 2,350 students. Many noted scholars and scientists are included in the alumni.

**GLASS** (gläs), the compound product of silica, having at least two metallic oxides, the most common being those of calcium or lead and potassium or sodium. It is brittle and sonorous at ordinary temperatures, generally transparent or translucent, and is made soft and ductile by heating. The point of melting and fusion varies with its composition. Hydrofluoric acid acts upon it, though ordinary solvents do not. It breaks with a vitreous fracture. Its discovery is not known, though as a commodity of utility and commercial importance it is as old as any known production of man. The Egyptians made use of glass before the Hebrew exodus. Their monuments and ruins bear evidence that they used it for vases, beads, and various ornaments as early as 3250 B. C. The Assyrians, Babylonians, Phoenicians, Greeks, and Romans were all more or less acquainted with and skilled in its manufacture. The vases made by the Romans were among the most beautiful productions of their arts, being finely finished by engraved figures



and relief forms, variously colored on shaded background, and sometimes more or less transparent. Among the surviving specimens still preserved is the famous Portland or Barberini vase, though relics of inferior productions of great antiquity are abundant.

The use of glass for windows is much newer than its manufacture for other purposes. It was not utilized in buildings until 250 years after the beginning of the Christian era. Europeans began to use glass extensively to admit light into dwellings and public buildings in the latter part of the 3d century, though for the purpose of lighting churches it was used fully four centuries earlier. The early Puritan settlers of Jamestown, Va., began its manufacture in 1608, and from their rude beginning it has sprung into a vast industry in America. The production in the United States represents a total annual value of about \$68,500,000. Practically all classes of glass are manufactured in Canada and the United States and several varieties, such as pressed glass, are American inventions. The principal manufactures of Europe are located in Germany, Belgium, and France, though the enterprise is carried on with more or less success wherever civilization extends. In window glass the American product exceeds all others in quality, while in the finer plate glass and the grade used for optical instruments the manufactures of Europe still exceed those of America. Among the states producing glass extensively are Pennsylvania, New Jersey, New York, Massachusetts, Indiana, Ohio, and Missouri.

In manufacturing the various kinds of glass different materials are used, such as fine sand or powdered flint, together with salt, alkali, alkaline earth, or metallic oxide. Crown, sheet, and plate window glass are made of silica, lime, and soda. *Flint glass* used for dishes, lamp chimneys, goblets, and bottles is more brilliant and tough than window glass and is made of silica, lead, and potash, though some forms of bottle glass are made of a variety of mixtures containing alumina. Any kind of glass may be *colored* by metallic oxides, though other substances are employed. In applying the coloring matter it may be mixed with the other ingredients while in a melted state, or a partially colored effect may be secured by taking the melted material from two vessels—the one colored and the other transparent—and in manufacturing the product so construct the desired article that a coat of colored glass will cover the other. Alumina and silver produce a yellow color; copper, gold, and oxide of iron, the reddish; cobalt, bluish; oxide of cop-

per and oxide of iron, the greenish; chloride of silver with peroxide of iron, the orange color. To destroy the transparency of glass it may be roughened on the surface, when it is called *frosted glass*, and has the appearance of hoar frost. It is used in buildings where light is admitted, but the view is obstructed. Among the most important properties of glass is its transparency, and, next to it, its effective resistance to acids. When heated, it can be formed into any shape, or may be spun into fine threads and used for ornaments and wearing apparel. It is a very efficient nonconductor of heat. When cold, it is most effectively cut by the diamond.

In glass manufactories the furnace is constructed of fire brick. Two openings are arranged in the furnace; one contains large melting pots and the other is employed to facilitate placing the half-blown product into the heat for softening it. Gas and crude oil are used for fuel, as most other fuels emit too much smoke. The melting pots are of the best fire clay and cement, usually three feet high, about four feet in diameter, and are open at the top. They are made with much care in order to bear the immense heat required in melting the sand and other materials of which the glass is made. Under ordinary care pots serve about two months and the furnace about two years, though neither should be allowed to cool. The melted material contained in the pots is dipped by workmen with an iron tube, called a *blow-pipe*, this being turned over and over until a sufficient quantity gathers and assumes an oval form. After placing the melted glass in a proper mold, it is blown and formed into the desired shape, such as a bottle, vase, tumbler, or some other vessel, this depending on the mold used.

The *engraving* on glass is effected by means of a sand blast, while *glass cutting* is done by a process of grinding on a cast-iron wheel, with which water and sand is brought in contact. Cut glass is prized for its brilliancy and is used in making fine grades of table glass. The ornamentation is not put on until after the glass has been annealed, a process under which it is gradually cooled, and requires about 36 hours. *Sheet glass* is made by taking the melted material from the pot, when it is blown and whirled until it assumes a cylindrical form. The ends are then cut off, the cylinder is cut open longitudinally, and the sheet is heated, pressed and rubbed until it is flattened out. *Plate glass* is made by pouring the melted material upon a table, which has a marginal edge equal in height to that desired for the thick-



ness of the glass. It is then flattened out by a roller passed over the table, resting on the edges, and thus secures equal thickness throughout. In making *stained glass*, the paint, which is usually compounded of the oxides of metals and oil of turpentine, is applied when cold and the colors are afterward stained into the glass by heating the latter. *Mosaic glass painting* is a department of art painting and is not to be associated with glass manufacture. The most common mosaic glass painting is executed with an enamel or a stain, though stained glass is often used for the background.

**GLASTONBURY** (glás'tūn-bēr-ī), a town of Somersetshire, England, on the Brue River, about twenty miles southwest of Bath. It has some export trade and various manufacturing establishments. In the vicinity are mineral springs. Glastonbury is noted chiefly for its ancient tradition and history. It is famous on account of the legend that Joseph of Arimathea came there with the Holy Grail and founded the first church in Britain. In 1539 the supposed grave of King Arthur was discovered while excavating for the abbey and a church. The abbey is one of the oldest in England. Population, 1906, 4,185.

**GLAUBER'S SALT** (glou'bērz), the popular name of a salt found native in sea water and the water of many mineral springs and saline lakes. It was so named from J. R. Glauber (1604-1668), a German chemist, who first prepared it by decomposing sodium chloride with sulphuric acid. Glauber's salt has a bitter saline taste, is soluble in water, and becomes liquid when heated. It loses most of its water by crystallization and becomes a white powder when exposed to the air. The chief use of this product is as a purgative medicine, especially in veterinary practice. It is used in fixing lead mordants in dyeing and printing and in the production of certain kinds of glass.

**GLAZING** (glāz'ing), the art of imparting a smooth, shining surface to anything, such as pottery, gunpowder, and paintings, to prevent them from being penetrated by fluids. The most common mixture for earthen vessels is constituted of ground flint with oxide of lead, which is generally used, but in various proportions and with different tints.

**GLEIWITZ** (glī'vīts), a city of Germany, in the province of Silesia, 98 miles southeast of Breslau. It is on the Klodnitz River and the Klodnitz Canal, has steam and electric railways, and is regularly platted and well paved. The manufactures include paper, glass, hardware, cigars, clothing, and machinery. Gleiwitz is first mentioned in the 12th century, but

its larger development dates since the last two decades. Population, 1905, 61,336.

**GLENCOE** (glēn'kō), a celebrated valley of Scotland, in the County of Argyll, near Loch Etive. The sides are almost perpendicular, rising abruptly to heights of 3,000 feet above the valley and giving the locality a wild and sublime aspect. In 1692 it was the scene of the Massacre of Glencoe, when Mac Ian, chief of the Macdonalds of Glencoe, was destroyed by his enemies under the leadership of Sir John Dalrymple. It had been arranged that he and his followers should have pardon if they submitted to William III. and Mary before Dec. 31, 1691, but the delay in the surrender caused his enemies to take advantage of the technicalities and treacherously destroy about sixty men, women, and children. Though the morning was stormy, about 300 men and women escaped, but a number of them perished from cold and hunger.

**GLENS FALLS**, a village of Warren County, New York, on the Hudson River, 55 miles north of Troy. It is on the Delaware and Hudson Railroad. The noteworthy buildings include the Crandall Free Library, Glens Falls and Saint Mary's academies, the Parks Hospital, and an old ladies' home. Among the manufactures are machine shops, iron foundries, brick works, paper mills, and cigar, shirt, and furniture factories. It has electric street railways and lights, waterworks, and a sewerage system. The surrounding country contains valuable deposits of limestone and black marble. It was incorporated in 1837. Population, 1900, 12,613; in 1910, 15,243.

**GLENVILLE** (glēn'vil), a village of Ohio, in Cuyahoga County, five miles from Cleveland, of which it is a suburban residential center. It is situated east of Gordon Park, on the Lake Shore and Michigan Southern Railroad, and is a well-improved place. The manufactures consist chiefly of furniture and machinery. It was settled in 1804 and incorporated in 1872. Population, 1900, 5,588.

**GLOBE**, a sphere used in geography and astronomy for the study of terrestrial and celestial phenomena. A *terrestrial globe* is a common schoolroom apparatus and is a useful supply in the study of geography. A globe of this kind may be made of plaster, metal, or pasteboard, upon the surface of which is a map or a representation of the surface of the earth. The extremities of an axis passing through the center represent the poles of the earth, and it is usually so constructed that it may be turned upon the axis to indicate the rotation of the earth. Meridians and parallels



of latitude are indicated by lines drawn upon the surface. The meridians are usually drawn through every 15° of the Equator, hence each two indicates points that differ by one hour in time. The globe is suspended in a brass ring somewhat larger than the diameter, within which it turns upon the axis, and is usually mounted on a wooden stand. In size globes vary from those six inches to four feet in diameter, though much larger ones have been constructed. A *celestial globe* has represented upon its surface the stars, which are placed in positions to indicate their actual situation in the skies.

**GLOMMEN** (glôm'men), the most important river of Norway, rises in Lake Aursundsjö, and flows into the Skager Rack. Its source is in the province of South Trondhjem, near the town of Röros, and its course of 350 miles is in a general southwesterly direction. In its course it passes the fortress of Kongsvinger and at its mouth is the city of Fredrikstad. The Vormen is its chief tributary. It is navigable for about thirty miles, but numerous falls and rapids interfere with its navigation farther up the course.

**GLOUCESTER** (glös'tēr), a river port and city of England, on the Severn River, about ninety miles northwest of London. Numerous railroads and canals facilitate important commercial enterprises, for which it is noted. Among the noteworthy buildings is the cathedral, one of the largest in England, being 140 feet wide and 420 feet long. The tower is 225 feet high. It contains the Great Peter's Bell, weighing more than three tons. Other buildings include the public library, a theological college, King's School, and an asylum for the insane. Among the manufactures are flour, cordage, cutlery, ships, ironware, and machinery. Gloucester was a Roman station under Aulus Plautius. At the time of the Saxons it was an important center of trade. Population, 1907, 52,435.

**GLOUCESTER**, a port of entry in Essex County, Massachusetts, thirty miles northeast of Boston. It is on the Boston and Maine Railroad, near Cape Ann, and includes Riverdale and several other villages. The municipal improvements include waterworks, electric and gas lights, stone and asphalt pavements, and electric street railways. It is distinctly a commercial city and its domestic fisheries are the most important in America. Those employed in mackerel and cod fishing include about 5,000 persons. It is the seat of a United States piscicultural station, is the center of a large foreign trade, and has a convenient harbor. The manufactures include clothing, machinery, muci-

lage, tents, seines, sails, canned fish, and granite products. In 1765 it had a population of 3,763, since which time it has grown steadily. Population, 1905, 26,006.

**GLOUCESTER CITY**, a railroad center of Camden County, New Jersey, on the Delaware River. It is on the West Jersey and Seashore and the Atlantic City railroads, one mile south of Camden, and is connected with Philadelphia by steam ferry. The chief industries are fishing and manufacturing. Among the manufactures are canned fish, calicoes, ginghams, and machinery. It was settled in 1677 and incorporated in 1868. Population, 1905, 8,055.

**GLOVE** (glöv), a covering worn on the hand, having a separate sheath for each finger. Gloves are made of various materials, such as silk, wool, linen, cotton, fur, and different classes of leather. Several kinds of the finer gloves are manufactured of the real-skins of goats, but most kid gloves are made of lambs' skins. The so-called dogskin, buckskin, and doeskin gloves are manufactured chiefly from sheepskin. In manufacturing this class of gloves the leather is dressed as light as possible and each glove is cut by means of a die. Much of the sewing is done by machinery. The glove is stretched over a metal hand, which is first heated on the inside, and the material is smoothed or dyed as desired. Gloves are cleaned with oil of turpentine, camphor, or benzine, the last mentioned being the cheapest and most serviceable substance now in use. Machine sewing is used largely in the cheaper grades, the best being hand-stitched. Gloversville, N. Y., contains large glove works, though factories are located in the larger cities throughout Canada and the United States. The finest and most expensive gloves produced in the world are made in France.

**GLOVERSVILLE** (glöv'ēr-z-vil), a city of Fulton County, New York, on the Cayadutta River, fifty miles northwest of Albany. It is on the Fonda, Johnstown and Gloversville Railroad. The streets are mostly broad and well paved. It has sewerage, stone and macadam pavements, electric lights, and street railways. Among the noteworthy buildings are the high school, the Nathan Littauer Hospital, and a public library with 10,000 volumes. The manufactures include machinery, vehicles, cigars, gloves, and buckskin and other mittens. In the manufacture of gloves it takes very high rank among the cities of America. It was known as Stump City until 1832, when it received its present name, and was incorporated as a city in 1890. Population, 1905, 18,672; 1910, 20,642.

**GLOWWORM**, a name applied to several



species of serricorn beetles. They somewhat resemble a caterpillar and are remarkable for the luminosity of some of the segments of the abdomen. The male has wings and emits a very faint light when flying about at night, and is attracted to the female by her soft, but strong, light. The luminous matter is capable of mixing with warm water, which increases its brilliancy. Though both sexes are luminous, the light in the female is much stronger than that of the male. The latter is wingless. See **Firefly**.

**GLOXINIA** (glōks-īn'ī-ā), a genus of herbaceous plants native to the tropical parts of America. It was so named from B. P. Gloxin, a German botanist, who developed a number of the species into fine flowering varieties. The



GLOXINIA.

common gloxinia has soft, velvety leaves and a nearly bell-shaped corolla. It flowers profusely. It is a favorite plant in flower gardens, both for the richly colored leaves and the graceful flowers.

**GLUCOSE** (glū'kōs), a sugar found in the vegetable kingdom and in honey. It occurs in small quantities in various animal substances, as in the blood and liver. Another name for it is grape sugar or starch sugar. It is less sweet than cane sugar and is manufactured in considerable quantities both in solid and liquid forms. A report made in 1840 by a committee of the National Academy of Science to the com-

missioner of internal revenue placed the sweetening power of ordinary glucose at about two-thirds that of cane sugar. The manufacture in the United States is principally from corn and in Europe it is made chiefly from potatoes. Its use is mostly for table syrups and confectionery, though it is employed in making artificial honey, in brewing beer and ale, and as a food for bees. In the production of artificial honey, the comb is made of paraffin and the cells are filled by machinery with a pure grade of glucose. Though less sweet than real honey, it is inviting, has a fine appearance, and can be sold at about one-half the price of genuine honey. As bleached grape sugar it is often mixed with table sugar and is used largely in the manufacture of condensed milk. A bushel of corn yields from 30 to 45 pounds of glucose. Manufacturers recognize four substances in corn, all of which are useful, but they need to be separated in order to secure the product desired. They comprise starch, oil, gluten, and bran.

The first process in manufacturing glucose is to soak the corn in water, in large wooden tanks, which hold from 500 to 1,000 bushels of corn. A temperature of 80° Fahr. is necessary, and fumes of burning sulphur are injected for the purpose of dissolving the gummy properties that bind together the gluten and starch. After soaking from one to three days, the corn is washed with fresh water and ground between corrugated rollers and crushed. Next the crushed material is placed in tubs and stirred mechanically with the view of separating the germs from the other portions. This is done for the purpose of afterward extracting the oil in the germs, which is about 50 per cent., and is valuable as a salad oil, for mixing paints, and in making toilet soaps. The oil is extracted from the germs by means of powerful hydraulic pressure of about 4,000 pounds, which causes it to run in a stream into tanks below, and the residue is utilized as a food for cattle. Next the gluten is removed from the starchy matter by means of a filter press, and is then dried and sold at about \$18 per ton for cattle food.

After practically all the ingredients unnecessary in the manufacture of glucose have been removed from the starchy material, the residue is mixed with water, and, by a process of filtering several times under the influence of sulphuric and muriatic acid, it is converted into a syrup. The converting is done most effectually under a pressure of from 25 to 40 pounds, the starch being heated by means of steam, about an hour being necessary to complete the process of converting starch to glucose or grape sugar. The product at this stage contains about 35 per



cent. of solid matter and is of a yellowish-brown color. To clarify it the liquid is passed through animal charcoal, by which all foreign substances and the coloring matter are removed, though for the higher grades a second filtration is necessary. After this process, the liquid is evaporated in a vacuum until it has reached the desired consistency for syrup or takes on the form of sugar.

The manufacture of glucose from beets differs somewhat from the process employed in using corn, though the steps employed in the later stages are similar. The amount of corn consumed annually in the manufacture of glucose in the United States is about 48,000,000 bushels, though the quantity varies somewhat with the price of corn and sugar, many factories limiting the output when corn is high in price and sugar is cheap, and increasing the capacity when the reverse is true. Within recent years glucose manufactured from beets has been encouraged under government supervision and has attained to the rank of an important industry. See **Sugar**.

**GLUE**, a viscid cement or adhesive preparation, usually a form of impure gelatin derived from boiling certain animal substances. Glue is used for uniting pieces of wood and other materials. It is made largely of the offal and heads of fish in seacoast towns, and from remnants of slaughterhouses, such as the feet, heads, cartilage, and sinews of hogs, cattle, and sheep. In some places it is made in large quantities from the fleshings, ears, horn piths, and intestines. These portions are freed from dirt and hair by boiling before they are actually utilized in the manufacture. The product is sold in the market either as thin, hard, or brittle cakes, which are afterward dissolved for use, or in a liquid form ready to be applied. *Gelatin* is made much the same as glue, but the parts used are selected with a view of making that product and are cleaned with greater care. *Fish glue* is made of isinglass dissolved in water. Commercial *isinglass glue* is manufactured of isinglass soaked in cold water, which, when swelled, is put in spirit of wine and later powdered chalk is added. *Marine glue* is made of equal parts of caoutchouc and shellac dissolved separately in naphtha and then mixed. *Waterproof glue* is derived from isinglass, for which purpose it is boiled in skim milk until the required consistency is obtained. *Fish glue* is used largely in making fine confectionery and as a gum for sealing letters.

**GLUTEN** (glū'tĕn), or **Vegetable Fibrine**, an elastic albuminous substance of a grayish-yellow color, obtained from the flour of wheat

and other cereals. The flour of good wheat contains about twenty per cent. of gluten. When gluten is heated, it crackles and swells, and when dried it loses more than one-half of its weight. It gives tenacity to the paste of flour and is important for its nutritive quality. Careful analyses have proven that the bran of wheat contains a larger per cent. of gluten than is found in the flour and, consequently, is more nutritious than the finely bolted flour. Since gluten gives tenacity to the dough, it is possible to judge of the quality of flour by test. The juices of certain plants, as well as oats, rye, barley, and other grains, contain gluten.

**GLUTTON** (glūt't'n), a carnivorous mammal of the badger family, ranging intermediately between the weasel and bear. It is found in the northern part of Eurasia and North America, extending as far south in the United States as Great Salt Lake. The common name applied generally is *wolverine*. Its fur is a valuable article of commerce, being used for muffs and sleigh robes.

**GLYCERIN** (glīs'ĕr-ĭn), an oily, transparent liquid compound, nearly colorless, with a sweetish taste. The different varieties are obtained by the decomposition of animal fats and some vegetable substances under treatment with alkalies, or superheated steam. It was first discovered by Scheele in 1779 while saponifying lard with the oxide of lead. Glycerin serves many useful purposes in the arts. It is of value as a preparation to keep more or less moist substances useful in the arts, such as paper for printing, tobacco, modeling clay, and materials used in rope making, spinning, weaving, and tanning. Glycerin is employed to lower the freezing point of water and as a preservative of meat and natural history specimens, and is the basic substance for many chemical products, among which nitroglycerin is one of importance. It is insoluble in ether, absorbs moisture from the air, and may be dissolved by a mixture composed of alcohol and water. In the manufacture of soap it serves a useful purpose in that it has the tendency to soften the skin, and as a medicine it is employed largely as a soothing and healing substance. Manufacturers of confectionery employ it. In some instances it is used as an adulterant of beer, wine, and milk, and is itself adulterated with cane sugar and glucose.

**GLYPTODON** (glĭp'tō-dŏn), a large extinct mammal, a member of the armadillo family, formerly common to the southern part of North America and the northern part of South America. Fossil remains are found in many parts of Florida, Texas, Mexico, and as far



south as Argentina. Four species have been described. The back and sides of the animal were covered with bony plates and the tail was encased in a sheath of horny scales. It resembled the Galapagos tortoise rather than the armadillo, but its size was much larger, since the fully developed specimens measured from six to eight feet in length.

**GNAT** (nät), a genus of insects found in marshy places, having wings laid flat on the back when at rest. The mouth of the female is furnished with a long, projecting proboscis adapted for piercing the skins of animals and sucking the blood, while the male has a proboscis with featherlike projections more suitable for sucking honey from plants. The eggs of the gnat are laid on the surface of stagnant water, hatching in about three days, and the young live in the water until they are fully grown. Several generations of gnats hatch in a single summer. The common mosquito belongs to this genus of insects.

**GNEISS** (nīs), a term introduced from the German to designate a variety of metamorphic rocks composed of mica, feldspar, and quartz. Gneiss differs from granite in that the constituents are arranged in layers instead of forming a confused aggregate mass. Originally it was sand or mud, having been acted on by heat in the course of time, and was converted into a hard, tough crystalline rock. It contains no fossil remains, since they were destroyed by the action of heat, but it is rich in copper, iron, cobalt, gold, silver, and other metallic ores. Large deposits are found in Northern Europe, especially in Norway, and in the Alpine region of that continent. New Brunswick, New England, and New York have large deposits of gneiss.

**GNOSTICISM** (nōs'tī-sīz'm), a system of philosophy devised to solve the origin of evil, and which flourished extensively from the 1st to the 6th centuries. It occupied a middle ground between Christianity and paganism, holding that knowledge rather than faith is the key to salvation. It promulgated the doctrine that there is an eternal God of infinite power, wisdom, and goodness. While there were many systems of gnosticism, all Gnostics agreed that God is incomprehensible, that all the natural and spiritual existences are derived from emanations from the supreme Deity, and that Christ was a superior emanation.

The two main branches of the Gnostics were generally distinguished as the Jewish and the Greek. Many sects of Jewish origin sprang up, including mainly the Sethians, the Cainites, and the Ophites, the last named being serpent wor-

shippers. Meander and Cerinthus were the leading Jewish Gnostics. The Greek Gnostics belonged chiefly to the schools of gnosticism founded by Basilides, Valentinus, Heracleon, and Ptolemy. Basilides and Valentinus were the founders of the Alexandrian Gnostics, which constituted the most important branch of the Gentile Gnostics. The literature of the Gnostics is extensive, but the sects did not endure beyond the 5th century.

**GNU** (nū), a kind of antelope found in small herds in South Africa, belonging to the ruminating animals. The hair is black, or yellowish, and bristly, the mane is white and stiff, and the



GNU.

tail resembles that of a horse. The average length of the body is nine feet. In all species the female is somewhat smaller than the male, but both have horns and cloven feet, and move with a gallop like a horse. When caught young, they can be domesticated. The flesh is considered a nutritious article of food.

**GOAT**, a hollow-horned ruminant quadruped which is allied to the sheep. It differs from the latter in having erect or keeled horns, an arched forehead, a short tail, and a bearded chin. The male is characterized by an unpleasant odor. Goats are common to mountain regions. They are skilled in passing over precipitous and rocky ledges, springing with much precision from rock to rock, and subsist on coarse and scanty food. It is thought that the domestic goat descended from the wild species of Western Asia, since they resemble those largely in size, form, and habits. Many species are known in both the wild and the domestic states, but they are commonly subdivided into goats proper and ibexes. Some are valuable for their production of wool or hair, flesh and milk. Many species are reared extensively in Eurasia for their flesh, which resembles mutton, and for general dairying purposes. The skin yields



leather known as morocco, which is valuable in the manufacture of gloves and shoes. The intelligence of goats is proverbial, many species being known for their playfulness, ingenious habits, skill in seeking protection, and contriving cuteness in obtaining food. Innumerable species have been domesticated in all inhabitable portions of the world. The food consists principally of grass and herbs, though they partake of many forms of vegetation and are fond of



HIMALAYAN GOAT.

ROCKY MOUNTAIN GOAT.

the younger shoots and bark of many shrubs and trees. The *Angora goat* (q. v.) has silky hair eight or nine inches long which hangs in curly locks from its sides. It is of a silver white color and useful in the arts and manufactures. The *Cashmere goat* (q. v.), a native of Cashmere, is rather undersized and has fine silky hair. Other species, including the *Maltese* and *Nubian* goats, are known for their superior milk, skin, and flesh. The *Rocky Mountain goat* is a native of the western portion of Canada and the United States, where it is generally known as the goat antelope.

**GOAT ISLAND**, an island in the Niagara River, at Niagara Falls. It divides the current where it plunges over the precipice, being situated between the American Falls and the Canadian Falls. The island is reached from the city of Niagara Falls, N. Y., by a fine stone bridge. It is covered with beautiful evergreen and deciduous trees and is improved by walks and drives. A fine view of the falls is obtained from the west end of the island.

**GOATSUCKER** (gōt'sūk-ēr), the common name of the European nightjar, which is allied to the night hawk, whip-poor-will, and other birds of North America. The goatsucker is so named from the popular belief that it sucks the milk of goats and cows and in so doing infects these animals with a deadly disease. The name nightjar comes from a jarring or purring sound

which it utters. Birds of this class have large mouths and at dusk frequent the ground in search of insects, from both of which facts the erroneous belief that they suck animals likely arose.

**GOBI** (gō'bē), **Desert of**, a vast stretch of desert in Central Asia, called Shamo, or Sand-Sea, by the Chinese. It is included in China, Turkestan, and Mongolia. The length is about 1,750 miles; breadth, 375 miles; and area, 290,850 square miles. Spurs of the Altai, Tian Shan, and Yablonoi mountains traverse the northeastern part. The general elevation above sea level is 4,000 feet. The boundary is designated by a gradual rise in a series of marked terraces and several interior rivers. The central point is at Ozon Khoshu, which is the lowest region in Central Asia, and is elevated about 1,940 feet above the sea. The interior is thought to have formed a vast sea in former times, but now is occupied by different Mongolian tribes, who utilize the region in rearing sheep, horses, cattle, and camels.

**GOD**, or **Supreme Being**, the infinite, eternal, immutable Creator and Preserver of all things, and the object of human sacrifice and worship. In Christian theology there is a general agreement that God is a perfectly good, true, and righteous personal spirit, that he is eternal, and that he possesses omnipotence, omnipresence, and omniscience. Christians generally agree as to the trinity of God; that is, he is held to be one individual, but constituted of three persons—God the Father, God the Son, and God the Holy Ghost. The three are held to have existed from eternity, not as three distinct beings, but as one God, the glory equal and the majesty coeternal. In the doctrine of the trinity, which is most elaborately defined in the Athanasian Creed, the persons of the Godhead are not to be confounded nor is the substance to be divided. God the Son is worshiped as Jesus (q. v.), who came to the earth, born of God and the Virgin Mary, to redeem fallen man under a plan of salvation instituted by the merciful God for his creatures. The Holy Ghost, the third person of the trinity, the Father being the first and the Son the second, is held to proceed from the Father and the Son, though is equal to them in substance and majesty. His function as a spirit of holiness is to apply to the hearts of men the benefits of Christ's death, and to sanctify them by inducing a belief in the truth as it is in Jesus. The Jewish people generally hold to the belief in Jehovah (q. v.), but reject Christ as the redeemer, and believe that the Saviour is yet to come.

Practically all peoples, even the most savage,



manifest belief in a being higher than man. There seems to be an innate feeling, a potent something, in man that renders him a worshipping being and leads him to stand in awe when contemplating the greatness and wisdom of the Creator and Preserver of the universe as a whole, and of the immutable laws under which organic and inorganic substances either multiply their kind or endure without material change. Within man dwells either a living faith in the superiority of his power to nature, which induces a feeling, an experience, that grounds his belief in God, or he denies his superiority to nature and is without faith in God, in which aspect he experiences nothing in existence but necessity and fate. Hence, the argument for the existence of God is based upon certain fundamental principles involved in our mental and moral being, such as causation and design. The existence of God is likewise argued from the manifestations he has made to man, either by miracles, visions, or personal contact, but even Christian theists admit that they cannot be accepted as real unless faith in the divine existence was previously held by those receiving them.

Various terms are employed to designate belief or disbelief in God. *Theism* is a system of belief in God as the Creator and Preserver; *atheism* implies, not a denial of the existence of a Deity, but an absence of any definite idea on the subject; *polytheism* is the doctrine that there are more gods than one; and *agnosticism* is the belief that God is unknown or unknowable. *Monism* is the doctrine which attempts to explain the cosmos by one principle of being or ultimate substance and may be materialistic, idealistic, or pantheistic. *Materialistic monism* holds that all spiritual phenomena are from matter; *idealistic monism*, that both spiritual and material phenomena are from spirit; and *pantheistic monism*, that both mind and matter are from one original substance, neither being substantial. *Materialism* is a denial of the doctrine that man possesses any immaterial part. *Fetichism* is a form of worship which implies the ability of man to force the Deity to comply with his wishes, and *totemism* is a kind of nature worship in which stones, trees, rivers, etc., are adored.

**GODAVARI** (gō-dä'vār-è), a river of central India, the largest stream of the Deccan. It has its source near the Indian Ocean and, after a course of 900 miles, enters the Bay of Bengal by a delta of seven mouths. The entire basin drained includes an area of 112,000 square miles, a large portion of which is fertile. Along its banks is much beautiful natural scenery. At

various places the water is led by canals from the narrow channel and utilized for irrigating purposes. The river is held sacred by the Hindus, and is the objective point of numerous pilgrimages. Among the chief tributaries are the Purna, the Maner, and the Manjera.

**GOD SAVE THE KING**, the national song of Great Britain. The words were probably written by Henry Carey (1696-1743) and the music was adapted from the national air of Germany, entitled "Heil Dir Mein Vaterland." The popular patriotic song of the United States, "My Country, 'Tis of Thee," is sung to the same tune. In Great Britain the song, "God Save the King," is played and sung on all solemn and festive occasions.

**GOKSCHA** (gök-chà'), or **Sevanga**, a lake of Russia, in the government of Erivan. It is situated almost due west of Baku, between the Black and Caspian seas, and is surrounded by high mountains. The surface is 6,350 feet above the sea and covers an area of 540 square miles. The Sanga carries the overflow to the Aras River, which discharges into the Caspian Sea. An Armenian monastery is located on Sevang, an island near the northwestern part of the lake.

**GOLCONDA** (göl-kön'dä), a ruined city and fortress of India, seven miles west of Hyderabad. Golconda was the capital of the principal kingdom of the Deccan, but was conquered by Aurungzebe in 1687. The fortress now serves as a military post and treasury of Nizam. It has extensive interests in cutting and polishing diamonds, which is the chief employment in the city, diamonds being mined some distance from it, at Partial, on the southeastern boundary of Nizam.

**GOLD**, a bright yellow precious metal, noted for its value, ductility, and malleability. The specific gravity is nineteen; the atomic weight, 196; and the melting point, about 2,282° Fahr. It has a ductility so great that a grain can be drawn into a wire 500 feet long and the same quantity is sufficient to gild two miles of silver wire. The malleability of gold makes it possible for one grain to be beaten out so as to cover 56 square inches, when it has a thickness of only  $\frac{1}{281,000}$  part of an inch. Water and oxygen do not act upon it at any temperature. Air does not tarnish it, and it may not be dissolved by hydrochloric, nitric, or sulphuric acid, but it is soluble in a mixture of nitric and hydrochloric acids. Gold crystallizes in cubes and other regular forms and yields two series of salts, aurous and auric. It is extracted from the quartz ore by pulverizing, and, after adding a quantity of mercury with some sodium, the amalgam is



heated to liberate the mercury. In this process, which is called *cupellation*, the sulphur and arsenic are set free by highly heating the auriferous pyrites before treating them with the amalgam.

Pure gold is 24 carats fine, but it is used in the arts to form an alloy for the reason that pure gold is too soft to serve useful purposes. One-fourth of copper and three-fourths of gold form the usual alloy used by jewelers. In gold coinage two parts of copper and 22 parts of gold form the standard, making it 22 carats fine. The highest degree of fineness commonly used by jewelers is eighteen parts of gold to six of alloy; thus the degree of fineness is eighteen carats. Both gold and silver occur as an alloy in nature, this form of the metal being of a paler yellow than pure gold, while the copper alloy has a more reddish-yellow color. Gold serves a useful purpose in medicine, especially in scrofulous diseases, while dentists use gold leaf in filling teeth.

Gold has been sought from early historic times. The Bible makes mention of this metal in the second chapter of Genesis. It is found in alluvial deposits, occurring in small particles or nuggets, and is separated by washing in troughs and pans, by which the foreign matter is separated from the gold dust, grains, or nuggets. However, it occurs most numerous in sandstone, slate, quartzite, granite, and serpentine. The most celebrated gold fields are in Australia. Those of California, discovered in 1848, in El Dorado County, brought on the so-called gold fever of 1849. Gold found in Alaska occurs largely as placer deposits, while in many of the extensive mountain regions, as in Colorado, portions of the Pacific coast, and in South Africa, it is found in fissures or in quartz veins. The mining is done by vast machinery in the larger mines and the rock is crushed, after which the gold is separated from the rock and other ore bodies by excessive heat; natural gas, coal, and electricity are employed as agents in smelting.

Gold deposits have been found in more or less paying quantities in many of the states and in all the countries of the world, though in some regions the deposits are not sufficiently rich to warrant the application of time and labor. It is estimated that the value of the world's production of gold from 1493 to 1905 equaled \$11,298,890,300. The present annual production of the world is estimated at \$407,775,020, which was the total output for 1906. Of this amount North America produced \$126,065,682; South America, \$10,043,714; Europe, \$28,088,571; Asia, \$24,575,711; Africa, \$134,914,114; and Austral-

asia, \$84,087,228. The largest pure gold nugget ever found was taken from the diggings at Ballarat, Australia, shortly after the discovery of the Australian gold fields in 1857. It weighed 130 pounds. Colorado, California, and South Dakota produced the largest output of gold in 1907, in the order named: Other very important gold fields are found in Alaska, Montana, British Columbia, Yukon, Saskatchewan, Utah, Arizona, Nevada, and Idaho. In 1907 Canada produced gold valued at \$12,023,932 and the output of the United States was \$96,101,400.

**GOLD COAST**, a British colony of West Africa, lying along the Gulf of Guinea. It has a coast line of 345 miles and extends inland 300 miles. The area is 16,500 square miles, but a protectorate of 46,600 square miles belongs to the colony. Among the principal towns are Accra, Elmina, and Cape Coast Castle. The first British colony within the region was founded in 1821. In the meantime several settlements were made by the Dutch, but they ceded their holdings to the British for trading privileges in 1872, since which time the English have had supreme control. Among the chief productions are live stock, gold, coffee, palm oil, copal, rubber, timber, monkey skins, and cocoa. Several railway lines connect the coast towns with the interior, while numerous canals and highways facilitate trade. The climate is quite unhealthy for Europeans. In 1908 the population was placed at 1,487,634, including about 500 Europeans.

**GOLDEN AGE**, the term applied in mythical history to the early period of many nations. It refers to a time when all animals were supposed to be at peace with each other, the earth produced the fullness of all necessary fruits for comfort, and innocence and happiness were general among mankind. The Egyptians believed that the gods sent successive conflagrations and deluges to purify the earth of guilt, and after these man was pure for a time, but when he was again degenerated a catastrophe once more came for his destruction. Roman literature was in its golden age from 150 B. C. to 14 A. D., when flourished the great Cicero, Caesar, Sallust, Ovid, Virgil, and Horace. In English literature the golden age includes the reign of Queen Anne, which period was made famous by the writings of such men as Pope, Addison, and Dryden.

**GOLDEN BULL**. See Bull.

**GOLDEN FLEECE**, in mythical history, a fleece taken by Phryxus from the ram Chrysomallus and nailed by Aetes in the Grove of Ares, where it was guarded at the entrance of the grove by an immense dragon which never



slept. To secure the fleece Jason made his Argonautic expedition to Colchis, and, while Medea put the dragon to sleep, he carried the treasure away. The name was applied to an order of knighthood, founded in Austria and Spain by Philip III. in 1429, which still survives and continues to be the highest order bestowed in those countries.

**GOLDEN GATE**, a passage from the Pacific to the Bay of San Francisco, about one mile wide. It separates two peninsulas and is defended by two forts, one on the inner and one on the outer side. The channel was named the Golden Gate by Sir Francis Drake in 1578.

**GOLDEN HOUSE**, a structure erected in Rome by Nero, located between Palatine and Esquiline hills. It covers an area of a square mile, including the baths, vineyards, and colonnades. In the court was a bronze statue of Nero, 120 feet high, and the portico was 3,000 feet long. The Golden House was taken down about 75 A. D., and the remains were used for the baths of Titus and Trajan. Though substantially constructed, only a few remains of the palace are now extant.

**GOLDEN-ROD**, a genus of plants allied to the aster, including more than one hundred species, most of which are native to America. The stems are rodlike, the leaves are alternate, and the flowers are closely bunched and yellow in color. In some communities the leaves are used for tea. The general distribution of the golden-rod has caused some states to adopt it as a state flower. It was selected as the national flower of the United States in 1899 by a vote taken among interested people.

**GOLDFINCH** (göld'fīnch), the name of several birds which are noted for their beautifully variegated colors, mostly yellow, red, black, and white. The bill is sharp and the song is exceptionally pleasing. A number of species are widely distributed, some being favorites as cage birds. They lay four or five purple and brown spotted eggs in nests built of twigs and moss, inlaid with wool, and most frequently breed in hedges and orchards. The goldfinch is found largely in America, Eurasia, and other grand divisions. A familiar species, the American goldfinch, or yellowbird, is found in most parts of North America.

**GOLDFISH**, a beautiful species of carp largely distributed in the fresh waters of China and Japan, whence it was introduced into Europe in the 17th century. In the native state it is greenish-brown in color, but by artificial breeding and selection a golden-yellow hue has been acquired. At present the goldfish is cultivated extensively, being kept largely in aquariums for

ornament. When propagated in large bodies of water, the artificially bred revert to the color of the original stock. The silver fish is a species of the same class of fishes.

**GOLD LACE**, a kind of fabric made by weaving gilded silk threads, but so constructed that the product is quite flexible. The manufacture of this product requires an unusual degree of skill, since it involves the work of making sheets of gold much thinner than can be obtained by beating. The usual method is to burnish leaves of gold upon a rod of silver, which is then drawn into a very fine wire, after which it is further extended by flattening between polished steel rollers, and the finishing is done by passing it through perforated diamonds or other gems. By this process it is possible to make a film much thinner than beaten gold leaf, which may be seen from the fact that an ounce of gold is sufficient to cover a wire fully 100 miles long. This flattened wire, being delicate and covered with the gold, is wound over the silk thread. In making silver lace the same method is used, except that the wire is not coated with gold.

**GOLDSBORO**, a city and the county seat of Wayne County, North Carolina, on the Neuse River, 47 miles southeast of Raleigh. It is on the Atlantic Coast Line, the Southern, and other railroads. The noteworthy buildings include an Odd Fellows' Orphan Home, a State normal school for Negroes, the high school, and the Eastern Insane Asylum. Among the manufactures are tobacco, cotton-seed oil, furniture, machinery, pottery, and cotton goods. It has waterworks, electric lighting, and several county buildings. The surrounding country is a fertile agricultural region. It was settled in 1838 and incorporated in 1841. Population, 1900, 5,877.

**GOLF**, an outdoor game of Scottish origin, played with balls and clubs. It may be played on any greensward. The players number one or more on each side, and each is provided with a separate ball. The player who can land his ball in a given series of holes with the fewest strokes of his club is the most skillful. To place the ball in a proper position for striking off is called *teeing*, and the plot on which the game is played is termed the *putting ground*. The balls generally used are made of hard gutta-percha, about five inches in circumference, and the golf clubs are of various sizes and shapes. The latter include those known as driver, cleek, iron, lofting iron, mashie, niblick, and putter. A large amount of literature has been published on the subject, and the rules governing the game differ somewhat according



to the country in which it is played. Many clubs are maintained in Canada and the United States, and frequent contests for national and international championships take place. The Royal Montreal Golf Club, organized in 1873, is one of the most noted in Canada. Those of the United States are very numerous, including the United States Golf Association, the Chicago Golf Club, the Newport Golf Club, the Florida Golf Association, etc. Most of the associations are governed by the rules of the Saint Andrew's Club of Scotland.

**GONDOLA** (gōn'dō-là), a class of barges used at Venice to navigate the canals. A gondola of medium size is rowed by one man, has seats amidships, and is about thirty feet long and four wide. The ends terminate with pointed projections about six feet high. Usually the larger sizes are rowed by two men, one at either end, each using a single oar.

**GONG** (gōng), a musical instrument shaped like a tambourine, made of copper alloy, and struck by a padded drumstick. It gives out a combination of harmonies, serving to produce signals and to add intensity to martial music.

**GONIOMETER** (gō-nī-ōm'ē-tēr), an instrument for measuring the angles formed by the faces of crystals. It consists of a graduated semicircular arc with a fixed and a movable radius, between which the crystal is placed, each radius being made to coincide with the plane of one of its faces. The angle of their opening may then be read off on the arc. This instrument is called *Hauy's goniometer*, and it cannot be depended upon for obtaining absolutely accurate results. A more complicated instrument has crystals with clear faces, which distinctly reflect the image of a dark line across a clear light, and its graduated arc is furnished with a vernier, by which the degrees are divided into minutes.

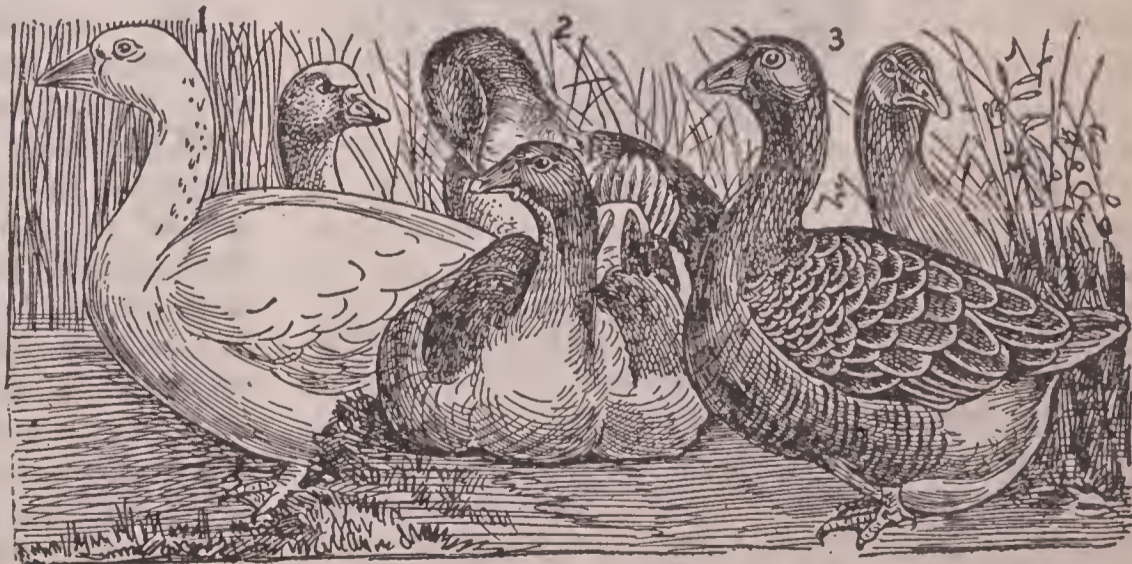
**GOOD FRIDAY**, the fast kept in memory of the crucifixion of Christ, on the Friday before Easter. Nearly all the Protestant and Catholic churches observe the feast with much solemnity. It is named *good* because of the beneficent effect that comes from keeping the day, and during its observance special prayers are included for all classes of people.

**GOOD TEMPLARS, Independent Order of**, a total abstinence society organized in New York City in 1851. In 1859 it adopted a plat-

form of absolute prohibition, no license, and total abstinence. It organized branch lodges in Europe in 1868, and in 1870 established a grand lodge in England. Both sexes are admitted and adults and juvenile members are recognized, though in different branches. About fifty official periodicals are issued in different languages. At present branch organizations are maintained in all parts of the civilized world. The membership in the main organization is 416,125, while the juvenile branch has 181,840 members.

**GOOD WILL**, the advantage of an established reputation to the interest of a particular business. It is sometimes described as a favorable disposition of persons to extend their patronage to a particular line of trade, or a certain locality, which is considered a benefit in addition to the capital invested. The good will of a business is often sold with it, hence the purchaser receives a promise, either oral or written, that the person or company selling will not engage in the same business in the vicinity for a definite time. In cases where the good will is purchased along with the business, it is an advantage to have an expressed agreement that the former owner will not engage in the same or a similar business, and it should state some particular sum to be forfeited as liquidated damages in case the agreement is violated.

**GOODWIN SANDS**, a stretch of shifting sand banks off the coast of Kent, England. The region is dangerous to navigation and has been the scene of many noted shipwrecks. A ridge divides the sands into two portions, which, during low water, are partly uncovered.



1. Snow goose; 2. Pomeranian goose; 3. Toulouse goose.

**GOOSE** (gōōs), a web-footed bird of the duck family. In all species the body is large and heavy, the bill is conical, and the upper mandible is slightly hooked. The head is small, the neck is long, the wings are powerful, and



the toes are short. Geese are migratory and move from the polar regions toward the warmer zones on the approach of winter. They swim less than ducks and do not dive, but commonly search for food by submerging the head under water. The domestic goose is thought to have originated from the *Anser ferus*, the typical genus of the subfamily *Anserinae*. Many species of geese are grown, all of which are valuable for their flesh, eggs, and feathers. Most of the wild species are gray in color and the domestic breeds are largely white. An average-sized goose is two feet ten inches long, the extended wings measuring five feet in expanse. Among the geese of North America are the snow goose, white-front goose, bean goose, Canada goose, China goose, Toulouse goose, Pomeranian goose, and cravat goose. The Canada goose is the most widely distributed wild species in North America. Several of the species are noted for their longevity. There are instances on record showing that they live to an age of eighty years. The male is commonly called *gander*.

**GOOSEBERRY** (gōōz'běr-rŷ), a class of shrubs allied to currants, but differing from



GOOSEBERRY.

them in having thorny stems. They grow wild in North America and Eurasia, but have been greatly improved by cultivation. The leaves are three-lobed and the flowers are small and yellow in most species. The fruit is succulent and variously colored when ripe, as green, yellow, whitish, and red. Plants four years old bear the best quality of fruit. The berries are eaten as a dessert and form a favorite material for jelly, pie, vinegar, and preserves. New plants may be propagated from the seeds or from slips.

**GOOSEFOOT.** See **Pigweed.**

**GOPHER** (gō'fēr), a class of burrowing animals native to North America. The name was first applied by the French to the species which honeycomb the ground by burrowing. Among the common species are the gray burrowing squirrel, the striped squirrel, and the pocket gopher. All these are mammals. The pocket or pouched gopher has peculiar pouches on the sides of the head, which facilitate piling up mounds in fields and meadows. Gophers are destructive to corn in the early stages of growth.

**GORAMY** (gō'rā-mŷ), or **Gourami**, a fish in the fresh and brackish waters of China and the East Indies. The body is flat and short. It is covered with large scales and the dorsal and anal fins have numerous spines. The ventral fins are prolonged backward and have long filaments. In size these fish are from two to five feet long. They are remarkable for building nests at the breeding season, using stems and leaves of grasses for that purpose. The nest is watched by both the male and female to prevent intrusion by other fish until the spawn is hatched. It is considered a fine fish for the table and has been acclimated in Australia and other continents.

**GORDIAN KNOT** (gōr'dī-an nōt), a knot bound by Gordius, a peasant of Phrygia, in tying the yoke of his chariot. This was done so intricately that the oracle of Delphi promised the empire of Asia to him who would untie it. When Alexander the Great arrived at Gordium, he wished to inspire his soldiers with courage and spread the belief among his enemies that he was destined to conquer. Accordingly, he cut the knot with his sword and claimed that he had fulfilled the oracle. To "cut the gordian knot" has since implied the removal of a difficulty by bold means.

**GORILLA** (gō-rī'là), the name applied as early as the 5th century B. C. to the largest animal of the ape family, which is native to the western part of Africa. An adult gorilla is from five to six feet tall when standing erect. It has black hair on the back and reddish-brown to black on its belly. The shoulders are broad and massive, above which is a heavy neck and a somewhat conical head. It subsists chiefly on vegetables and fruits. The gorilla is allied to the chimpanzee, but is larger. In the number of teeth, height of the body while standing, bones in the hand, ribs, and brain structure it corresponds to man, though the brain measures only from 23 to 35 cubic inches, while in man it measures from 62 to 114 cubic inches. In physical strength the gorilla is powerful, being the strongest of the anthropoid apes. The



voice resembles a bark, though it is like a roar when the animal becomes enraged. Gorillas live in families and build hammocks in trees as places to sleep and rest.



GORILLA.

Male, female, and infant.

**GÖRLITZ** (gēr'līts), a city of Germany, in the province of Silesia, 62 miles east of Dresden. It occupies a fine site on the Neisse River and has railway communication. The chief buildings include the Church of Saint Peter and Saint Paul (Protestant), the Gothic Frauenkirche, the city hall, and the public library. It has many gymnasiums and benevolent institutions and is the seat of the Upper Lusatian Scientific Society, which has a library of 75,000 volumes. The manufactures consist chiefly of clothing, toys, machinery, cigars, earthenware, and jewelry. It has an extensive jobbing trade. Görlitz was founded about 1200. It was the capital of the Duchy of Görlitz from 1377 until 1396. In the 17th century it was annexed to Saxony and became a part of Prussia in 1815. Population, 1905, 83,766.

**GOSHAWK** (gōs'hāk), the name of several species of hawks widely diffused in Europe and Asia. They include five or six species and are distinguished from the true falcons by a festoon on the edge of the upper mandible, while the latter have a sharp tooth. Their wings are shorter, reaching to the middle of the tail. In flying at game and other birds, they do not rise in the air to descend upon them, but pursue a straight line in making the attack. The goshawk native to America is larger than the European species. It is abundant in Canada and Alaska during the summer and moves southward to the southern part of the United States

during the fall. Locally it is known as the chicken hawk or hen hawk.

**GOSHEN** (gō'shən), an ancient district of Egypt, the territory assigned to Jacob and his family after they left their native land. It included the region around Heroopolis, near the eastern border of the Nile delta, but its exact boundaries are not known. Goshen was spoken of as fertile land and suited for grazing. The Hebrews resided here until they were enslaved by the Egyptians, after which they were delivered by Moses, who led them through the wilderness and within sight of Canaan.\*

**GOSHEN**, a city in Indiana, county seat of Elkhart County, on the Elkhorn River, midway between Chicago and Toledo. It is on the Cleveland, Cincinnati, Chicago and Saint Louis and the Lake Shore and Michigan Southern railroads. The public library, the high school, and the county courthouse are its chief buildings. An abundance of water power is secured from the Elkhart River, which has facilitated building up many manufacturing establishments. Among the manufactures are wagons, plows, flour, oil, woolen goods, machinery, and cigars. The lumber, grain, and fruit trade is extensive. It has regularly platted streets, gas and electric lighting, brick and macadam pavements, and a municipal system of waterworks. Population, 1900, 7,810.

**GOSPEL** (gōs'pəl), meaning a joyful message, any one of the four histories of the life and teachings of Christ written by Matthew, Mark, Luke, and John. The first three give a summary or synopsis of the ministry of Christ and were probably written between 60 and 70 A. D. It is certain that they were completed before the destruction of Jerusalem, to which they refer as a future event. The Gospel of John was probably written near the close of the first century, at Ephesus, since writers generally assign its completion to the year 90. They are not complete biographies of Jesus, but contain an account of the events that appeared most important to each evangelist as a means of leading the people to believe that Christ is the Savior of mankind. The Gospels were received and used in the churches before the end of the 2d century, which is confirmed by Origen and other ante-Nicene fathers of the Church.

**GOSSAMER** (gōs'sā-mēr), a term applied by German and French writers to the flakelike webs seen floating in the air on calm autumn days. They are composed of silk emitted by many species of immature spiders. Being lighter than the atmosphere, they float in the gentle breezes. The threads are spun to connect different blades and plants, and, by reason



of the loosening effect resulting from autumnal breezes and the shrinking of plants, the gossamer becomes detached and is carried to various heights and frequently long distances. The name *gossamer* applies to a light waterproof cloak worn by ladies.

**GOTHA** (gō'tà), a city of Germany, capital of the duchy of Gotha, fifteen miles southwest of Erfurt, with which it is connected by railway. It is located near the northern border of the Thuringian Forest, is well platted, and has a large number of fine and substantial buildings. The palace of Friedenstein, a massive structure of the 17th century, contains a library of 200,000 volumes. Other buildings of note include the museum, an art gallery, a theater, the post office, and the town hall. The manufactures consist chiefly of porcelain, stoves, cotton and woolen goods, boots and shoes, machinery, and tobacco products. It has extensive machine shops and railway repair shops. Gotha passed to the electors of Saxony in 1440 and has been the capital of the duchy of Gotha nearly 400 years. Population, 1905, 36,947.

**GOTHARD**, or **Gotthard, Saint**, a mountain group in Switzerland, belonging to the Helvetic Alps, and famous for the Saint Gothard pass over the Alps. The highest peak of this mountain group is about 12,000 feet, and the point at which the Saint Gothard Hospice stands is 10,810 feet. A carriage pass across the Alps was completed in 1832. One of the most important railroad tunnels in the world, known as Saint Gothard's, passes through the mountains between Airolo on the south and Göschenen on the north, and by it the railroad systems of Italy, Switzerland, and Germany are connected. The tunnel was commenced in 1872 and opened for traffic in 1882. It is nine and one-half miles long and cost about \$12,000,000.

**GOTHENBURG**. See **Gottenburg**.

**GOTHIC ARCHITECTURE** (gōth'īk), the style of architecture which is characterized by the pointed arch and makes use of the cross-vault or groin-vault. In a wider sense it includes the forms introduced by the barbaric tribes that overthrew Rome. It prevailed largely in Europe from the 6th to the 16th century, though in a newer classification it dates only from the 11th century, when it took on an improved form. The term is generally used in history to distinguish the Gothic from the classic architecture as well as from the transition styles introduced by the Norman-Franks. Besides the pointed arches, it is marked by a prolongation of vertical lines, an absence of square edges, a want of columns and rectangular surfaces and the general substitution of various

surfaces and grouped shafts. It stands in contrast to other styles because of its multiplication of different ornamental forms. Excessive decoration of the perpendicular lines and ornamentation of the horizontal by starring caused the Gothic to lose favor, but it is now reviving somewhat. Many of the most noted historic buildings of Germany, Spain, France, England, Norway, Sweden, and other countries of Western Europe are in the Gothic style. The two principal forms of the Gothic architecture are known as the *perpendicular* and the *decorated*. The former originated in Germany and the latter in England.

**GOTHLAND** (gōt'länd), an island in the Baltic Sea, about 52 miles east of Sweden, to which country it belongs. It has a rocky coast, but much of the soil is fertile. The surface is about 250 feet above sea level and the area is 1,210 square miles. It has several good harbors. The larger cities are connected by railway and carry on an important trade in cereals and fish. Wisby is the chief city, having a population of 7,645. The island became a part of Sweden in the 9th century, was captured several times by the Danes, and has belonged permanently to Sweden since 1645. Population, 1906, 53,290.

**GOTHS** (gōths), an ancient race of German people who occupied a large portion of Europe and Asiatic Russia. In the early part of the 3d century they inhabited the country north of the Black Sea, and by numerous conquests came into possession of much territory and powerful military forces. They were divided into three great tribes, known as Ostrogoths (eastern Goths), Visigoths (western Goths), and Moesogoths (the Goths of Bulgaria). Before their division into the eastern and western branches, their king, Filmer, led an army and occupied Euxine, from which region the different historical branches sprang. War was waged by their king, Ostrogotha, against the Romans in 248, and extensive contests were conducted in the eastern provinces of Rome for eighteen years, but subsequently Claudius defeated them. Emperor Aurelian was compelled, in 272, to cede the province of Dacia to them, where the Visigoths formed their chief settlement, while the Ostrogoths remained in the region of the Black Sea. Ermanric attained much power and included the region from the Gulf of Bothnia to the Black Sea, extending far toward the east. Internal disputes caused a division in the year 369, after which the Visigoths formed a separate kingdom west of the Danube and the Ostrogoths became confined to the section east of that river. Alaric, King of the Visigoths, in-



vaded Greece in 396, conquered the Peloponnese, and obtained the government of Illyria. He invaded Italy in 409-10, captured Rome, and carried away much of the riches of that city. Shortly after the death of Alaric, in 410, the Visigoths invaded Spain and Gaul. In the 5th century they established the seat of their government at Toulouse, their principal provinces being Languedoc, Provence, and Catalonia. The Visigoths were finally vanquished by the Moors, who crossed into Spain from Africa, and for many years constituted the principal factor in the Iberian Peninsula. Roderick, who died in 711, was the last king of the Visigoths.

The kingdom of the Ostrogoths was overthrown by the Huns in 375, after which they largely followed a nomadic life. At the time Attila, the Hun, invaded Gaul he was supported by a vast horde of Ostrogothic warriors, and, when the empire of the Huns came to an end, they settled near Vienna, and later in Moesia, now called Bulgaria, from which they became known as Moesogoths. The Ostrogoths attained vast military power under Theodoric. This ruler was educated at Constantinople as a Roman nobleman and in 474 was made king by the Ostrogoths. Odoacer the Usurper conquered the western empire in 476. In 489 Theodoric invaded Italy with a vast army, and four years later was recognized king. He reigned successfully until his death in 526, and in 554 the kingdom came to an end. During its greatest prosperity the Ostrogothic kingdom included Italy and large portions of Switzerland, Hungary, Austria, and Rumania. Subsequently the Gothic people lost their identity as a nation and became assimilated by other peoples.

The German, English, and Scandinavian languages may be traced to the Gothic tongue, the first two to the Visigothic and the last to the Ostrogothic. A translation of the Bible into Gothic was made by Bishop Wulfila, a man of profound learning, about 375. Several portions of this work are extant, with which are included a number of explanations of the gospels. The language attained its highest literary culture during the occupation of Italy, though it did not long survive the Gothic peoples. A number of literary works and the translations from the Bible are of great value in studying the growth and history of the early Germanic languages.

**GOTTENBURG** (göt'en-bürg), or **Göthenburg**, a city and seaport of Sweden, called Göteborg in Swedish. It is situated on the Cattegat, about 25 miles southwest of Stockholm, and has an excellent harbor and extensive canal

and railroad connections. Among the noteworthy buildings are the market place, the cathedral, the governor's palace, the public library, and the arsenal. It has a fine museum and a scientific society founded in 1778. Systems of gas and electric lighting, stone and macadam pavements, and electric street railways are maintained. The city ranks among the best built cities of Sweden, having extensive shipbuilding yards, excellent institutions of learning, and important factories. Among the products are cotton and woolen goods, sail cloth, spirituous beverages, machinery, sugar, tobacco, paper, glass, and furniture. It is important for its exports of fish, iron, copper, tar, pitch, and lumber. The imports include cereals, food products, and salt. Since 1865 a successful system of municipal regulation has been in force, under which companies are licensed for the management of public houses, and, after retaining six per cent. as profit on the capital invested, they turn the balance over to the city. Gottenburg was founded in 1619 by Dutch settlers, who platted the town and built several canals. In 1806, during the continental blockade, it rose to commercial importance. Population, 1906, 156,927.

**GÖTTINGEN** (gēt'ting-en), a city of Germany, in the province of Hanover, on the Leine River, about 58 miles south of Hanover. It has connections by several railroads, a fine school system, and a hospital. However, it is famous chiefly as the seat of the celebrated University of Göttingen, which was founded in 1734 by George II., King of England and Elector of Hanover, and formally opened in 1737. The university contains an observatory, a museum, botanical gardens, anatomical collections, and a library with 515,000 volumes and 6,000 manuscripts. It has 135 professors, 1,550 students, and an alumni that includes many of the eminent German masters, among them Blumenbach, Gieseler, Gauss, Herbart, Müller, the Grimm brothers, and Weber. Among the illustrious Americans who studied there are Longfellow and Bancroft. The city is supplied with all municipal facilities, such as telephones and electric conveniences. It has manufactures of woolen and cotton goods, scientific instruments, chemicals, and musical instruments. Göttingen was founded in the 10th century and was prominent as a member of the Hanseatic League. Population, 1905, 34,081.

**GOURD** (görd), a plant related to the cucumber, having large yellow flowers, ovate or oblong fruit, trailing stems, and hairy leaves. Many varieties have been produced by propagation, some of which are edible, and others yield



a tough outer shell useful for bottles, dippers, and other household vessels. Several species are native to Astrakhan and the East and West Indies, but many have been naturalized and are cultivated in America and Europe. The gourd family includes the watermelon, muskmelon,



GOURDS.

squash, cucumber, pumpkin, and musk gourd. Many members of this family of plants have been highly improved by cultivation. They furnish valuable food for man and cattle and form important articles of commerce.

**GOUT**, a constitutional disorder arising from an excess of uric acid in the blood, caused by an impaired condition of the kidneys. It arises from excessive indulgence in wines, fermented beverages, and inactivity, and is not uncommon among those who partake of undue quantities of nitrogenous foods. However, it is inherited by some individuals, but seldom appears before the age of thirty. Gout is more common among males than among females. It is characterized by pains in the joints, but more commonly affects the great toe, the heel, and the calf of the leg. Gout affecting the internal organs is most dangerous. The best preventives are regular habits, proper diet, and abstinence from alcoholic drink.

**GOVAN** (gŭv'an), a city of Lanark County, Scotland, on the Clyde River, immediately west of Glasgow, of which it is a suburb. It contains extensive manufactures and has important shipbuilding yards. Electric and steam railways connect it with Glasgow and other cities. It was one of the largest towns of Scotland in the 16th century, when it was known as Meikle Govane. Population, 1907, 84,513.

**GOVERNMENT** (gŭv'ĕrn-mĕnt), that power or influence which is exercised by one person or thing over others. The mainspring of a watch, gravitation, the parental head of a family, and civil officers are agencies that govern in their respective spheres of influence. The term is applied most commonly to the power exercised by recognized officers of a state or

nation. Government is an essential element in civilization, indeed, without it citizens would be unprotected in their personal safety and security of property against the attacks of lawless vandals and marauders. Thus, the term government implies the organized means of a state or nation maintained to vouchsafe protection to the industrial, political, social, and moral rights of the people, and for perpetuating its own existence.

Governments vary in their form, the most ignorant and barbarous people being governed by tyrants and despots, while the more intelligent and law-abiding are governed under a system in which each individual has certain recognized rights to be protected, and certain powers which he may exercise in promoting and enforcing the laws. The principal forms of government known in history are patriarchal, theocratical, monarchical, aristocratic, democratic, and republican. In general the *patriarchal* is the family government and existed as the first and oldest. The father is the recognized head of the family, and exercises an influence in shaping the welfare of the household. Though patriarchal governments do not exist at present, yet the family government is the true basis of national security and intelligence. In a *theocratic* form of government the people are governed as were the Israelites, by the immediate direction and administration of God.

In a *monarchical* government a monarch is the supreme ruler, who bears the title of king, emperor, czar, sultan, pasha, or some other term implying sovereignty. Monarchies are *limited* when the power of the sovereign is restricted by a constitution and established laws, but *absolute* when unlimited power is vested in the chief ruler, and he is responsible to no earthly tribunal. China, Morocco, and Persia are absolute monarchies, while Germany, England, Italy, Austria, and Spain are limited. A *hereditary* monarchy is one in which the sovereign inherits the title to the throne, and in an *elective* monarchy the sovereign owes his position to an election by the people. In an *aristocratic* government the supreme power is vested in a few men of wealth, usually comprising the clergy and a titled nobility, though both these classes are not uncommon in monarchical governments. A *democratic* government is one in which the people exercise absolute power, and not only have a voice in making the laws, but in seeing that they are enforced. A *republican* government is representative. In it the people authorize officers to serve them in making and enforcing the laws. The government of the United States is sometimes called a *democratic-*



*republican* government for the reason that the people may direct their lawmakers to some extent and are represented by them in making laws, while by public approval or disapproval they may induce the officers chosen to administer the laws wisely and justly. On the other hand, Canada is governed as a *limited monarchy*, in which the people have large powers in managing local and provincial affairs, while the general government of the country is vested by heredity in the crown of Great Britain.

Three distinct branches are recognized in every well-established government—the executive, legislative, and judicial. *Executive* power in the United States government is vested in the President, who is advised in his duties by nine cabinet officers. The cabinet officers are appointed by the President with the consent of the Senate. *Legislative* power is vested in a Congress, which contains two branches—the Senate and House of Representatives. The Senate is composed of two members from each State, who hold office for six years. Members of the House of Representatives, who are elected by a popular vote in the states, or in various congressional districts of each State, hold office for two years. The *judicial* department, consisting of a system of Federal courts, culminates in a Supreme Court, which is composed of a Chief Justice and eight associate justices. These are appointed by the President with the consent of the Senate and hold office during good behavior. Each State has a local government modeled after the essential features of the general government, and which the Constitution of the United States guarantees to maintain. The executive officer of the State is the Governor, the legislative power is vested in the General Assembly, and the judicial authority is in a Supreme Court having jurisdiction within the particular State. In Canada the government is very similar, but the Governor General, who represents the Crown, takes the place of the President. This official is the chief executive officer within the Dominion and is appointed by the home government. Each Province, instead of a governor, has a Lieutenant Governor, who is appointed by the Governor General. The legislative functions for the country and the provinces are exercised respectively by the Dominion and the provincial parliaments.

Among the principal resources of the general government of most countries are customs duties, internal revenue taxes, proceeds of the sale of public lands, and its ability to borrow money. The required amount of revenue is devoted to the general expenses of the government, and all surplus revenue is expended for

the gradual reduction of the public debt or for constructing internal and general improvements.

**GOVERNOR** (gŭv'ĕrn-ĕr), a mechanical device serving to regulate the admission of steam to an engine according to the rate of velocity. It is formed of a vertical shaft, on which two balls are suspended, and, when the shaft revolves, the balls swing outward. The centrifugal force increases with the rate of velocity at which the shaft rotates, hence the balls are caused to swing farther from the axis of rotation. The object is to secure the uniform velocity of the engine, which is done by this arrangement, since the admission of steam is restricted by a valve as the balls swing outward, but is admitted more freely when they swing nearer to the axis of rotation. A similar contrivance is utilized in mills to equalize the motion of machinery. In high-class motors the ball governor is being displaced rapidly by the *inertia governor*. This invention overcomes the objection that a ball governor does not act on the valve until the speed is increased. The inertia governor consists of weights and springs, is set in the flywheel of the engine or motor, and acts by its inertia. When there is a tendency of the speed to increase, the inertia of the weights acts in opposition to this tendency, affects the eccentrics, and through them the valves. By means of this device it is possible to check a tendency to increase speed in less than one revolution of the fly wheel. Other governors include those which regulate the inflow of gas and water, each class being used for various purposes.

**GOVERNOR'S ISLAND**, an island in New York Bay. It has an area of 65 acres. Since the War of 1812 it has been occupied by the War Department. Besides containing a number of forts, it is headquarters for the Department of the East. It is the seat of a military museum in which are a number of interesting relics, among them the horse ridden by Sheridan from Winchester, which has been substantially mounted.

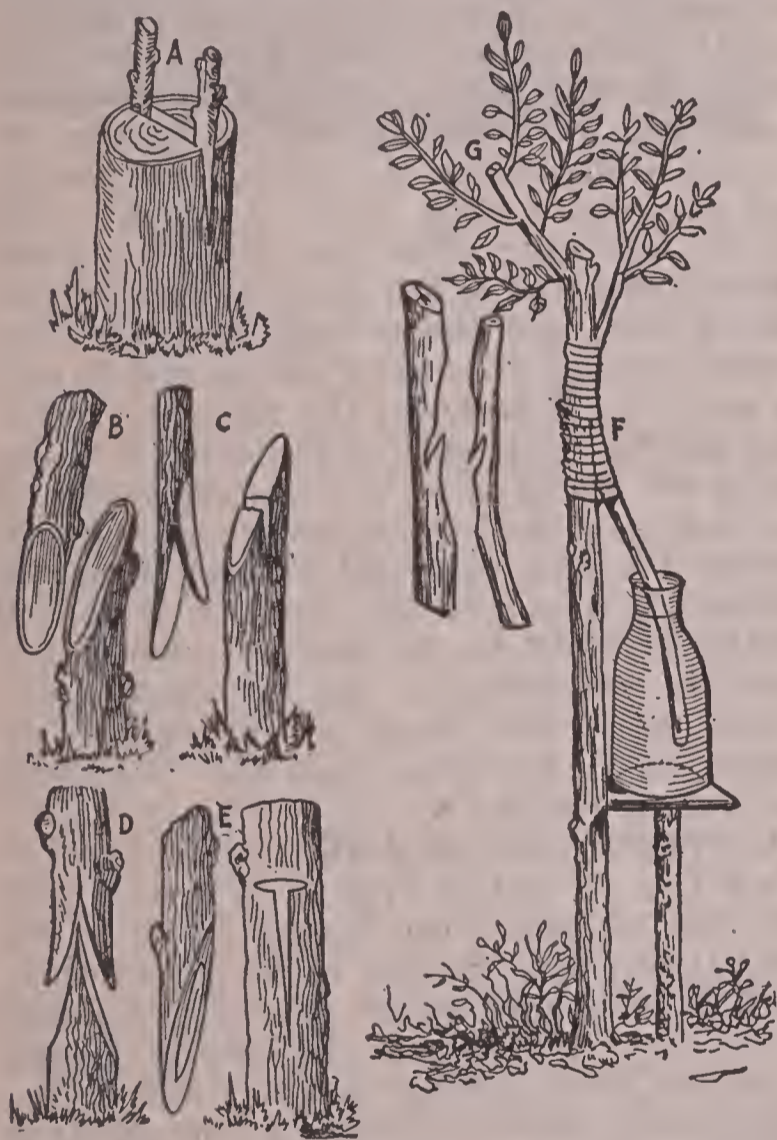
**GOVERNOR'S ISLAND**, an island of Massachusetts, in Boston Harbor, about two miles east of Boston. For government purposes it belongs to Suffolk County. Fort Winthrop, at its northern end, is the principal fortification. The island is occupied by the national government.

**GRACE**, Days of, a short period, usually three days, allowed for the payment of a bill of exchange or a promissory note, after the day indicated for payment on the face. In most countries, as in Great Britain and the United States, there are three days of grace,



but in some instances the time is longer, varying from three to thirty days. Such an allowance is now almost universal; hence a bill does not become due, either in law or in fact, on the day stipulated, but on the last day of grace. If the last day of grace is a holiday, so the banks are closed, the obligation is due the date preceding the last day of grace.

**GRAFTING** (gráft'ing), the process of inserting a scion or bud, taken from a vigorous tree or shrub, into a closely allied species so as to cause them to unite organically and enable the graft to receive greater nutritive power than it could otherwise obtain. Among the advantages



GRAFTING.

A, Cleft grafting; B, splice grafting; C, tongue grafting; D, saddle grafting; E, side grafting; F, scion receiving moisture partly from a vessel; G, part of stock.

of grafting are the rapid multiplication of species, the propagation of particular types which cannot be obtained from seed, and the cultivation of tendencies to bear fruit several years earlier than is otherwise possible. The fruit borne by the graft does not partake of the identical kind common to the stock, but preserves its own peculiarities. Thus, it is possible to propagate several species of fruit or flowers on one stock. This is shown in the illustration,

since the scion F receives support in part temporarily from water contained in the vessel, while the twig G is a part of the stock.

The principal methods of grafting are by approach, scions, and buds. In *approach grafting* several parts of two or more plants growing from different stocks are united by bringing the roots, branches, or stems together. To effect this it is necessary to remove equal parts of the bark and unite the wounds by air-tight inclosures of grafting wax, ligature, or clay. *Scion grafting* includes various methods, some of which are known as cleft, side, splice, tongue, saddle, crown, and whip grafting. In all of these forms it is necessary to bring the growing parts into apposition; that is, the edges of the bark must be arranged so the alburnum of both parts will be in close contact. The scion method may be performed both in woody and herbaceous plants, but union takes place only in case the processes of life are freely exercised. *Bud grafting* is practiced largely in fruit trees and roses. It consists of transferring the buds of one plant, along with a small section of the bark, to another plant in which a wound has been made. In all forms of grafting it is necessary to exclude air from the wound. Among the common materials used for this purpose are India rubber, clay, and a mixture of beeswax and tallow. See **Budding**.

**GRAFTON** (gráft'ün), a town of Massachusetts, in Worcester County, seven miles southeast of Worcester. It is on the Boston and Albany and the New York, New Haven and Hartford railroads, and has a large trade in produce and manufactures. The chief industries include cotton mills, boot and shoe factories, and machine shops. It has electric lights, waterworks, and several fine schools and churches. The first settlement was established by John Eliot in 1660 and the town was incorporated in 1735. Population, 1905, 5,002.

**GRAFTON**, a city of North Dakota, county seat of Walsh County, forty miles northwest of Grand Forks, on the Northern Pacific and the Great Northern railroads. It is nicely located on the Park River, in a fertile farming district. Among the enterprises are flour mills, stock yards, machine shops, grain elevators, and a creamery. It is the seat of a State institution for the feeble-minded. Population, 1905, 3,523.

**GRAFTON**, a city in West Virginia, county seat of Taylor County, on the Tygart Valley River. It is on the Baltimore and Ohio Railroad. The surrounding country is lumber and coal producing. Among the noteworthy buildings are the State reform school, which is at Pruntytown, the courthouse, and the high



school. Near the city is a national cemetery with 1,265 graves. It has manufactures of railroad cars, machinery, flour, and ironware. Grafton was platted in 1854 and incorporated two years later. The growth of the city is due largely to the machine shops of the Baltimore and Ohio Railroad. Population, 1910, 7,563.

**GRAHAMLAND**, a region discovered in 1832 in the Antarctic Ocean and claimed for Great Britain by Captain Biscoe. It is situated south of 68° south latitude, has an apparently large area, but is snow and ice bound and of little value.

**GRAIL**, or **Graal**, **Greal**, **Grasal**, and **Sangrael**, according to legends, the cup used by Christ at the Last Supper, preserved by Joseph of Arimathea, and by him used to receive some blood of Christ at the crucifixion. An account of this vessel is given in the gospel of Nicodemus, a work not accepted as canonical. Many of the Moorish and Christian remains of early times indicate traces of the tradition and the use of various forms of worship into which a symbolic vessel entered. According to a legend, the Holy Grail, as it became known, was brought to England by Joseph of Arimathea in 63 A. D. Later the vessel was lost because the possessor to whom it had passed committed sin, and a search undertaken for the lost treasure by King Arthur and the Knights of the Round Table became known as the Quest of the Holy Grail. At the capture of Caesarea by the Crusaders, in 1101, a dish made of a single large emerald was found which was regarded as the Holy Grail, and is still preserved at the Cathedral of San Lorenzo in Genoa. The Holy Grail was reputed invisible to persons not pure and holy, and when anyone approached who was unholy the cup vanished. Wagner accords the story of the Holy Grail a prominent place in the opera of "Parsifal" and Tennyson gives it a place in his "Idylls of the King." Lowell's "Vision of Sir Launfal" makes mention of it. The numerous romances and poems found in literature referring to the Holy Grail are of much interest, particularly those of Arthur and the Knights of the Round Table.

**GRAIN**, a term applied to the common cereals, as growing plants, in gathered condition, or as seeds in bulk. Many of the grains are used in making meal or flour. They include corn, wheat, rye, oats, barley, rice, buckwheat, flax, and cotton. The principal constituents of grain seeds are starch, gluten, sweet mucilage, and an aromatic substance. Among the largest grain fields of the world are those of the Mississippi Valley in North America, the Paraná valley in South America, the Nile valley in

Africa, and the valleys of the Po, Volga, and Ganges of Eurasia.

**GRAIN ELEVATOR**, a building used for elevating, storing, and loading grain for transportation into cars or vessels. Buildings for these purposes are maintained in all the grain-producing districts and in the large cities where the grain market centers. The capacity of grain elevators situated in the trade centers and shipping ports is very large. Some of the larger elevators of Chicago have a capacity of 50,000,000 bushels; New York, 29,000,000 bushels; Minneapolis and Winnepeg, 26,000,000 bushels; Buffalo and Toronto, 15,000,000 bushels; Saint Louis, 15,000,000 bushels; and Toledo, 7,000,000 bushels. The largest elevators in Chicago are 150 feet wide and 550 feet long and have a height of 160 feet. In construction the bins and the buildings were formerly largely of wood, and the outside was encased by a brick or fireproof metallic covering. At present the construction is principally of steel, modeled after the methods of constructing blocks of steel in cities, and thus furnish ample protection against fire. This form of construction provides greater convenience and durability. The newer elevators are built largely of brick and concrete, though the frame and bins are of steel and iron. See **Elevator**.

**GRAKLE** (grāk'1), or **Grackle**, the name of several birds found in both hemispheres. The name was first given to various birds of the starling family, such as the paradise grackle, which is native to India. These birds are represented in America by the crow blackbird and the rusty grackle. The former is widely distributed, some species of which are known locally as the jackdaw. Most species have a long tail and the male is uniformly glossy black, while the female is gray or brownish. The rusty grackle extends from the eastern part of the United States to the northwestern part of Canada.

**GRALLATOIRES** (gräl-lä-tō'rēz), or **Waders**, an order of birds which frequent shores, banks, and marshy places. They have long legs, necks, and beaks, and wade in the shallow water in search of worms and insects. Some of the species dive to obtain food at the bottom of the water. Among the representative birds of this order are the plovers, coots, snipes, curlews, and herons.

**GRAM**, or **Gramme**, the unit of weight in the metric system. It is intended to be exactly equivalent to the weight in a vacuum of one cubic centimeter of pure water at its maximum density. In comparison with the English system it is equal to 15.432 grains. A gram degree, in



physics, is a unit of heat, being the amount of heat necessary to raise the temperature of one gram of pure water one degree centigrade.

**GRAMMAR** (grăm'mēr), the science which treats of the principles and usage of language. English grammar is divided into four parts, orthography, etymology, syntax, and prosody. *Orthography* treats of elementary sounds, letters, syllables, and spelling; *etymology*, of the classification, derivation, and properties of words; *syntax*, of the construction of sentences; and *prosody*, of the quality of syllables, of accent, and of the laws of versification. Every language has a grammar peculiar to itself. *Comparative grammar* is based on the study of words, analyzes them, and accounts for the changes they have undergone. It properly embraces a study of the growth of languages. However, comparative grammar is of recent origin. It dates from the development of knowledge of the Sanskrit as associated with the Indo-European group of languages. Among the eminent students of comparative grammar are Grimm, Max Müller, Pott, and Schleicher.

**GRAMOPHONE** (grăm'ō-fōn), an apparatus to reproduce sound, invented by Emile Berliner. It differs from the phonograph and graphophone in that the record is on a disk instead of a cylinder. The disk contains the record on a rubber surface and the stylus or needle is connected with a diaphragm, which travels along a spiral groove as the disc revolves horizontally under the impulse of a spring clockwork. The gramophone is now used quite extensively as a phonograph (q. v.).

**GRAMPIANS** (grăm'pī-āns), a group of highlands in Scotland, stretching a distance of 150 miles from the northeast to the southwest. The average height is about 2,500 feet, but Ben Macdhui and Ben Nevis, the highest summits of Scotland, have elevations of 4,048 and 4,406 respectively. Beautiful valleys intersect the Grampians. A mountain system in the western part of the province of Victoria, Australia, is known by the same name.

**GRAMPUS** (grăm'pūs), the popular name of a genus of large dolphins. The common grampus differs from the porpoise in having a thicker body. It has no teeth in the upper jaw, only a few teeth in the front part of the lower jaw, and the color is gray with streaks of white. The larger species are about twenty feet long. The common grampus feeds on small fish, squid, and mollusks. The name is applied to nearly all the cetaceans that are too small to be classed with the whales and too large to be grouped with the porpoises.

**GRANADA** (grā-nā'dā), a former Moorish

kingdom of Spain. It had an area of 11,060 square miles, but is now included with the three Mediterranean provinces of Almeria, Granada, and Malaga. Grenada became a separate kingdom in 1225 and was made a part of Spain in 1492. The products of the region are cereals, domestic animals, sugar cane, fruits, and minerals, especially lead and iron. Granada, one of the chief cities, is the capital of the province of Grenada.

**GRANADA**, a city of southern Spain, capital of the province of Granada and formerly of the Moorish kingdom of Granada. It is situated on the Jenil River, at the foothills of the Sierra Nevada, and occupies a site about 2,000 feet above sea level. Its streets are tortuous, but the houses are well built in the Moorish style. The city is connected by several railroads and within recent years has had a healthful commercial growth. It has manufactures of saltpeter, woolen textiles, gunpowder, silks, and machinery. Among its public institutions are a splendid cathedral, a university, several public parks, and a number of schools and academies. The university was founded in 1531, carries advanced courses of study, and is attended by several hundred students. Granada was founded by the Moors in the 8th century. It became the capital of the Moorish kingdom in 1235, and, when conquered by Ferdinand and Isabella, in 1492, it had a population of nearly 500,000. In 1610 the Moors were expelled from Spain, which caused the city to decline. At present it is surrounded by a strong wall. It still contains the Moorish palace of Alhambra and an unfinished palace commenced by Charles V. Population, 1906, 76,090.

**GRAND ARMY OF THE REPUBLIC**, a patriotic society of the United States, founded at Decatur, Ill., on April 6, 1868. The principal object is to promote a feeling of fraternal friendship among the sailors and soldiers who took part in the naval and military forces of the Federal government during the Civil War, to perpetuate the memory and history of the dead, and to extend aid and comfort to the orphans and widows. All the sailors and soldiers who were called into active service between April 12, 1861, and April 9, 1865, and received an honorable discharge, are eligible to membership. The list of eligibles also includes those who were members of State regiments, hence were subject to the Federal officers. Annual encampments are held in the leading cities and meetings of state and territorial departments usually meet each year. The official badge consists of a ribbon showing the national flag, to which is attached the brass star of the mem-



bership badge. The membership in 1890 was 409,489, but there has been a constant decrease owing to the annual deaths, which have averaged about 9,000. In 1908 the membership was 216,832. Though the society is not organized as a political body, its members have in many cases influenced the election of members of the Legislature and of Congress. All the presidents from Grant to McKinley saw service in the Civil War, and they polled nearly the entire vote of the society. Much has been done by the organization to promote legislation, relieve suffering, and maintain a fraternal feeling among its members.

**GRAND FORKS**, a city in North Dakota, county seat of Grand Forks County, on the Red River of the North, about 75 miles north of Fargo. It is on the Northern Pacific and the Great Northern railroads, and is surrounded by a fertile agricultural country. The noteworthy buildings include the high school, the county courthouse, the Northwestern Normal College, the Federal building, and a number of banks and hotels. Besides being the seat of Saint Bernard's Ursuline Academy, it contains a Lutheran college and the University of North Dakota. Among the manufactures are farming implements, flour, woolen goods, cigars and machinery. It has electric lights, waterworks, pavements, and other municipal improvements. Grand Forks was settled in 1871 and incorporated in 1881. Population, 1905, 10,127.

**GRAND HAVEN**, a port city on Lake Michigan, county seat of Ottawa County, Michigan, near the Grand River, about 31 miles west of Grand Rapids. It is on the Père Marquette and the Grand Trunk railroads, and is surrounded by a fertile agricultural and fruit-growing country. The city has a good harbor, two lighthouses, and a large trade in grain and lumber. Among the manufactures are furniture, machinery, sailing vessels, ironware, and cigars. The fisheries are an important factor in its prosperity. Several steamboat lines furnish regular communication. It is improved by electric lights, waterworks, etc. The chief buildings include the high school, the public library, and the Ackley College for girls. It was first settled in 1835. Population, 1910, 5,856.

**GRAND ISLAND**, a city in Nebraska, county seat of Hall County, on the Platte River, 148 miles west of Omaha. It is on the Chicago, Burlington and Quincy, the Union Pacific, and other railroads, and has extensive railway machine shops. The noteworthy buildings include a fine courthouse, the Grand Island College (Baptist), the public library, the Saint Francis Hospital, and the Nebraska Soldiers' and Sail-

ors' Home. It is an important grain and stock shipping center, and manufactures flour, beet sugar, wire fences, brooms, machinery, farming implements, and cigars. It has systems of sewerage, parking, electric lights, waterworks, and telephones. It was settled in 1869 and incorporated in 1872. Population, 1900, 7,554.

**GRAND JURY.** See Jury.

**GRAND MANAN** (mà-năn'), an island of Canada, in Charlotte County, New Brunswick, at the entrance to the Bay of Fundy. It is about twenty miles long and five miles broad and is well timbered with hardwood and evergreen trees. The shores are high and the surface is fertile, though the island is not greatly elevated. Good drives and roads have been constructed and the island is popular as a summer resort. At Indian Beach, on the northern shore, is a small settlement of Quoddy Indians. Grand Harbor is the principal settlement. The island has a population of 2,750.

**GRAND PRÉ** (grän prâ), a village of Nova Scotia, in Kings County, on the Windsor and Annapolis Railway. It is about fifteen miles from Windsor and is famous in literature as the central theme in Longfellow's "Evangeline." The French settled it in 1604 and it became a British possession in 1713. However, the expulsion of the Acadians did not occur until 1755. Population, 1900, 874.

**GRAND RAPIDS**, a city and the county seat of Kent County, Michigan, at the head of navigation on the Grand River. It is on the Grand Trunk, the Michigan Central, the Père Marquette, the Lake Shore and Michigan Southern, and other railroads, and has communication by a network of electric railways. An abundance of water power is obtained from the rapids in the Grand River. The streets are well paved with brick and asphalt and lighted with gas and electricity. The architecture is generally substantial, including many tall and fireproof buildings. Among the noteworthy structures are the Federal buildings, the county courthouse, the public library, the Masonic Temple, the Pythian Temple, and many public schools and churches. It is the seat of the Michigan Soldiers' Home, Saint John's Orphan Asylum, State Masonic Home, city home for the treatment of contagious diseases, and numerous hospitals.

Grand Rapids is important as a manufacturing and jobbing center. It has a large trade in lumber, fruit, grain, quarry products, and merchandise. Among the manufactures are furniture, flour, clothing, machinery, utensils, and hardware. Near the city are gypsum quarries that product an immense quantity of stucco. It



has extensive productions of brick and tile. The furniture manufactories rank as the largest in the world. Grand Rapids was settled in 1833 and received its charter as a city in 1850. Population, 1904, 95,718; in 1910, 112,571.

**GRAND RAPIDS**, a city of Wisconsin, county seat of Wood County, 95 miles west of Green Bay. It is on the Wisconsin River and on the Chicago and Northwestern, the Chicago, Milwaukee and Saint Paul, and other railroads. It has a public library, electric lighting, waterworks, and a growing trade in merchandise and agricultural products. The manufactures include paper and wood pulp, furniture, flour, machinery, and clothing. It has a number of fine county and school buildings. A bridge connects the city with Centralia, which was annexed to Grand Rapids in 1900. Population, 1905, 6,157.

**GRAND REMONSTRANCE** (rě-mön'-strans), a document presented by the House of Commons to Charles I. of England in 1641. It was adopted by a majority of 11 votes at a time when the king was absent in Scotland, and consisted of 204 sections in which real or alleged irregularities of the government were enumerated. Among the principal grievances stated were that the government had levied forced loans, practiced excesses in the courts of the Star Chamber, injured the people by building up commercial monopolies, and illegally enlarged the royal forests. The king at first ignored the manifesto and later issued an evasive reply, but afterward tried to impeach the leaders who promoted it in the House of Commons. This unsatisfactory policy on the part of the king was one of the causes that brought on the Civil War and the establishment of the Commonwealth.

**GRAND RIVER**, a tributary of the Colorado, rises in Grand Lake, and after a course of 350 miles joins the Green River in Utah to form the Colorado. It flows through a mountainous country in the greater part of its course, and in several localities passes through deep canyons. The Dolores and Gunnison are its chief tributaries.

**GRAND RIVER**, a river of the United States, rises in Iowa, and after a course of 300 miles flows into the Missouri. Its direction is mainly toward the southeast, entering the Missouri River at Brunswick, Mo. The country through which it flows is highly fertile and in its lower course are valuable forests.

**GRANGE** (grānj), or **Patrons of Husbandry**. See **Farmers' Organizations**.

**GRANITE** (grăn'it), an unstratified rock, generally consisting of the three minerals,

quartz, mica, and feldspar. The crystal grains of which it is formed vary in size, thus giving rise to the fine-grained and coarse-grained varieties. The latter is commonly called *pegmatite*. The grain crystals range from the size of a pin head to a two-foot cube. Such minerals as beryl, garnet, and tourmaline are found in granite formations, often in small particles scattered through the body. Granite is classed as an igneous or fire-formed rock, and originated under great heat and pressure beneath the surface of the earth, the pressure being produced in most cases by earth, but also by water and steam. It was forced from the pre-Cambrian to the Tertiary ages, the granite of the Alpine region of Europe being of the more recent formation. It is widely distributed and constitutes the most durable material for buildings and monuments. Among the productive granite districts of the United States are those of New England, New York, California, Michigan, and other states. It is quarried extensively in Canada, Italy, Sweden, Switzerland, Russia, and in Africa. The *red granite* of Scotland and the *Barre granite*, a gray species, of New Hampshire, are used extensively in monuments.

Granite varies greatly in hardness and color, according to the proportion of its constituents. The varieties in which feldspar predominates are inclined to crack, hence they do not possess much value for building. The harder species are used for building monuments, bridges, public buildings, and fortresses. Its hardness makes the expense for quarrying and cutting considerable, though this is at least in part overcome by its durability and beauty. Most species take on a fine polish. Those containing considerable feldspar are reddish, the flesh shade of some being due to mica, while others are grayish-blue, gray, yellowish, pinkish, or drab. Among the ancient Egyptians granite was highly prized as building material and for tombs and monuments. Their statues were made largely of Oriental basalt found in the deserts of Egypt, while Oriental red granite served for monuments, such as Cleopatra's Needles and Pompey's Pillar. The ancient method of polishing brought out good results, and usually the finished product was decorated with finely cut hieroglyphics. Egyptian ruins bear evidence that they preferred to use the species which are darkened by the presence of hornblende, the grayish, and those containing a flesh color due to the presence of feldspar.

**GRAPE**, the wine plant or its fruit. It belongs to the genus *Vitis*, is a climbing vine, and has lobed and somewhat hairy leaves. The stock is woody and is supported by strong ten-



drils. Nearly all the plants have very long and branching stems, from which the outer bark is easily removed. It is thought that the best fruit-bearing plants are native of the region surrounding the Caspian Sea, extending as far west as the Crimea. Several species of wild grape of inferior quality are native to many countries and grow extensively in the forests of America. The cultivated species thrive in the warm and temperate zones. They produce berries in clusters, some of which are seedless, but others have from one to four stony seeds.

The Phoenicians introduced the grape into Europe from Asia, where it has been grown from remote antiquity, and it was brought to America as soon as permanent settlements were made in the new world. Since then many of the native plants have been improved by cultivation and new species originated by mixture with those of Eurasia. The grape plant may



GRAPE VINE.

be propagated by inoculation, cuttings, grafting, and seeds. Grades of sweet wine are made from grapes which are allowed to be left on the vines until overripe, when they contain a larger per cent. of saccharine matter. The wine products of France, Spain, and Germany are noted, while for productiveness and large species few countries exceed South Australia. In many of the warmer climates the wine plant bears twice a year. The application of artificial heat has materially increased the production, though this was not practiced extensively until within the last century. California is the greatest wine-producing State of the United States, and its products now rival those of Germany and France.

Not less than 500 species of grapes are indigenous to North America, but the number cultivated is comparatively small. The plants are usually obtained by cuttings and are set in rows about ten feet apart. In most cases the ground is cultivated in other crops one or two years, after which it is subjected to clean culture and the vines are supported on trellises. Careful trimming is necessary to secure a large yield of good quality. Among the popular species of grapes grown for the market are the Concord,

Catawba, Niagara, Clinton, White Frontignan, Madeira, and Black Prince.

**GRAPESHOT**, a class of spherical shot put up in stands, generally consisting of three tiers with three shots in each tier. The use of case shot has superseded largely that of grapeshot.

**GRAPHITE** (gräf'it), a mineral carbon, also called *black lead* and *plumbago*. It is found in the oldest rock formations, occurring in many portions of the Altai Mountains, Germany, and the United States, especially in New York, Pennsylvania, Michigan, Alabama, and California. Extensive deposits are found in Canada, notably in the Laurentian rocks at Brougham, Bohemia, and Ceylon. It occurs in masses or beds, having a chemical composition similar to anthracite coal, and may be made artificially from coal. The marketable grades have a highly metallic luster, a granular texture, and an iron-gray color. They are soft to the touch and quite unchangeable in the air. Graphite may be heated in a closed vessel without effecting a change. Its use is largely for crucibles, portable furnaces, and pencils. It is employed in electrotyping, for protecting iron from rust, and various other purposes in the arts and industries. The manufacturing establishment founded at Stein, Germany, by A. W. Faber is one of the oldest and largest in the world engaged in the manufacture of pencils. In making pencils the larger blocks of pure graphite are utilized in their natural state by cutting them into pieces and forms of proper size, while the cheaper grades of pencils contain graphite secured by grinding the smaller particles of powder and purifying them by washing, and afterward drying and pressing into proper forms. The harder varieties of graphite pencils are made by adding a small quantity of clay.

**GRAPHOPHONE** (gräf'ô-fôn). See **Phonograph**.

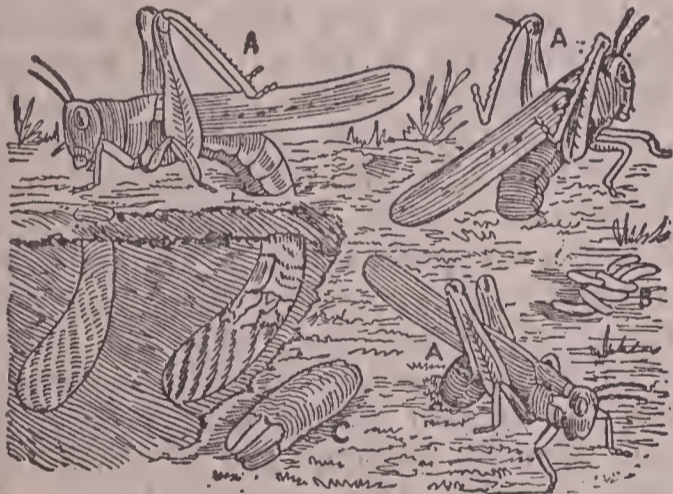
**GRASS** (gräs), an important and extensive order of endogenous plants, including about 450 genera and 4,500 species. They are distinguished from sedges by their generally cylindrical, pointed, and hollow stems, while sedges are largely triangular in shape, pointed, but solid. There are two classes of grasses, *artificial* and *natural*. The former include such cultivated plants as trefoils, sainfoin, and clover grown for fodder, and the latter embrace the grasses proper. Both of these are of incalculable value on account of the nutritious herbage furnished for stock and the various textiles employed in manufacturing. The soil is enriched by the decaying substances of grasses, and washing away of the surface soil by rains is hindered largely by their roots. Many of the



grasses are annuals, but those growing in forests and many having woody structure are not. Different species are commonly found on hills, slopes, valleys, and marshes, and the quality of the soil is often indicated by the kind of grass it bears. The growth in a single season varies from minute forms to heights of fully one hundred feet. Bamboo grasses are woody, while grains rank with the herbs. The different cereals and their products, such as beer, paper, sugar, rum, medicine, bread, and starch, are treated in separate articles.

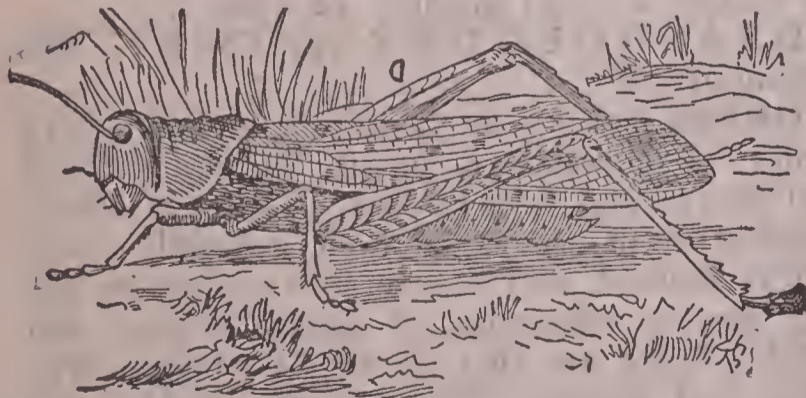
**GRASS CLOTH**, the name of certain beautiful fabrics manufactured from ramie, or China grass. The name is somewhat misleading, since the fibers from which the product is made do not belong to the grasses, and the kinds of cloth made from the fiber of true grasses are very coarse. Some varieties of cloth made from ramie resemble silk in fineness and luster and are extremely durable.

**GRASSHOPPER** (grás'höp-pēr), an order of insects characterized by large, strong hind legs fitted for leaping. They are allied to the



GRASSHOPPERS.

A, A, A, Adults depositing eggs; B, eggs; C, group of eggs.



ADULT GRASSHOPPER.

locusts, crickets, and cockroaches. Distinguishing and characteristic sounds are produced, as in the locust, by rubbing the wings and wing covers together during flight, and others by rubbing the serrated hind legs against the wing covers, while the peculiar sounds of the katydid and cricket are caused by rubbing one wing cover on the other. The common grasshoppers

have long, threadlike antennae and the wings are folded together like the sides of a roof. In some species they are rudimentary and usually are grayish or green in color. They are numerous in all parts of the world, often occurring in such numbers as to be destructive to vegetation. In some of the arid regions, as in western Kansas and Nebraska, they have been known to obscure the sun for hours in their flight, and, when alighting, to be so numerous as to greatly damage the growing crops. Some species are said to live on insects, but the greater number feed on grass and herbage.

**GRASS TREE**, the common name of tree-like plants native to Tasmania and Australia, so called from the grasslike foliage. Six species have been described, all of which have upright stems with tufts of long narrow foliage at the upper part, and clusters of flowers are borne amid the tufts of leaves. The bases of the inner leaves are edible and are prepared for the table by roasting. A balsamic gum useful in medicine is obtained from the stem by incisions. The stem rarely reaches a height of more than six feet, though usually it is about four feet high, and the diameter is sometimes a foot.

**GRASS VALLEY**, a city of California, in Nevada County, 68 miles northeast of Sacramento, on the Nevada County Railroad. It is surrounded by a rich gold-mining region. The industries include quartz mills, machine shops, and marble works. It is the seat of Saint Mary's Academy, has electric lights and a public library, and is the center of a growing trade in merchandise and manufactures. The first settlement on its site was made in 1849. Population, 1900, 4,719.

**GRATZ** (gräts), or **Graz**, a city in Austria, capital of Styria, on the Mur River, about ninety miles southwest of Vienna. The site of the city is a beautiful eminence about 400 feet above the river, the streets are well improved, and important railroad connections facilitate commercial enterprise. Besides a well-organized school system, it has a university founded in 1586 which is attended by 1,725 students and has a library of 90,000 volumes. Other noteworthy buildings are the Gothic cathedral, founded in 1456 by Frederick III., a Gothic church, numerous monasteries, several government buildings, and many splendid residences. The manufactures include silk, woolen, and cotton goods, machinery, ironware, vehicles, soap, sugar, railroad cars, wine, and candles. It has electric lights and street railways, waterworks, pavements, several public parks, and many fine monuments. Gratz was founded in



the 12th century. The Hungarians made an attack upon it in 1481, but they were repulsed. It was captured by the French in 1797 and in 1809. The building of railways and the development of manufactures since 1860 has caused it to grow rapidly. Population, 1906, 158,212.

**GRAVEL** (grāv'ěl), the general name of small stones or pebbles mixed with sand, loam, or clay. It is formed by the action of water disintegrating rocks, the particles appearing first as boulders, but later are worn down to pebbles, sand, and even silt. Gravel forms useful material in building highways and ballasting railroad grades.

**GRAVELOTTE** (grāv-löt'), a village in Lorraine, about eight miles west of Metz, Germany. It is noted as the scene of a severe battle on August 18, 1870, between the Germans and the French. The German army consisted of 211,000 men under the personal direction of King William of Prussia, and the French army of 140,000 was under Marshal Bazaine. The German losses were 20,000 and the French 13,000, but the army of the latter was compelled to retreat to Metz, where the whole force surrendered to Prince Frederick Charles.

**GRAVITATION** (grāv-ī-tā'shūn), the force with which all heavenly bodies attract each other, often called the attraction of gravitation. That heavenly bodies attract each other was believed by Democritus and Epicurus and later by Bacon, Galileo, and Kepler, but it was left for Newton to discover the universality of gravitation and the law of its action between all bodies. The law he announced is that every particle of matter in the universe attracts every other particle of matter with a force directly proportional to its quantity of matter, decreasing as the square of the distance increases. In all heavenly bodies two opposing forces are constantly at work; one an attractive and the other a projectile force. If the attraction of gravitation alone operated, all planets would fall into the sun; or, if the projectile force alone existed, all planets would go off into space and move in a straight line forever, unless ultimately brought to rest by some external agency.

The two forces of gravitation are so nicely balanced that all heavenly bodies move around the central luminary with an exact precision, and when a planet is nearest the sun its projectile force is increased to exactly balance the increased force of attraction. Not only are the planets attracted by the sun, but they attract the sun. Their revolution is not properly around the sun, but all heavenly bodies, including the sun, revolve around the center of gravi-

tation, which is a point at or near the center of the sun. The same law operates in the case of all the satellites and primary bodies; they all attract each other directly as their respective masses, and inversely as the square of their distance. The laws of gravitation are well known, but why interposed substances will not interrupt gravitational tendencies, and how it can act at a distance without contact or connection, are problems not yet fathomed.

**GRAVITY** (grāv'ī-tŷ), the natural force exerted on all terrestrial matter, by which all bodies have a tendency to fall toward the center of the earth. This attraction holds all objects, as rock, water, animals, air, buildings, metals, and wood, and from it they receive the property called *weight*. The term *specific gravity* has reference to the relative weight or density of substances. If gravity did not exist, all objects loose on the earth's surface would be inclined to pass off into space by themselves. It is greatest at the surface of the earth, and diminishes as one goes upward, being a thousandth part less on a mountain 10,000 feet high. It is exerted alike on all bodies of equal density, and remains constant at a given place. At the poles its influence is greatest and it gradually decreases toward the Equator. Tests with spring balances have demonstrated that bodies appear to become heavier as we proceed toward the poles. This is due to the centrifugal force caused by the revolution of the earth upon its axis, which is greatest at the Equator and has a tendency to throw bodies off the earth. The difference in weight is  $\frac{1}{174}$ , or a body weighing 194 pounds at the Equator weighs 195 pounds at the poles. From this is learned that if the earth turned seventeen times faster upon its axis than it does, gravity would be overcome, and bodies would lose the property of weight. Gravity is measured by the acceleration of a falling body and by an oscillating pendulum. Increase in the weight of a falling body on the line between Canada and the United States is about 50.2 feet per second, and the variation of acceleration in different places determines the gravity. A pendulum oscillating once a second at sea level in the latitude of New York, moves slower or faster at places having greater or less gravity, hence it must be shorter or longer respectively to oscillate the same number of times. All heavenly bodies have gravity, the intensity of which is modified by their volume, density, velocity, and the attraction of gravitation.

**GRAYLING** (grā'ling), the name of a genus of edible fish, resembling in habits and external appearance the small salmon. The body is slender, the head is somewhat elongated, and the



mouth is small. It is active and considered a good game fish. The flesh is highly prized for table use. Two species are widely distributed in North America. These include the *arctic grayling* of Canada and Alaska, which is about eighteen inches long and weighs from one to two pounds. The other species, generally known as the *Michigan grayling*, is found in various parts of the United States, but especially in Michigan and the head streams of the Missouri River. The European species are abundant in the northern part of that continent and extend as far south as northern Italy.

**GREAT BARRINGTON**, a town of Massachusetts, in Berkshire County, forty miles west of Holyoke, on the New York, New Haven and Hartford Railroad. It is surrounded by picturesque scenery, hence is popular as a summer resort. The manufactures include cotton goods, machinery, cigars, and electrical apparatus. It has electric lights, a public library, and waterworks, and is the seat of Sedgwick Institute. In 1786, during Shay's Rebellion, it was the scene of an insurrection. William Cullen Bryant was the town clerk of Great Barrington for several years. It was settled in 1725, but formed a part of Sheffield until 1761, when it was incorporated. Population, 1905, 6,152.

**GREAT BASIN**, a vast triangular plateau between the Wasatch and Sierra Nevada mountains. It includes nearly all of Nevada and part of Idaho, Oregon, and California. Its length from north to south is 800 miles, and its breadth in a line crossing Great Salt Lake equals about 500 miles. The surface is diversified by valleys and mountains, among which numerous streams and salt lakes abound, but none has an outlet to the sea. In early geologic times the basin formed a vast lake.

**GREAT BEAR LAKE**, a large fresh-water lake in the western part of North America, situated in the district of Mackenzie, Canada. Its coast line is irregular and, being crossed by the Arctic Circle, its waters are frozen half of the year. Keith and McVicar bays are the principal coast indentations. The surface area is 14,000 square miles and the elevation above the sea is about 225 feet. It discharges into the Mackenzie by the Great Bear River.

**GREAT BRITAIN**, the English Empire, including the British Isles and extensive colonial possessions, and known officially as the United Kingdom of Great Britain and Ireland. The British Isles embrace two principal islands, the most important of Europe, the largest of which contains the three political divisions of England, Scotland, and Wales, and the smaller, Ireland. Five groups of islands are included, of which

the Scilly and Channel islands belong properly to England, and the Orkney, Hebrides, and Shetland islands, to Scotland. Other islands adjacent and belonging to Great Britain include Wight, Man, and Anglesey. The eastern boundary of the British Isles is formed by the North Sea; the southern, by the Strait of Dover and the English Channel; and the western and northern, by the Atlantic Ocean. Ireland is separated from the larger island by the North Channel, Irish Sea, and Saint George's Channel. The area of the British Isles is 130,979 square miles. It has a coast line, including indentations, of about 4,000 miles.

**SURFACE.** The surface is greatly diversified, being mountainous and rugged in the northern portion, especially in Scotland, while the southern part consists of undulating plains. Immense bogs characterize the interior of Ireland, but its coastal regions are fertile and of moderate elevation. The most elevated peaks of Scotland are the Grampians, which attain to heights of about 4,410 feet. In Wales the highest elevation is Snowdon, 3,375 feet, and the most elevated in Ireland is Carrantal, 3,414 feet. The mountain regions extend from Scotland and Wales into England and culminate in Scafell, 3,210 feet. On the border between England and Scotland are the Cheviot Hills, separated from the Pennine Chain by a low strip of country, but a larger part lies in Scotland. These highlands enabled Scotland to maintain a separate political existence for many years, and transportation lines are still mainly around the ends, where they are lowest.

**RIVERS.** Numerous rivers and lakes furnish ample interior water surface for navigation, fisheries, and facilities to propel machinery and supply cities with water. However, the rivers are not of great length and volume, owing to numerous mountains and the comparatively small extent of the surface. The Clyde and the Severn are the two longest rivers, the former in Scotland and the latter in England. The Clyde has been greatly improved by widening and deepening and is an important avenue of commerce. Next to the Severn, which is nearly 250 miles long, is the Thames, about 200 miles, among the river systems of England. Both have sluggish currents and are benefited for navigation by the tides. The Thames is one of the most important avenues of commerce in the world, estimated on the basis of the volume transported. Other streams of importance include the Don, Tay, Dee, Spey, Forth, Trent, and Tweed. In the northwestern part of England is the Lake District of the Cumbrian Mountains, and a famous lake region is in the





GEORGE V.

George V., King of Great Britain and Ireland and Emperor of India, born June 3, 1865, is the son of Edward VII. and Alexandra, eldest daughter of Christian IX., of Denmark. He was trained to become a sailor, after which he spent five years in cruising, and in 1892 entered the House of Lords as Duke of York. He succeeded his father in 1910. He married Victoria May, daughter of the Duke of Teck, in 1893. Edward Albert, the heir apparent, was born June 23, 1894.







Highlands of Scotland. Among the lakes of the latter are included Loch Katrine, Loch Lomond and Loch Rannoch.

**CLIMATE.** The climate as a whole is healthful. The summers are cool and the winters are moderately cold, while the rainfall is quite large. These characteristics are due to the proximity of the sea, since the location in latitude is about that of the Gulf of Saint Lawrence in North America. The harbors do not become ice bound at any time of the year and snowfalls are rare, except in the higher altitudes, but none of the mountains are covered with snow in the summer. In winter the average temperature is about 25° and in summer it is about 60°, while the annual average may be placed at 48°. Clouds are very frequent and the land is covered with fogs quite often. The inland and the western part have the heaviest rainfall, but the annual average for the country is about 40 inches. It is much greater in Wales, where it reaches 60 inches. As a whole the climate of the British Isles is favorably modified by the Gulf Stream, which sweeps across the Atlantic Ocean from North America, and by the prevailing southwest winds. These causes combine to render it equable and highly salubrious.

**INDUSTRIES.** The wealth of Great Britain originated from extensive agricultural and mining interests, and upon these were built vast manufacturing enterprises. By aid of an extensive marine it was possible to open the channels of commerce for the exchange of products and the increase in the output of manufactories. All the available land fit for cultivation is utilized with much care and the fertility is maintained by a high state of cultivation and by the use of fertilizers. All the domestic animals common to North America are grown successfully, especially milch cows, dairying being an important enterprise. The agricultural products were nearly sufficient for the food supply of the people until the middle of the 19th century, but with the advent of steam power and improvement in machinery the demand for raw materials rapidly increased and the cost of foreign foodstuffs was cheapened. For these reasons it became impossible to compete longer with grain grown in foreign countries, and thousands of agricultural laborers left the farms and sought employment in the manufactories. Great Britain at present exceeds all countries in the importation of food products and the supply grown at home is far short of the requirement.

Commercially Great Britain holds an important position among the nations. On the one hand it is the largest importer of food products, and on the other hand exports a vast quantity

of manufactured articles. The total imports received annually are valued at \$3,150,000,000, of which about one-half is paid for articles of food and drink, and the bulk of the balance is expended for raw material for shipyards and factories. At present the domestic exports aggregate about three-fifths of that of imports and nearly all of this represents manufactured or partly manufactured articles. The manufacture of cotton, woolen, linen, and silk textiles have been renowned for many centuries. Its productions of tinware, ironware, machinery, glass, furniture, porcelain, and other useful commodities take high rank among the products of the world. It not only holds a high place among the most important manufacturing nations, but in the production of merchant-marine vessels and general shipbuilding it occupies first place. The annual output of vessels is about 750, with a tonnage of 1,850,000.

Great Britain possessed good transportation facilities long before the advent of the era of railroad building. None of the manufacturing or commercial centers is far from the sea, not more than 75 miles, and all of the cities that have a large trade are near rivers or canals. The Thames River was improved by the government as early as 1423, and the vast network of main and auxiliary canals now in use aggregate a length of about 3,250 miles. The Manchester Ship Canal, 35 miles in length, is one of the most important waterways for large ocean vessels. Many of the rivers, such as the Severn, Thames, and Clyde, have been canalized. The railroads are exceptionally well built and equipped and include a total of 23,500 miles, exclusive of the lines operated in Ireland. With the exception of the United States and Germany, no country of the world has risen to the high development in commerce enjoyed by Great Britain. The import trade, based on values, in the order of importance, is with the United States, France, Germany, Holland, Russia, Belgium, Spain, and Denmark. The exports are largely to the colonies, though it has a large export trade with France, Germany, and Brazil.

**EDUCATION AND RELIGION.** Educationally the British Isles take a high rank, though the per cent. of illiteracy is much greater than in Germany and the Scandinavian countries. Until 1870 education was voluntary, but in that year measures to promote elementary education were passed, and soon after attendance was made compulsory for all children between the ages of five and fourteen. A school attendance law for Scotland was enacted in 1872, by whose terms attendance was made compulsory from five to fourteen years. The Board of Education cre-



ated in 1899 has charge of educational affairs in England and Wales, but in the latter division the instruction includes a department in the Welsh language. Schools are maintained generally by taxation and public grants. Support is given by the government to many industrial institutes which teach agriculture, dairying, commerce, mining, and the fine arts. In Ireland the educational status is not as well advanced as in the other portions, but a spirit in favor of progressive teaching and for greater educational advancement is becoming more marked.

Among the higher institutions of Great Britain are the universities at Cambridge and Oxford, which rank among the most celebrated of Europe. Other universities in England include those at Liverpool, Manchester, Sheffield, Birmingham, London, and Leeds. The University of Dublin is the most noted in Ireland, and the four celebrated institutions of Scotland are at Glasgow, Aberdeen, Edinburgh, and Saint Andrews. Besides these, there are about ninety colleges in the British Isles, which are supported partly by public grants, but mostly by private and religious societies. All forms of religious worship are tolerated. However, in England and Wales the Protestant Episcopal and in Scotland the Presbyterian churches are favored by state endowments. In this portion of the British Isles the people are largely Protestants, while in Ireland about two-thirds belong to the Roman Catholic Church. Among the numerically strongest Protestant sects in Ireland are the Presbyterian, Methodist, Independents, Baptist, and Friends.

**GOVERNMENT.** The government is a constitutional monarchy. It was gradually developed from the feudal period to a popular form. The two leading features, which are an administrative ministry and representation of the people in the legislature of two houses, have been adopted by many of the republics of the world. However, the constitution is unwritten and consists of important manifestoes and treaties, royal decrees relating to administration, and numerous precedents and judicial decisions. The *Magna Charta* of 1215, the Declaration of Rights in 1689, the Act of Settlement in 1771, the Act of Union with Scotland in 1777, and the Act of Union with Ireland in 1800 are the most important of the constitutional instruments. Nominally the executive power is vested in the king or queen and the two houses of Parliament, but it is actually exercised by a committee of ministers known as the *Cabinet*. The Parliament has supreme legislative power, and the laws made by that body are administered through the Cabinet. Since the cabinet officers are dependent

largely upon Parliament and the latter body may name the sovereign when the question of succession arises, it is apparent that the principal governmental powers in the kingdom ultimately are vested in the Parliament.

Succession to the crown is vested in the eldest child of the preceding ruler and male heirs are preferred over female heirs. At the age of eighteen the heir apparent comes into possession of his title, being Duke of Cornwall by heredity and Prince of Wales by grant. The Protestant Episcopal church being official, it is required that the heir and crown affiliate with it. The sovereign is the nominal head of the Church, presides over the highest ecclesiastical bodies, may grant pardons and issue passports, has power to declare war and make treaties, is the commander of the navy and army, and may appoint and remove certain administrative officers. It is within his range of power to summon, open, prorogue, and dissolve Parliament, but the last-mentioned function is not exercised without the advice of the ministry. Though he has the veto power in legislation of Parliament, this right has not been exercised since 1707.

When a new Cabinet is to be chosen, the sovereign selects the leader of the majority party in the House of Commons as Premier, who, after holding consultations with the members of his party, selects a ministry. The ministers chosen by the Premier are appointed by the sovereign, and they may be members of either house of Parliament. They not only retain their seats in Parliament, but as ministers propose many subjects for legislation and are leaders in the debate. Twenty ministers make up the Cabinet, but all of them are not directly engaged in the work of council. When a majority of Parliament become dissatisfied with the action of the Cabinet, they declare that the ministry no longer has their confidence, and they must either change their course in deference to the wishes of the majority or resign.

The legislative functions of the government are exercised by the two houses of Parliament, the House of Lords and the House of Commons. The *Great Council*, as the Parliament was originally called, was first a gathering of nobles and bishops, but in 1265 the commoners were given representation. Edward I., in 1295, issued writs ordering the election of two citizens from each city or borough and two knights from each county. In the 14th century the Parliament was divided into the two houses, and this arrangement has continued up to the present. The lords hold their seats by hereditary right; by virtue of office, as bishops of the Established Church; by creation of the sovereign;



by election for the duration of Parliament, as in the case of Scottish peers; or by election for life, as in the case of Irish peers. In 1900 the number of names on the roll of lords was 593. Power to revise all bills that come from the House of Commons, except those relating to public revenue and expenditure, is vested in the House of Lords. The expenditures of the nation are controlled by the lower house. All the members of the House of Commons are chosen by qualified electors. The right to vote is restricted to male citizens who are twenty-one years of age or over and who possess a property qualification. The total membership of the commons is 670 members, being one representative for each 54,000 inhabitants, and a few of the towns and the great universities have representation. Women are permitted to vote under certain conditions for city and county councils and school boards, and are eligible to serve as members of the latter, but they are not permitted to vote for members of Parliament.

Great Britain being one of the largest political powers in the world, necessarily has vast interests in different lines of government, both local and colonial. Local government is administered in six distinct lines, including those of parishes, rural districts, urban districts, school districts, boroughs, and counties. In these administrative districts the government is vested very largely in the people themselves, subject only to the law and constitution of the nation. Wales has been governed as a part of England since 1536, and the privileges of its inhabitants are coextensive with that of other English subjects. Scotland is represented in Parliament by 16 peers and 72 commoners, and the administration is through the Chief Secretary for Scotland. Local government is similar to that of England, but there is a separate system of civil and criminal courts, though the House of Lords is the highest judicial tribunal to which appeals may be taken. Ireland is governed through a personal representative of the crown, who is known as the Lord Lieutenant. He is aided by the Chief Secretary for Ireland, who, like the Chief Secretary for Scotland, is usually a member of the Cabinet. Ireland has 28 peers and 103 commoners in the British Parliament, but has no Parliament of its own. Here the local government conforms quite generally to that of England, and its system of courts culminates in the supreme court of judicature, from which appeals may be taken to the British House of Lords.

The colonies are divided into four classes, depending upon the system under which government is administered. Those of the first class include the possessions that are practically inde-

pendent of the mother country, such as Canada and Australia; those of the second class are semi-independent, where the legislature is partly elected by the people and partly appointed by representatives of the crown, such as Ceylon and Malta; those of the third class are known as crown colonies and are governed by a council and governor appointed by the crown, such as British Honduras and the empire of India; and those of the fourth class embrace the protectorates, in which native agencies conduct the government. To these may be added a fifth class in which the government is administered by charters through trading companies. Egypt is in a class by itself, where the influence of Great Britain is paramount, but the government is nominally administered through Turkey.

Great Britain has the largest navy in the world. It includes, besides others, 60 battleships, 20 armored cruisers, 100 protected cruisers, 80 torpedo boat destroyers, and 100 torpedo vessels. The total displacement of vessels is estimated at 1,150,000 tons. The revenues of the government for all purposes are derived from various sources, but the most important of the direct taxes is the income tax, which is levied on the income of individuals in graduated rates. In addition to this are the excise duties, inheritance tax, customs duties, house duties, stamp duties, and land tax. In 1908 the national debt amounted to \$3,875,000,000. Many of the public utilities are owned by the government, such as the postal service, which includes a parcel post, and the telegraph lines.

**INHABITANTS.** The population of Great Britain, including Ireland, has been increasing steadily. However, Ireland has shown a constant decrease for many decades. London, the capital of the British Empire, located on the Thames, is the largest city in the world. In 1907 fourteen cities of England, two of Ireland, and two of Scotland had a population of more than 200,000. Owing to the great uplift in manufacturing enterprises, there has been a constant increase in urban population. Fifteen per cent. of the people of Wales speak Welsh only, 45 per cent. of Ireland speak Irish only, and 63 per cent. of Scotland speak Gaelic only. The inhabitants of the United Kingdom in 1907 were 44,100,231. Of this number 4,378,568 were in Ireland, 4,776,063 were in Scotland, and 34,945,600 were in England and Wales.

**COLONIES.** The colonial possessions of Great Britain are more extensive than those of any other nation. The entire possessions embrace about one-seventh of the land area and nearly one-fourth of the inhabitants of the earth. All the more important islands and continental prov-



inces are treated in separate articles. The table published in connection with this article does not include some of the minor possessions and some of the unsurveyed territories of Africa may contain a greater or smaller area and population than stated. However, based upon the most recent reports, the table may be considered sufficiently accurate.

GREAT BRITAIN AND COLONIAL POSSESSIONS.	AREA IN SQUARE MILES.	POPULATION.
<b>In Africa:</b>		
Ascension Island.....	35	260
Basutoland.....	10,293	348,840
Bechuanaland Protectorate.....	386,200	120,770
Cape Colony.....	277,000	2,409,800
Central Africa Protectorate (British).....	40,980	1,000,500
East Africa (British, Uganda, and Zanzibar).....	289,258	8,200,000
Mauritius and dependencies.....	877	400,000
Natal (including Zululand, Amatongaland, and other districts).....	35,371	1,108,750
Nigeria.....	310,000	25,000,000
Orange River Colony.....	50,392	387,315
Rhodesia.....	750,000	925,000
Saint Helena.....	47	3,882
Seychelles.....	148	20,275
Somaliland Protectorate.....	60,000	300,000
Transvaal.....	111,196	1,354,200
West African Colonies (Gold Coast, Lagos, Gambia, Sierra Leone).....	138,260	4,263,700
<b>In America:</b>		
Bermudas.....	18	23,317
Canada.....	3,619,946	5,371,315
Falkland Island and South Georgia.....	7,500	2,044
Guiana (British).....	90,500	302,170
Honduras (British).....	7,562	39,968
Newfoundland.....	40,200	220,000
Labrador.....	120,000	4,000
<b>In Asia:</b>		
India (British and Native States).....	1,766,642	294,361,056
Ceylon.....	25,333	3,812,931
Cyprus.....	3,584	237,022
Hong Kong.....	32	335,000
Aden, Perim, and Kuria Muria..	101	41,406
Sokotra.....	1,382	12,000
Bahrein Islands.....	270	70,000
Borneo (British North).....	31,106	200,000
Labuan Island.....	31	8,411
Brunei.....	4,000	12,000
Sarawak.....	41,000	500,000
Straits Settlements (Singapore, Penang, and Malacca).....	1,542	572,249
Federated Malay States (Perak, etc.).....	26,380	678,595
Wei-Hai-Wei (in Shantung).....	1,785	150,000
<b>In Australasia:</b>		
Australia, Commonwealth of....	2,972,918	3,925,000
British New Guinea.....	90,540	350,000
New Zealand.....	104,751	857,000
Fiji.....	7,435	121,773
<b>In Europe:</b>		
United Kingdom.....	121,089	41,458,721
Isle of Man.....	227	54,752
Jersey and Guernsey.....	76	95,700
Gibraltar.....	2	26,830
Malta.....	117	202,134
<b>Pacific Islands:</b>		
Tonga, or Friendly Islands.....	390	18,959
Other Islands.....	9,000	200,000
<b>West Indies:</b>		
Bahamas.....	5,450	56,135
Barbados.....	166	199,000
Jamaica and dependencies.....	4,424	806,690
Leeward Islands (Virgin Islands, etc.).....	701	127,536
Trinidad (including Tobago).....	1,868	273,900
Windward Islands.....	498	170,171

**HISTORY.** As a distinct name Great Britain was first used to distinguish the English government from that of Britainy in France, though it was employed only in a poetic sense until 1603, when James I. began to style himself King of Great Britain. In that year the crowns of England and Scotland were united by the accession of James VI. of Scotland to the throne of England as James I., but an independent legislative body was retained by each. The name Great Britain became legalized in 1707, when the two countries became organized as one inseparable union. Queen Anne, the last of the Stuarts, ascended the throne in 1702 and died in 1714. She was succeeded by George I. of the present house of Hanover. Twelve new peers had been created in 1711 and this gave the Tories a majority in the lords, but the rise of the house of Hanover caused the Stuarts to be exiled, and the insurrections that followed were soon suppressed. King George was supported by the Whig party, which remained in undisputed power nearly fifty years. During his reign Walpole rose to power and was a potent factor in overcoming the panic that followed the failure of the South Sea Company. He was the first of the premiers, though he did not assume the title, and remained influential after the succession of George II., in 1727.

In 1739 Great Britain became involved in a war with Spain, though Walpole tried to avert it, and three years later he resigned rather than assume the responsibility of the Austrian Succession. He was succeeded by the ministry of Carteret, who participated in the War of the Austrian Succession, which proved unprofitable to England, but was rather fortunate for the house of Hanover. Charles Edward Stuart, the Young Pretender, invaded England while the war was in progress, but was finally defeated at Culloden in 1746. Ten years later, in 1756, William Pitt entered the Cabinet. He supported Frederick the Great in the Seven Years' War and advocated the war against France, which resulted in the loss of Louisiana, Canada, and India to the French. George II. was succeeded by George III. in 1760, and the new king immediately began to plan for a restoration of many of the royal powers that had been lost by his two predecessors. Pitt resigned from the Cabinet in 1761 and was succeeded by Lord Bute, but the latter soon gave way to Lord North, during whose ministry the Revolution in America began. The Treaty of Paris conferred independence on the American colonies in 1783, and as a result of the dissatisfaction that followed the younger Pitt became Prime Minister, retaining this position until his death in 1806.



The general attitude of republicanism in France after the Revolution along with other causes brought on a war with France in 1793. It resulted fortunately to England, since Nelson's victory at Trafalgar made Great Britain the supreme naval power, while the successes of Wellington in Spain and Portugal forced the Congress of Vienna to grant favorable terms to the British. However, Ireland undertook to obtain independence by force of arms and England soon after became involved in the War of 1812 with the United States. The reign of sixty years by George III. was ended in 1820, when George IV. ascended the throne. He had already served as regent for his insane father, during whose term of service the country had contracted an enormous debt, which greatly retarded economic and political reforms. In 1822 England opposed the alliance between Austria, Prussia, and Russia for the suppression of democracy, and five years later assisted the Greek patriots against Turkey. George Canning became Premier in 1827, but was soon succeeded by Wellington, who promoted a policy of reform. Catholic emancipation was granted in 1829. William IV. ascended the throne in 1830 and the following year Lord Russell introduced the first of the famous reform bills, which was indorsed after an appeal to the country by a large majority. Slavery was abolished in the colonies in 1833, new poor laws were enacted in 1834, and Upper and Lower Canada were united into one Dominion in 1837.

Queen Victoria began her long reign of 64 years in 1867. She exercised a very limited political influence, since the government was largely in the hands of the ministry. Among the principal events of her reign are the extension of territory and political power in India, the repeal of the Corn Laws, the invasion of Afghanistan in 1839, the Crimean War in 1854, the Opium War in China in 1840, the Sepoy Mutiny in 1857, the disestablishment and disendowment of the Irish Church in 1871, the proclamation of Victoria as Empress of India in 1877, the Anglo-Boer War in 1899, and the agitation for home rule in Ireland. Edward VII. succeeded his mother, Queen Victoria, in 1901, while the Anglo-Boer War was still in progress. At the conclusion of peace, in 1902, the territory of the Orange River Republic and of the Transvaal Republic was annexed to the British possessions. The past fifty years of history are important in the newer progress of the great empire, especially in its educational, commercial, and military development. Within this period lived many of the eminent statesmen who formulated its newer policies, including Gladstone,

Ewart, Disraeli, Salisbury, and Campbell-Bannerman. See England.

**GREAT EASTERN**, the first of the large steamships built in Europe. It was constructed in 1854-58 at Millbank, England, for the Eastern Navigation Company, after designs made by Scott Russell, and intended for service to Australia by way of the Cape of Good Hope. The length was 680 feet; breadth, 83 feet; and height to the bulwarks, 70 feet. It had one mast of wood and five of iron and a capacity of 11,000 horse power, and could spread 7,000 yards of sail. The capacity was ample for 5,000 persons when all compartments were fitted out, though the design was to carry only about 1,000 passengers and devote the remaining space to the cargo. The cargo capacity was 20,000 tons. It cost \$300,000 to launch the vessel, which was done on the Thames, Sept. 8, 1859. The expense of manning and keeping up repairs made the enterprise disastrous. After laying the Atlantic Cable and making a number of trips across the Atlantic, the vessel was used to transport troops and later as a coal hulk at Gibraltar in 1884. Subsequently it served as a curiosity. In 1888 it was sold at auction in Liverpool and broken up for repair and building material. Although the *Great Eastern* was considered too large to be practical at the time it was in use, it has been greatly surpassed in size and power by the modern vessels. For instance, the *Kaiser Wilhelm II.* is 683 feet long and the *Lusitania* is 760 feet long.

**GREAT FALLS**, a city in Montana, county seat of Cascade County, on the Missouri River, near its falls at the mouth of the Sun River, 98 miles northeast of Helena. It is on the Great Northern and other railroads, within a region which produces large quantities of gold, silver, iron, coal, copper, and sandstone. Among the chief buildings are the county courthouse, the public library, the high school, and the Federal building. It has seven parks with a total area of 560 acres. Immense water power is derived from Rainbow and Great falls. Among the manufactures are earthenware, clothing, cigars, machinery, and brick. It has large smelting and refining works. Great Falls was settled in 1884 and incorporated in 1888. Population, 1900, 14,930; in 1910, 13,948.

**GREAT FISH**, or **Back River**, a stream of Northern Canada, rises near Lake Aylmer, and flows into the Arctic by a wide estuary. Its source is in Mackenzie, whence it has a course of about 500 miles toward the northeast. It was discovered and explored by Sir George Back in 1834.

**GREAT KANAWHA** (kà-nà'wà), an important river flowing into the Ohio, rises in the



Blue Ridge Mountains of North Carolina. Its entire length is 410 miles, about 100 of its lower course being navigable. The upper portion is called New River, which has a general direction toward the northeast through Virginia, but makes a bold turn into West Virginia, and thence the Kanawha has a northwesterly course. Among the towns on its banks are Charleston, W. Va., and Pearisburgh, Va. The region through which it passes is rich in coal and iron deposits.

**GREAT LAKES.** See **Lakes, The Great.**

**GREAT PEDEE RIVER** (pě-dě'), a stream formed in North Carolina by the confluence of the Yadkin and Rocky rivers. It passes into South Carolina, where it receives the Little Pedee, and flows into Winyaw Bay at Georgetown. It has a total length of 415 miles and is navigable to Cheraw, a distance of 150 miles.

**GREAT SALT LAKE**, a body of salt water situated in the northern part of Utah. It is about 85 miles long, from 20 to 48 miles wide, and is 4,150 feet above sea level. Its only outlet is by evaporation, hence the water is one of the most concentrated salt brines known in the world, containing about 20 per cent. of sodium chloride and slight quantities of other salts. No fish subsist in the lake, but its shores are frequented by gulls and wild fowl. The discharge from Lake Utah, a fresh-water lake, is carried into it by the Jordan from the south. Other rivers flowing into it include the Ogden, Bear, and Weber.

The first account of this lake was made in 1689 by Baron La Hontan (1667-1715), who based his report on information given by the Indians. In 1776 Escalante, a Franciscan friar, mentioned the lake and Frémont explored it in 1843. The adjacent geological formations give evidence that in early times the lake was an immense body and at least 1,000 feet deeper than at present. The present average depth is about 18 feet and at its deepest point it is about 35 feet. The valleys lying adjacent have been improved greatly by irrigation, and now constitute the richest part of the State. Numerous railroad lines traverse the adjacent country, and near it are the thriving cities of Salt Lake City, Ogden, and Logan. A line of the Southern Pacific Railroad crosses the lake, passing almost due west from Ogden.

**GREAT SLAVE LAKE**, a large, irregular fresh-water lake in Mackenzie, Canada, about 325 miles long and 80 miles wide. The area is 7,100 square miles. It has irregular shores and numerous islands, and is frozen over half the year. The discharge from Athabasca Lake flows

into it, and its surplus waters are carried to the Arctic by the Mackenzie River.

**GREAT WALL OF CHINA.** See **Chinese Wall.**

**GREBE** (grēb), the name of a water bird common to Europe and America, peculiar in that the feet are not webbed. Each toe has a separate membrane, which is united with the membrane opposite. It has no visible tail. The bill and head are of nearly equal length, the wings are short, and the legs are thin and not well fitted for walking. In water they are skillful and swim rapidly, and when frightened they dive quickly and pass under water for considerable distances. The common grebe is about ten inches long and is hunted for the silky plumage of the under part, which is used in the manufacture of muffs and trimmings. Nine species are common to North America, ranging from Mexico to the southern part of Canada. They are quite numerous along the eastern coast and are known locally as *dippers* and *hell-divers*. The *crested grebe* is one of the larger species and has the finest plumage.

**GREECE**, a kingdom in Southeastern Europe, occupying the most easterly of the three peninsulas that project from Europe into the Mediterranean. The northern boundary is formed by Turkey, eastern by the Aegean Sea, southern by the Mediterranean, and western by the Ionian Sea. It extends from latitude 40° north southward to latitude 36° 23'. The length from north to south is about 250 miles and the greatest breadth is 180 miles. Many islands are located in the Aegean and Ionian seas, most of which appear to be the summits of sunken volcanic formations. The boundaries of the interior provinces are formed largely by mountain ranges, all of which have associated with them historic incidents of much interest. Together with the Ionian Islands, the Euboea and the Cyclades, it has an area of 25,040 square miles.

**DESCRIPTION.** A continuation of the Balkan Mountains, known by the general name of Pindus, extends across the boundary line from Turkey and divides and subdivides into numerous chains. The coast line is extraordinarily irregular, being indented by many gulfs and bays valuable in commercial enterprises. The numerous islands that belong to Greece are separated from the mainland and from each other by navigable channels, and like the mainland contain numerous mountain elevations. Olympus, 9,750 feet high, supposed to have been the dwelling place of the gods in ancient times, is located on the northern boundary. It belongs to the eastern extremity of the Cambunian Mountains. Other



mountain peaks include Parnassus, 8,075 feet, and Cithaeron, 4,615 feet, in central Greece; and Taygetus, 7,900 feet, situated in the Peloponnesus. A number of plains are located in different sections of the country, but all of them are surrounded by chains of mountains. The great plains of Thessaly, in the northern part of Greece, are the most extensive. They are level and woodless, but have a very fertile soil and may be regarded the granary of the kingdom. Other plains are located in Argolis, Boeotia, and Messenia.

The rivers of Greece are numerous, but all are quite small and unimportant, except as they are associated with legends and history. None of the streams is important for navigation or water power. The greater number dry up during the summer, others disappear in sinks in limestone, and only the largest flow the entire year. The Achelous, which flows into the Ionian Sea north of the Gulf of Patras, is the most important river. The Iri (Eurotas) and the Alpheus are the chief rivers of the Peloponnesus. Aside from the Messongi; on the Island of Corfu, there are no streams in the islands. The mountainous regions have a number of lakes, many of which have no visible outlet to the sea, the surplus being drained through porous limestone. Lake Copais in Boeotia is the largest inland body of water. The Gulf of Lepanto or Corinth, located northwest of Athens, is almost surrounded by land, and is connected with the Gulf of Patras, an inlet from the Ionian Sea, by a narrow channel.

**CLIMATE.** As a whole, the climate is temperate and salubrious. The atmosphere is remarkable for its clearness and beauty, rivaling the Italian sky, and the country is generally healthful, though it is not thought to be as agreeable as it was in ancient times. The sirocco winds from Africa make some of the summer days very hot, almost unendurable, and the cold of winter is somewhat intensified by the winds blowing from the snowy mountain summits of the north. Frosts and snowfalls rarely occur in the lowlands, but the summits of mountains are visited by heavy snows in the winter. The eastern part is subject to droughts, hence irrigation is necessary for many farm crops, but the western region has an abundance of rainfall. A larger part of the precipitation takes place in autumn and winter and the summers are generally very dry. On the plains and some of the coasts the soil is quite fertile, hence the yield of produce gives greater returns than any time since Greece had its ancient prosperity.

**MINING.** Lead is the most important of the minerals, the yield being about 30,000 tons per

year. Lignite coal is found in Euboea, but the supply is quite limited. Important deposits of iron and copper are known to exist, but the scarcity of fuel has prevented them from being worked to any extent. Gypsum, salt, and sulphur deposits of considerable value are found in various localities. Fine marble is obtained in Paros and Pentelicus and emery occurs in Naxos and other islands. Building stone, especially limestone, is very abundant.

**AGRICULTURE.** Greece is principally an agricultural country. The ownership of the land is vested largely in the peasant farmers, who must depend to a considerable extent upon irrigation. Nearly half of the tilled land is used in the cultivation of cereals, but the supply of wheat and other grains is not sufficient for the home demand. In the region of Elis, where the lands are low and well watered, a superior quality of rice is grown. Fruits are cultivated very extensively, especially currants, grapes, figs, lemons, oranges, apples, and pomegranates. The mulberry tree is propagated extensively as an adjunct of the silk industry and vegetable gardening is an enterprise of much value. Sheep are the most important of the domestic animals, while goats are reared for their milk, from which butter and cheese are made. Other domestic animals include horses, cattle, and swine. Bee culture has been practiced from ancient times. The forest area is very small, this being due to the fact that the large number of goats tend to kill the young trees, but some attention is given to forestry.

**MANUFACTURING.** Greece is especially adapted to the production of wines that are rich in color and alcohol, hence their manufacture receives marked attention. Most of the manufacturing enterprises are conducted in small shops, many of which are located near the towns and in the country. Peasant women weave carpets in their houses and engage locally in spinning and sewing. Flour is ground in many of the towns and cities. Piraeus is the center of cotton, wool, and silk factories. The fisheries yield many commercial products, especially the sponge fisheries of the Aegean Sea. Other manufactures include machinery, clothing, utensils, toys, leather, soap, and sailing vessels.

**TRANSPORTATION AND COMMERCE.** Greece had 950 miles of railways in 1908. Electric lines and tramways are operated in the cities and in some sections of the rural districts. About 2,200 miles of good highways are maintained and 6,500 miles of telegraph lines are in operation. Much of the transportation is by the sea. The Corinth Canal, completed in 1893, crosses the Isthmus of Corinth and connects the Aegean with the



Ionian Sea. It is the seat of an important commerce, since it furnishes a short and safe route between points in Italy and Constantinople. A railway line parallel to the Gulf of Corinth has been in operation a number of years, furnishing transportation facilities between Athens and Patras, and important lines are being constructed to connect the chief centers of Greece with those of the central part of Europe. The imports exceed the exports, the former being about \$26,500,000 and the latter \$17,500,000. Foreign trade is chiefly with Great Britain, Russia, Austria, Turkey, Germany, France, and Italy.

**EDUCATION.** The state of education has been greatly neglected, in consequence of which many of the people are unable to read and write, the proportion of illiteracy being about 25 per cent. This is due not so much to the inclination of the Grecians, but more particularly to the fact that the country has been subject to distracting internal and foreign wars. These causes have brought about a low state in the national finances. Within recent years the school system has been modeled after that of Germany, in which the *Realschulen* are important factors in fitting for the industries. By national law all children between six and twelve years of age are required to attend school, but the law has not been enforced strictly in the more impoverished districts. Besides the public elementary schools, there are private institutions and a system to promote higher education, including numerous colleges, academies, and the national university at Athens. A number of European and American colleges have been established to promote the investigation and study of antiquities with the view of adding to general knowledge of Grecian art and history. Religious worship is free and unrestricted, though a very large majority of the people belong to the Greek Catholic Church, which is the official religion. The Christian sects aside from the Greek number about 25,000, while the Mohammedans have about the same strength and 6,000 are Jews.

**GOVERNMENT.** The government is a constitutional monarchy, of which the king is the chief executive. Legislative power is vested in a chamber of deputies known as the *Boulé*, which meets in Athens annually, and its members are elected by popular vote. The six heads of departments compose the ministry, and they are responsible to the chamber of deputies. Service in the army is compulsory from the ages by nineteen to forty years, if necessary, though two years' service with the *colors* enables admission to the *reserve*, and the remainder to the *Landwehr*, these three divisions constituting the army. On a peace footing the military force

numbers 25,180 men and the reserve is 98,000. The entire navy as now organized is composed of forty vessels of all classes. The drachma, equivalent to the franc, is the monetary unit. Greece adopted the metric system of weights and measures in 1898 and maintains an efficient postal service.

**INHABITANTS.** The modern Greeks resemble the Iberians of Spain and the Ligurians of Italy. In stature they are medium, averaging about five feet six inches, and the hair, skin, and eyes are dark. About one-tenth of the people are Albanians and the remainder of the inhabitants are Greeks. Not more than one-third of the Greek people live in Greece, the remainder being distributed largely in European Turkey, Crete, Asia Minor, Cyprus, and the United States. Athens, the capital, is the largest city and chief center of trade. Other cities include Corfu, Piraeus, Patras, Larissa, Volo, and Zakyntos (Zante). The total population in 1907 was 2,631,952.

**LANGUAGE.** The Greek language is a branch of the great family of Indo-European languages, and was spoken as early as the 15th century B. C. From Asia Minor and southeastern Europe it was carried by colonies of Greeks to Sicily, lower Italy, and other regions on the Mediterranean. Ultimately it became the spoken language of Macedonia, Syria, Egypt, and the Byzantine Empire. Ancient writers, especially those associated with Greece and Rome, trace the language to a race of people called by them Pelasgi, who were regarded by some more recent writers as of Gothic origin, and who were undoubtedly the people from whom both the Greeks and Romans had their origin. Little was known of the Greek language to the people of Western Europe during the Middle Ages, but with the revival of learning came a renewed interest in the language and literature of the Greeks, who came to be known as a people of much culture and refinement. The Dutch scholar, Erasmus (q. v.), not only induced a widespread interest, but carried Greek as a branch of study to Cambridge University in 1510.

Three distinct dialects, known as the Ionic, Doric, and Aeolic, were spoken in the historic period of ancient Greece. Of these the first two were the most important, since they entered more largely into the literary treasures of the Greek masters. The Ionic was the dialect used by Homer, Hesiod, and Herodotus, and thus is embodied in the master productions known to modern students. In northern Greece and the colonies the Doric prevailed largely, and it is represented in the writings of Pindar and Theo-



critus. As a whole, the language was remarkable for its beauty and elasticity, on account of which many of its elements are retained in the modern European languages. The spoken tongue was greatly influenced by the Roman conquest, after which many Latin words were incorporated with the vocabulary. However, the classical forms are well preserved in the modern language, making it possible for a student of ancient Greek to read the modern tongue quite readily. The Germanic languages, especially the English and German, have incorporated many words from the Greek, but the words of Greek origin are comparatively few as compared with the number derived from a Latin source.

LITERATURE. Much of Greek literature, as known to modern writers, is as old as the history of the Greek language. The first works known to us as Greek writings are the "Iliad" and the "Odyssey," two productions generally attributed to Homer. They are unlike the first writings that have come down to us from other nations in that their language is highly cultured, instead of being a recital of simple fable or folklore. From this it is evident that learning had flourished long before the time of Homer, and that the poetic art had a firm hold upon the Greeks many centuries before the Christian era. Both these productions are epic poems, the "Iliad" treating of the war against Troy, and the "Odyssey" reciting the adventures of Odysseus, a celebrated Greek hero of the Trojan War, while on his return voyage to Greece. It is generally assumed that these epics were passed from generation to generation in a spoken form, and that they were not committed to writing until after many years. This circumstance has given rise to doubts as to their authorship, it being quite probable that Homer only collected and compiled them into convenient form.

Hesiod, the eminent poet of nature, flourished about a hundred years after the time of Homer and is the author of "Works and Days," an epic treating of farm life and work. It contains many general reflections on domestic virtues, industry, and poetic art. The same writer gives a genealogy of Greek gods and heroes in his "Theogony." Lyric poetry had its rise in the latter part of the first period, and its finest examples are embodied in the writings of the poetess Sappho, and Alcaeus, Alcman, and Pindar. The latter was, perhaps, the greatest of all lyric poets, his productions treating of the heroes associated with the Olympian and other festal games. It was the custom in Greece to recite the epics in the family before retiring at night, while the lyrics were sung at the festi-

vals given on state occasions and in the homes of the wealthy classes.

Greek literature is particularly rich in drama and history and attained its height of importance in the oratory of Attica. In the Golden Age of Greece the literature reflected the political glory and educational importance of the Hellenes. The drama rose as a means to educate the common people in religious duties, as well as to instruct them in government and the industries. The dramatical works reached their highest perfection in the Age of Pericles, when vast theaters were built to accommodate large audiences, the largest at Athens. Sophocles, Aeschylus, and Euripides are among the best known writers of tragedy, and Aristophanes has the highest place among the writers of comedy. Herodotus stands preëminent as the greatest historian of Greece. We are indebted to him for much of our knowledge of early peoples, including the Chaldaeans and Babylonians, and many events in the Persian wars. Other historians of note were Thucydides and Xenophon. The former is best known for his "History of the Peloponnesian War," and the latter by his "Recollections of Socrates" and "Cycropaedia," a history of Cyrus the Great.

Socrates stands preëminent among the philosophers and is closely associated with Plato and Aristotle, these three being the greatest philosophical teachers of antiquity. We are indebted to Plato for a knowledge of the teaching of Socrates, the latter leaving no written works. Plato is the author of "Dialogues," a work that has exercised marked influence on modern thought. Aristotle wrote on metaphysics, logic, economics, physics, and rhetoric. No less important than Grecian philosophy is the oratory of the Hellenes. To be an orator was not only regarded a high accomplishment, but oratory was taught as a special branch of study, and expert teachers found lucrative employment in writing speeches. Antiphon was the first of the ten great orators, but Demosthenes ranked as the most eminent, and his efforts are taken as the highest perfection in the art. The most noted oration of the former is "On the Murder of Herodes," while the oration of Demosthenes entitled "Oration on the Crown," which was directed against Aeschines, and his "Philippics" against Philip of Macedon, were the most effective in arousing the Athenians against the Macedonians. Other great orators include Pericles, Lysias, and Isocrates. The three philosophical schools of Greece were the Stoics, Epicureans, and Skeptics, with which are associated respectively the names of Zeno, Epicurus, and Pyrrho.



The Alexandrian Age of Greek literature is the last period in the literary development of ancient Greece, being so called from the rise of Alexandria in Egypt. It embraces the epoch from the division of the empire founded by Alexander the Great to the conquest of Greece by the Romans, from 300 to 146 B. C. In this period Greek scholars influenced learning in Egypt and aided in producing the Septuagint version of the Old Testament, the name applied to the translation from the Hebrew into the Greek made by seventy scholars at Alexandria. Among the writers of this period are Theocritus, author of "Idylls," Euclid, Archimedes, and Aristarchus, the last mentioned being a forerunner of Copernicus. The scientist, Strabo (50 B. C.); the astronomer, Claudius Ptolemy (150 A. D.); and the historian Plutarch, are among the later writers to enrich the literature. Plutarch, a Greek-Italian writer of the 14th century, had a modifying influence on Greek literature as the author of "Parallel Lives," in which he contrasts many Greek soldiers and statesmen with the leaders of Rome.

Modern Greek literature has its beginning with the fall of Constantinople, in 1453, but the early productions of this period are characterized by the defenses of orthodox traditions as against the Latin heresy. In this respect they are a continuation of the spirit of Byzantine literature. However, comparatively little of permanent value was produced until the 18th century, when the works in fiction and poetry began to multiply. In the 18th century many dramatical works were translated from Lessing, Shakespeare, Schiller, Goethe, and other English and German writers by Alexander Rangabé and Demetrios Bernardakis. A revival of the spirit of nationality in the 19th century has stimulated many current works. The improved condition of schools and institutions of higher learning is having a wholesome and elevating effect in literary lines.

**HISTORY.** Historically, Greece occupies an important position, though mostly because of its glory in the remote past. Hellen is its fabled ancestor, who was regarded the son of Deucalion and Pyrrha, two survivors of the deluge. From him descended the four celebrated divisions—the Dorians, Ionians, Aeolians, and Achaeans. Collectively, these were called *Hellenes* and the country became known as *Hellas*, the names by which the Grecians still call themselves and their country. The Italians originated the word *Greek* from their northern tribes *Gracci* which, through the Romans, passed into common usage among the Europeans. The Achaeans were renowned in war, but the Ionians and Dorians

were the most important divisions, and respectively founded the two great cities of Athens and Sparta. A people called the Pelasgians occupied the country before the Grecians secured possession, but they probably were earlier Aryan immigrants from Asia, since they were readily assimilated by the intellectually superior Grecians. Phrygia in Asia Minor is regarded the nativity of the Grecians before coming to Greece, and it is thought that they came by way of the Hellespont to the islands of the Aegean Sea. Civilization and religious rites were brought over from Egypt and Phoenicia.

The Heroic Age of Greece has reference to the historic events of Hercules, Theseus, Minos, Jason, and the celebrated Trojan War, all of which are treated in special articles. It is thought that the Trojan War occurred about 1194-84 B. C. Authentic history begins about 1000 B. C., at which time the celebrated Dorian invasions of two centuries were ended. These were followed by the establishment of the Dorian states in the Peloponnesus, the successive invasions of Asia Minor, and the conquests of Crete, Rhodes, Cos, and other islands of the Ionian and Mediterranean seas. The best picture of early Greek life is given in the famous works of Homer, the "Iliad" and "Odyssey." While mixed with poetic fancy, they make us acquainted with the Grecian deities, customs, industries, games, commerce, and arts of war.

The Dorians and Ionians were long powerful rivals for supremacy among the Hellenes. While the former established their stronghold at Sparta, the latter made Athens their seat of influence. Lycurgus prepared a code of laws for the Spartans, under which the people secured greater rights and developed material prosperity. The culture of Sparta was military, a condition brought about largely by the need of means of defense and the promotion of commerce. At Athens, Solon prepared a code of laws, repealing many that inflicted severe forms of punishment. His laws made ample provision for the intellectual, physical and moral culture. Under the legislation introduced by Solon splendid temples and public improvements were built, libraries were founded, and learning was patronized. Though hostile to each other, the several states of Greece united when King Darius of Persia landed at Marathon in 490 B. C. for the purpose of conquering the Athenians. In the battle that ensued, Miltiades led an army of 10,000 Athenians and succeeded in defeating the Persians, the battle being classed as one of the decisive engagements of the world.

In 432 B. C. the Spartans began a general war to conquer Athens and after 27 years established



Spartan supremacy. The oppressions that followed caused an alliance between a number of the states and the Persian king, and in 371 led to the defeat of the Spartans at Leuctra. Greece attained its height of prosperity and military power during the Macedonian supremacy, particularly under Alexander the Great, son of Philip of Macedon, who reigned in 336-323 B. C. This great leader defeated Darius, overthrew the Persian Empire, annexed large parts of Asia and Africa, and among other cities founded Alexandria. The brief reign of Alexander was followed by internal dissensions and an invasion by the Gauls in 279 B. C., and the nation was threatened by the states that rose in the West. Had Greece remained united by strong internal ties, it might have predominated over the Romans, but, owing to local differences, all of Greece became a Roman province after the capture of Corinth in 146 B. C. Under Roman rule a period of peace and prosperity prevailed.

The Goths invaded Greece in 395 A. D. and captured many of its cities. However, Rome was divided in the same year into the Eastern and the Western empires, by which the country became incorporated with the former. It remained an integral part of the Byzantine Empire (q. v.), with its capital at Byzantium, until that city, whose name had been changed to Constantinople, was captured by the Turks in 1453. While belonging to the Byzantine Empire it retained renown for its learning and was turned from paganism to Christianity.

In 1453 Greece was conquered by Mohammed II., and in 1669 it came under absolute control of the Turks. A war of independence began in 1821 under the leadership of Alexander Ypsilanti. With the help of Russia, France, and England it finally threw off Turkish rule in 1828. The Greek statesman, Count Capo d' Istria, became president, but in October, 1831, he was assassinated. The powers in 1832 elected Otho, second son of the King of Bavaria, as King of Greece, who reigned thirty years and abdicated.

George I., the present sovereign, ascended the throne in 1863. He is the second son of the late Christian IX. of Denmark, and owes his election to the national assembly. He granted a liberal constitution, which went into effect in 1864, and the widespread brigandage that formerly prevailed was finally suppressed in 1870. Owing to the cruel treatment of Greek Christians in Crete by the Turks, hostilities continued more or less for several centuries, and war broke out anew between Greece and Turkey in 1897, which proved disastrous to the Grecian army in every battle. The treaty of Constanti-

nople required Greece to pay a war indemnity of \$18,000,000 and rectified the frontier between the two countries. In 1898 the powers required Turkey to withdraw from Crete, which was made nominally independent of Turkey under the protection of Greece. The war with Turkey aroused anew the spirit of nationalism, which is exemplified in its present efforts for greater prosperity.

**GREEK CHURCH**, one of the Christian sects, whose official title is Holy Orthodox Catholic and Apostolic Church. Its membership is confined largely to the countries formerly under the Byzantine Empire and to Russia. Three distinct branches of this faith are recognized, which are known as the Orthodox Church in the Turkish Empire, the Orthodox Church of Russia, and the National Church of Greece. Each of these has a definite head, but in points of doctrine and practices they are closely allied. The Orthodox Church in the Turkish Empire is presided over by the patriarch of Constantinople, who is under the protection of the Sultan, and with it are affiliated the patriarchates at Alexandria, Antioch, and Jerusalem. The Holy Synod of Saint Petersburg is the primary influence of the Orthodox Church of Russia, but the Czar is the temporal head of it and of the whole Greek Church. The Holy Synod of Greece, established in 1833, is at the head of the National Church of Greece. Prior to 1054 the adherents of the Greek Church were a part of the Roman Catholic denomination, but in that year the two branches became separated, largely on account of contentions regarding papal supremacy and vital doctrinal points.

The Greek Catholics teach seven sacraments, those of baptism, confirmation, eucharist, penance, extreme unction, holy orders, and marriage. They reject the word *purgatory* and the papal supremacy, but admit there is purgation after death and pray for the dead. They practice triple immersion, teach transubstantiation, and use leavened bread in giving the Lord's Supper. The pictures of the saints and the Blessed Virgin are very common in churches, but the crucifixes are not used. No seats are provided for the worshipers, who stand during the entire service, and instrumental music is not permitted in the churches. Many formal ceremonies are used and periods and days for fasting are numerous. Clergymen are usually required to marry before they are ordained, but bishops do not marry. Formerly the archbishop of North America was resident in Alaska, but his seat is now in New York City. The Greek Church of the world at present has a total membership of about 100,000,000, of which 90,300,000



are in Russia. The Greek Orthodox Church has 101,500 communicants in the United States and the Russian Orthodox has 40 churches and 68,000 members.

**GREEK FIRE**, the name applied to several inflammable and destructive compounds used in military operations during the Middle Ages. A preparation of this kind was employed extensively by the Greeks of Constantinople, who used it both in naval and military warfare. The simplest weapon was the hand tube, which was filled with combustibles of various kinds and flung by the hand against the buildings and upon the vessels of the enemy, serving to inflict damage and set fire by the explosion that followed. The use of explosive compounds of various kinds gave the Greeks superiority for centuries, and the art of manufacturing them was concealed for a long time at Constantinople. They were made principally of sulphur, naphtha, and niter. A compound of sulphur, saltpeter, and lampblack has been used for a similar purpose in modern warfare. Bunsen made an agent of this kind and called it the *kakodyl*, which somewhat resembles the Chinese stinkpot, both having a deadly efficiency through the use of arsenic.

**GREENBACK PARTY**, a political organization of the United States, formed in 1876, called by its members the Independent National party. The name *Greenback* was attached to it because it favored the larger use of "greenback" currency, a class of legal tender notes issued by the government during the Civil War. It had for its main tenets the repeal of the specie resumption law enacted in 1875, suppression of national bank paper, and the circulation of United States notes. It advocated the freer use of silver money. Peter Cooper, its candidate, received 81,740 votes for President in 1876; J. B. Weaver, 308,578, in 1880; and B. F. Butler, 175,375, in 1884. Ultimately it became merged in the People's party.

**GREEN BAY**, a city in Wisconsin, county seat of Brown County, on Fox River, 112 miles north of Milwaukee. It is on the Chicago and Northwestern, the Chicago, Milwaukee and Saint Paul, and other railroads, and has communication by steamboats and electric railways. The harbor is ample for the accommodation of the largest lake steamers. The noteworthy buildings are the public library, the county courthouse, the high school, the post office, and the State reformatory. Hagemester Park is a fine public resort. The streets are well paved and improved by modern facilities. Among the manufactures are flour, clothing, furniture, soap, fermented beverages, cigars, and machinery. The surrounding country is agricultural. Nu-

merous calcic magnesian springs are within a short distance of the city, which have made Green Bay a favorite health resort. It has a large trade in lumber, cereals, live stock, and dairy products. Green Bay was settled in 1745 and chartered as a city in 1854. Fort Howard was united with it in 1896. Population, 1905, 22,854; in 1910, 25,236.

**GREEN BRIER** (*brí'ér*). See **Smilax**.

**GREENBUSH**. See **Rensselaer**.

**GREENFIELD**, county seat of Franklin County, Massachusetts, in the valley of the Green and Connecticut rivers, eighty miles northwest of Boston. It is on the Boston and Maine Railroad and several electric lines. The surrounding country is farming and stock raising, which makes the town a central shipping point. Among the chief buildings are the public library, the Franklin County Hospital, the townhall, and several fine schools. It has a monument erected to the soldiers. The manufactures include boots and shoes, machinery, bicycles, and cutlery. It was settled in 1686 and was incorporated as a town in 1753. Population, 1905, 9,156.

**GREEN GAGE**, the name of a luscious kind of plum, cultivated quite extensively in America and Europe. The tree is small and spreading, but bears abundantly and quite regularly, and the fruit ripens in August. Chancellor Livingston brought it from France to America, and it has been cultivated for many years in the eastern part of the United States and the southeastern section of Canada. The fruit is juicy and of a green or yellowish color.

**GREENHEART**, or **Bebeeru**, the name of a valuable tree of South America, found chiefly in Guiana and the northern part of Brazil. It yields the *bebeeru* bark, which is used in medicine. The seeds are rich in starch and the natives use them as food. However, the greenheart tree is most valuable for its wood, which is hard and durable and takes a high polish. It is used extensively in turnery and shipbuilding. The tree has a tapering trunk about fifty feet high and four feet in diameter, hence yields a large quantity of lumber.

**GREENHOUSE**, a structure designed to furnish protection for plants. Formerly greenhouses were built principally to protect exotic and other tender plants that were grown for ornamental or scientific purposes, but more recently structures of this kind came into wide use as forcing houses for the growth of plants out of their season. Greenhouses are kept for the latter purpose either to grow plants for resetting or to raise them for the early market, and are sometimes called hothouses, conservatories, or warm houses. The construction is usually sim-







Danish expeditions sent for the inspection of the colonies from 1585 to 1670 were unsuccessful in finding them. The only evidence of their former existence consists of inscriptions and numerous relics. In 1721 the Danes founded a colony, the expedition being led by Hans Egede, and it became known as Good Hope Settlement. Nansen crossed the interior from east to west in 1888, which was the first extensive interior expedition. Subsequently explorations were made by Peary and Nordenskjöld. Only 228 of the inhabitants are whites, the others being Eskimos. Population, 1906, 12,093.

**GREEN MOUNTAIN BOYS**, the name of a band of Vermont mountaineers who took part in the American Revolution. They were led by Ethan Allen and Benedict Arnold on May 10, 1776, when they captured Fort Ticonderoga with 50 British prisoners and 200 cannon. Other notable victories include those of Crown Point and the Battle of Bennington. They rendered efficient service throughout the Revolution.

**GREEN MOUNTAINS**, a range of the Appalachian system, dividing Vermont into two nearly equal portions. Mansfield is the highest peak, 4,280 feet high, and five others range over 4,000. The mountain sides are covered with fine forests of spruce and other evergreen and deciduous trees. They contain valuable deposits of gneiss, granite, slate, iron, and marble. Numerous streams have their sources in the Green Mountains, flowing through fertile valleys. The region was first settled by the patroons and others and became famous in Colonial and Revolutionary history.

**GREENOCK** (grēn'ūk) a city and seaport of Scotland, in Renfrewshire, on the Firth of Clyde, eighteen miles northwest of Glasgow. It has an excellent harbor, is beautifully located along the coast, and back of it are picturesque cliffs. Among the public buildings are several educational institutions, the townhall, and several fine churches. Sugar refining and shipbuilding are the principal industries. Other manufactures include anchors, cordage, steam engines, clothing, textiles, and sails. The prosperity of the city dates from 1707, when its commerce with the West Indies and America became important. Visitors are shown the grave of Burns's "Highland Mary" and places frequented by Watt, who was born here. Greenock was a small fishing village in 1635. Population, 1907, 71,269.

**GREEN RIVER**, a river of the United States, rises in the Wind Range Mountains of Wyoming, and joins the Grand River to form the Colorado. From the western part of Wyoming it flows in a general direction toward the south, passing through a small part of north-

western Colorado and joining the Grand River in southeastern Utah. Green River, Wyoming, is the principal town on its banks. It has a length of about 500 miles, the greater part of its course being through deep and rugged canyons.

**GREEN RIVER**, a river of the United States, rises in Lincoln County, near the central part of Kentucky, and flows into the Ohio about six miles above Evansville, Ind. The Echo River of the Mammoth Cave is a subterranean affluent of the Green River. The lower valley of the Green River has vast coal deposits and its upper course is through a region of limestone. It is about 300 miles long and the construction of dams and locks have made it navigable nearly 200 miles.

**GREENSBORO** (grēnz'būr-ō), a city in North Carolina, county seat of Guilford County, about eighty miles northwest of Raleigh. It is on the Southern and the Cape Fear and Yadkin Valley railroads, and has manufactures of clothing, textiles, earthenware, cigars, hosiery, and machinery. Among the chief buildings are the public library, a State college of agriculture, Bennett College, and Greensboro College. The surrounding country produces large quantities of cereals, live stock, and fruits. It has deposits of iron and copper. Greensboro was settled in 1808 and became a city in 1870. Population, 1900, 10,035.

**GREENSBURG**, a city in Indiana, county seat of Decatur County, 45 miles southeast of Indianapolis. It is on the Cleveland, Cincinnati, Chicago and Saint Louis and other railroads. The noteworthy buildings include the county courthouse, the high school, and the State Odd Fellows' Home. It is surrounded by a fertile country and has a large trade in produce. The manufactures include clothing, furniture, flour, carriages, and machinery. The city has good municipal improvements. Population, 1900, 5,034.

**GREENSBURG**, a borough of Pennsylvania, county seat of Westmoreland County, thirty miles southeast of Pittsburg, on the Pennsylvania Railroad. The surrounding country has rich deposits of gas and coal. Among the manufactures are glass, brick, flour, engines, and hardware. It has a number of fine schools, several county buildings, and institutions for secondary education. The village of Hanna's Town, located in the vicinity, was destroyed by the Indians in 1782. Population, 1900, 6,508.

**GREENVILLE**, a city in Mississippi, county seat of Washington County, on the Mississippi River, 98 miles northwest of Jackson. It is on the Southern and the Yazoo and Mississippi



Valley railroads. The industries include oil mills, cotton compresses, and lumber mills. It has a public park, a fine courthouse, and several large schools. Electric lights, waterworks, and telephones are among the improvements. Its annual shipment of cotton is very extensive. Population, 1900, 7,642.

**GREENVILLE**, county seat of Darke County, Ohio, on Greenville Creek, 35 miles northwest of Dayton. It is on the Cleveland, Cincinnati, Chicago and Saint Louis and other railroads and is surrounded by a fertile farming country. It has a Carnegie public library, a children's home, and a fine county courthouse. The manufactures include vehicles, furniture, and machinery. It is a grain-shipping center. A public park, waterworks, and electric lights are among the facilities. Greenville occupies the former site of an Indian village in which Tecumseh made his home. General Wayne made it his headquarters in 1794. It was incorporated in 1832. Population, 1900, 5,501.

**GREENVILLE**, a city in South Carolina, county seat of Greenville County, on the Reedy River, 160 miles northeast of Atlanta, Ga. The manufactures include carriages, cotton goods, tobacco, clothing, and machinery. It is the seat of Furman University, the Greenville Female College, and Chicora College. Other noteworthy buildings include the public library and the county courthouse. It has systems of electric street railways, electric lights, waterworks, and pavements. The surrounding country is fertile, producing large quantities of cotton, cereals, fruits, and live stock. It was settled in 1784 and incorporated in 1831. Population, 1900, 11,860.

**GREENVILLE**, a city in Texas, county seat of Hunt County, 56 miles northeast of Fort Worth, on the Missouri, Kansas and Texas and other railroads. The noteworthy buildings include the high school, the county courthouse, and the Holiness and Burleson colleges. It is surrounded by a fertile region and has a large trade in farm produce and merchandise. The chief manufactures are utensils, cigars, clothing, and machinery. It has systems of waterworks, sewerage, and electric lighting. Greenville was settled in 1844 and incorporated in 1875. Population, 1900, 6,860; in 1910, 8,850.

**GREENWICH** (grīn'ij), a borough of London, in Kent, England, situated on the south side of the Thames, about five miles southeast of London. The most important building is the Greenwich Hospital, founded in 1694 by William and Mary for the care and maintenance of British soldiers, but it was not completed until eleven years later. Its original cost was \$250,-

000, but subsequently additions were made by which the hospital was enlarged and rendered much more serviceable. Other noteworthy buildings include the Royal Naval College, a naval museum, and the Royal Observatory. It is connected with London and other centers of population by railroads, electric car lines, and telephones. Among the enterprises are extensive rope works, shipyards, machine shops, and engineering establishments. It is the birthplace of Henry VIII. and Queen Elizabeth. Longitude is reckoned from Greenwich by English geographers, and it is made the basis of calculations by American writers in connection with the American basis, which is at Washington. Population, 1907, 192,519.

**GREENWICH OBSERVATORY**, an institution situated in Greenwich, England, where it was erected in a park containing 190 acres and designed for the advancement of nautical astronomy and navigation. It was founded by William III. and completed in 1705. The courses of study pursued at present fit the students either for the navy or the merchant service. This institution is one of the oldest and most celebrated observatories in the world and is equipped with all modern apparatus. From it the exact time is telegraphed to various English cities.

**GREGORIAN CALENDAR** (grê-gō'rī-ən). See **Calendar**.

**GREIFSWALD** (grīfs'wält), a city of Germany, in the province of Pomerania, three miles from the Baltic Sea. It is located on the Rick River, has railroad facilities, and is the seat of the University of Greifswald. This institution was founded in 1456. It has a library of 140,000 volumes. Other buildings include the gymnasium, a geographical and scientific museum, and a number of fine churches. Among the manufactures are machinery, sailing vessels, tobacco, chicory, and canned fish. It has a large foreign trade in fruit preserves, fish, machinery, and grain. Greifswald was an important member of the Hanseatic League, became a possession of Sweden in 1631, and has belonged to Prussia since 1815. Population, 1905, 23,767.

**GRENADA** (grên-ā'dà), an island of the West Indies, in the Windward group. It has an area of 133 square miles. The surface is mountainous, especially in the interior, where the peaks rise to a height of about 3,000 feet above the sea. The valleys and coastal regions are fertile, yielding cocoa, sugar cane, spices, and cereals. Columbus discovered Grenada in 1498 and the French colonized it in the 17th century. In 1763 it was captured by the British,



but was retaken by the French in 1779. It was restored to the British in 1793 and has since been a British colonial possession. Saint George, the capital, is strongly fortified and has a fine harbor. In 1906 the island had a population of 69,784, of which the greater part was colored.

**GRENADIER** (grĕn-à-dĕr'), the name of a class of troops distinguished by their height and fine appearance. The name was originally applied to the soldiers who threw the hand grenade, a small explosive shell filled with gunpowder and furnished with a fuse. It originated in 1594 and was employed chiefly to be thrown from parapets upon the besiegers below, and later came into use in naval service in close action. Grenadier troops continued to use the grenade until the modern musket was invented, and now the name is applied to a company of picked men attached to most European regiments.

**GRENOBLE** (grĕ-nō'b'l), a city of France, capital of the department of Isère, sixty miles southeast of Lyons. It is well located on the Isère River, has transportation facilities by railways, and is surrounded by high mountains. The chief buildings include the University of Grenoble, a military school, and a public library of 170,000 volumes. The streets are finely paved and lighted, and a system of electric railways provides transportation facilities with urban and interurban points. Among the manufactures are leather, cement, liquors, gloves, and cotton and woolen goods. Anciently it was called Cularo and was fortified by the Romans, who changed its name to Gratianopolis in honor of Gratian. Population, 1906, 73,022.

**GRETNA GREEN**, a village in Dumfriesshire, Scotland, near the head of Solway Firth. It is famous as the place for contracting many irregular marriages. The Scotch law relating to marriage, being more liberal than that of England, caused young couples from the latter country to resort to Gretna Green to take the marriage vows. In the most widespread prevalence of this practice, about 1771, the marriages there often reached 200 per year. The marriage laws were revised in 1856, whereby those contracted at Gretna Green were invalid unless one of the contracting parties had been a resident of Scotland at least 21 days previous to the ceremony.

**GREYHOUND.** See **Dog.**

**GRIFFIN** (grĭf'fin), or **Gryphon**, a fabulous monster of ancient India, supposed to have watched over the treasury. It is represented as half bird and half beast, and is said to have guarded the gold of the Hyperborean regions from the one-eyed Arimaspians. In fable

and poetry the ancients describe it as having the head and wings of an eagle, the ears of a horse, and the body of a lion. It was common to have the figure of the griffin in heraldry.

**GRIFFIN**, a city in Georgia, county seat of Spalding County, forty miles south of Atlanta, on the Southern and the Central of Georgia railroads. The State Experimental Farm is near the city. It has manufactures of furniture, cigars, machinery, canned fruits, and utensils. The surrounding country produces large quantities of cotton, fruits, cereals, and live stock, thus giving it considerable trade advantages. Among the municipal improvements are waterworks, sewerage, and pavements. Population, 1900, 6,857.

**GRINDING**, the operation of breaking and reducing any hard substance to fine particles by friction or attrition. The process is used in various mechanical arts, such as grinding corn and wheat, and fitting for use various metals and stones. In grinding glass into facets it is generally customary to use stone lapwheels, while in grinding needles and steel pins a process called *dry grinding*, which is effected by dry grindstones, is employed. Diamond dust is used in grinding diamonds and other precious stones. Grinding is employed variously, depending upon the material to be affected by friction. The mechanical implements used are variously constructed and are propelled either by hand, steam, or electric power.

**GRINDSTONE** (grĭnd'stōn), a sandstone disc, more or less circular, used for abrading hard substances. A horizontal axle rests upon a support on either side of the stone. The stone, in its simplest form, is rotated by means of a handle or a foot treadle, while in machine shops or factories grindstones are turned by belts or some other appliances. Grindstones are used extensively for sharpening many kinds of edged articles and in smoothing and polishing rough surfaces.

**GRIPPE** (grĭp). See **Influenza.**

**GRIQUALAND** (grĕ'kwā-lānd), a region of South Africa, in Cape Colony, so named after the Griquas, a class of people that originated from native and Dutch ancestry. Griqualand East is an eastern district of Cape Colony. It has an area of 7,594 square miles and a population of 225,500, including about 5,000 whites. It has been a dependency of Cape Colony since 1875. Kokstad is the capital. Griqualand West is a northern district of Cape Colony and has an area of 15,187 square miles. In 1871 it was annexed to Cape Colony. Kimberley, the capital, is surrounded by a productive diamond-mining region. Population, 1906, 84,278.



**GRISTLE** (grīs'1). See **Cartilage**.

**GRODNO** (grôd'nö), a city of Russia, capital of the government of Grodno, 160 miles northeast of Warsaw. It is located on the Niemen River, has extensive railroad facilities, and is surrounded by a fertile region. The city is not well built, but it has a large trade in merchandise and grain. Among the manufactures are soap, tobacco, paper, pottery, and machinery. In 1793 it was the seat of a conference that agreed upon the partition of Poland, and it became a part of Russia two years later. The French occupied in 1812. Population, 1908, 51,092.

**GRONINGEN** (grō'nīn-ġen), a city and port of the Netherlands, capital of a province of the same name, on the Hunse River, 92 miles northeast of Amsterdam. It is connected by several railroads and has canal facilities through the Hunse and the Aa rivers, by means of which large vessels reach the city. Among the important buildings are a beautiful Gothic church with a tower 345 feet high, a university founded in 1640, and several government buildings. It has an observatory, a museum of natural history, an academy of architecture and navigation, and a library of 95,000 volumes. Many electric railway lines furnish communication to suburban and interurban localities. Among the manufactures are ships, soap, white lead, paper, clothing, furniture, and machinery. Extensive dikes protect it against the encroachments of the sea, while substantial fortifications make it an important strategic point. Groningen dates from the 11th century, when it was known as Villa Cruoninga. Population, 1906, 73,278.

**GROSBEAK** (grôs'bēk), the general name of a number of birds, especially those that have a large bill of sufficient strength to break the stones of olives, cherries, and other fruit. The common grosbeak of North America winters in the southern part of the United States and breeds as far north as Maine and Manitoba. It is a favorite bird of song, has a rose-red breast, and is commonly called the *rose-breasted grosbeak*. The pine grosbeak breeds far north in Canada and winters in the latitude of Washington, D. C., and southward. Other species include those known as the *blue grosbeak*, the *evening grosbeak*, and the *black-headed grosbeak*. Birds of this class belong to the finch family and the hawkfinches. The *hawkfinch* of England is usually classed as a grosbeak.

**GROSSWARDEIN** (grôs'vār-dīn), or **Nagyvarad**, a city of Hungary, capital of the county of Bihar, 36 miles southeast of Debreczin. It is situated in a beautiful plain, has railroad facilities, and is notable as a military cen-

ter. The buildings include a number of fine cathedrals, the Church of Saint Ladislas, and several educational institutions. Among the manufactures are pottery, wine, starch, liquors, machinery, and earthenware. Electric lights and street railways, stone and asphalt paving, and waterworks are among the public utilities. The sulphur springs of Hajó are six miles south of the city. Population, 1906, 49,508.

**GROUND HOG.** See **Woodchuck**.

**GROUND SQUIRREL**, the name of a class of rodent mammals intermediate in character between the marmots and the true squirrel. The common ground squirrel has short legs and a slender body and lives chiefly on or in the ground. It is an active and restless animal, has longitudinal stripes on the back and sides, and emits a peculiar chirping sound when calling its mate. The *chipmunk* belongs to the ground squirrels. Other species are the *flickertail* of North Dakota and Saskatchewan and the *striped gopher* of the northwest. The *pocket gopher* has peculiar pouches on the sides of the head and is troublesome in piling up mounds in the meadows. Allied species are found in Asia and other continents.

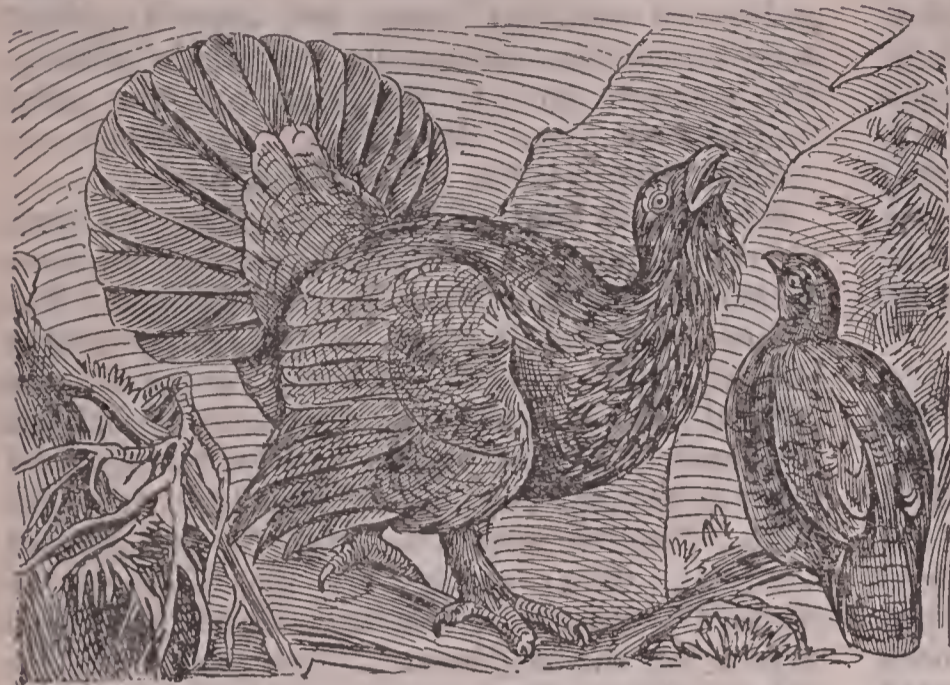
**GROUSE**, the common name of various game birds abundant in the northern sections of both hemispheres, belonging to the group of gallinaceous birds, distinguished by a naked band in place of an eyebrow. They are characterized by their plump bodies and the feet, legs, and nostrils are covered more or less with feathers. In many species a loose, bare sac is suspended on each side of the neck. They are the most delicate game birds that come to the table. Among the different species are found the ptarmigan, red grouse, ruffed grouse, pinnated grouse, and sage hen. To the same family belong the quail and various domestic fowls, including the cock and hen, turkey, guinea fowl, and peacock.

The *ptarmigan* is a species native to the Arctic regions, whose plumage in winter is snow-white. It somewhat resembles the red grouse, sometimes called the *European ptarmigan*, which is found in Scotland and does not turn white in winter. The *ruffed grouse* is common to America. It is known in the eastern states as pheasant, farther west as partridge, and in the western states by its proper name—*grouse*. This species prefers to frequent timber and brushy lands, is shy and quick in movement, and the color is closely adapted to the gray of the underbrush. A distinguishing habit of the male is a drumming sound, made while standing upright, by strokes of the wings upon the earth or some hard substance with



such rapidity and strength as to be heard at a considerable distance.

Several species closely allied to the ruffed grouse are found in Eurasia, but do not drum.



GROUSE.

Male.

Female.

The pinnated grouse, or *prairie chicken*, inhabits the central and western plains and is protected by the laws of the states, except for a short period in the fall of the year. The *oom-oom-boo* produced by the male in the breeding season is well known to hunters, and is made by means of the large, orangelike sacs on its neck. These sacs are covered with long, winglike tufts of feathers, which, when booming, stand up like ears, giving it a peculiar appearance. In size the prairie chicken is equal to the common hen and has a speckled-grayish color. The *sage hen* is the largest American grouse and is found principally on the western plains of Canada and the United States, especially in the arid regions of the Rocky Mountains. It lives on wild sage, which renders it inferior for food to other members of the grouse family.

**GRÜNBERG** (grün'bērg), a city of Germany, in the province of Silesia, thirty miles northwest of Glogau. It is located on a tributary of the Oder and has convenient railway facilities. The surrounding country is noted for its extensive production of grapes and other fruits. Among the manufactures are wine, flour, yarn, clothing, and machinery. Population, 1905, 21,630.

**GUADALAJARA** (gwä-thä-lä-hä'ra), a city in Mexico, capital of the state of Jalisco, the second city of the republic. It is situated in the fertile valley of the Rio de Santiago, about 280 miles from the city of Mexico, and ranks as an important manufacturing and commercial cen-

ter. The streets are regularly platted and well paved with stone and asphalt. The most important buildings include a government mint, the cathedral, several convents, and the university. Among the manufactures are pottery, paper, jewelry, cotton and woolen goods, leather, and machinery. It has good railroad and electric railway facilities. The city was founded in 1530. Population, 1909, 106,802.

**GUADALQUIVIR** (gä-däl-kwiv'ēr), the largest and most important river of Spain, rises near the frontiers of Murcia. It has a general course toward the southwest, flowing into the Atlantic north of Cadiz. Its length is 375 miles, of which 85 miles, or from the sea to the city of Seville, are navigable by large vessels. It has been improved by canals and jetties and is noted for its production of fish.

**GUADALUPE HIDALGO** (gwä-thä-lōō'pā è-thäl'gō), **Treaty of**, a treaty concluded between Mexico and the United States at the conclusion of the Mexican War. It was negotiated at Guadalupe

Hidalgo, a small town near the city of Mexico, on Feb. 2, 1848. The Senate ratified the treaty on March 16th and the ratifications were exchanged the following May. By the terms of the treaty Texas, New Mexico, and Upper California were ceded by Mexico to the United States and the Rio Grande was fixed as the boundary between Texas and Mexico. The United States assured protection to the Mexicans and their property within the ceded territory, assumed the payment of claims of American citizens against Mexico in the amount of \$3,250,000, and agreed to pay Mexico \$15,000,000.

**GUADELOUPE** (gä-dä-lōōp'), a colonial possession of France in the Lesser Antilles, consisting of two islands, Grande Terre and Basse Terre, which are separated by a narrow channel called Rivière Salée, meaning Salt River. The colony, together with five small dependent islands, has an area of 688 square miles. Basse Terre is the larger of the two main islands, having a length of 27 miles and a breadth of 15 miles; while Grande Terre is 29 miles long and about 10 miles wide. The islands are of volcanic formation, but in several regions of the group are large tracts constructed by corals. The climate is marked by humid atmosphere, generally hot and unhealthful, and the soil is fertile. Among the principal exports are tobacco, sugar, coffee, pepper, dye and cabinet woods, cacao, and a large variety of tropical fruits. The imports consist of machinery, fab-



rics, and various implements. Most of the trade is with France. In 1897 the islands were disturbed by destructive earthquakes and in 1899 by a disastrous hurricane. Basse Terre is the capital and Pointe-à-Pitre is the chief commercial center. A senator and two deputies represent the colony in the chambers at Paris. Columbus discovered these islands in 1493 and they were colonized by the French in 1635. They belonged to England and France at different times, but have been French territory since 1814. Population, 1906, 183,108.

**GUADIANA** (ḡwā-thē-ā'nā), a river of the Iberian peninsula. It rises in New Castile, Spain, has a general course toward the west until it enters Portugal at Monsaras, and thence flows south into the Atlantic. Its entire course is 520 miles, but the navigable portion is only about 40 miles. The Ardilla and Giguela are its chief tributaries.

**GUAM** (gwām), an island in the Pacific Ocean, the largest of the Ladrone Islands, situ-



ated about 1,500 miles east of Manila. It has an area of 190 square miles. Guam is thirty miles long and from two to twelve miles wide. It has a mountainous surface, but the soil is fertile, producing rice, indigo, sugar cane, and fruits. Agaña, situated on Agaña Bay, is the capital and contains more than half of the population of the island. This possession is of little importance except as a port of transit and as a naval station, for which purpose the harbor

of Apra has been improved, but the principal station is at the capital.

The inhabitants consist chiefly of Chamorros intermixed with Malays and Tagalos, and they engage largely in fishing and agriculture. Domestic animals were imported by the Spaniards, who introduced the cultivation of rice, fruits, and vegetables. Sugar and indigo are produced to some extent, and the climate is generally favorable and healthful. Since 1898 Guam has belonged to the United States, having been captured by the cruiser *Charleston* in the Spanish-American War and ceded by the Treaty of Paris. It is governed by a naval officer acting under the direction of the Secretary of the Navy. Important reforms were instituted by Captain Leary, the first governor, and the present policy is to encourage agriculture, restrict the sale of intoxicating liquors, and extend education among the natives. Population, 1906, 10,798.

**GUAN** (gwän), a bird of Central and South America, where it is found both wild and domesticated. It belongs to the same family as the curassow and in many respects is similar to the grouse and partridge. The color is dark brown or black, marked with green and white, and the throat is wattled and nearly bare. Some of the species have the head crested. The tail and wings are quite long in all the species. These birds are seen in flocks most of the year, but during the breeding season separate into pairs, and incline to live a considerable part of the time in the high forest trees. The guan, or *chachalaca*, of North America, is found in the valley of the lower Rio Grande, both in Texas and Mexico. It is about two feet long, has a glossy grooved tail, and the general color is dark brown with lighter shades below. It builds its nests on the ground, in bushes, or in the limbs of trees.

**GUANABACOA** (ḡwā-nā-vā-kō'ā), an important suburban town of Cuba, situated about four miles east of Havana, with which it has railroad and telephone connections. It is noted for its beautiful gardens, parks, and hot and cold baths for invalids. The streets are regularly platted and many of its buildings are of good material and on modern plans. Population, 1907, 21,805.

**GUANACO** (gwā-nä'kō), a kind of llama found in various parts of South America, especially on the plains of Patagonia and the highlands of Peru and Ecuador. It is somewhat smaller than the alpaca and llama, which are the domesticated species. The height at the shoulders is about four feet. It has slender legs. The flesh and skin are valuable. It can be eas-



ily domesticated, in which state it furnishes milk and flesh for food, and wool and skin for clothing. It is greatly improved by domestication and artificial breeding.

**GUANAJUATO** (g̃wä-nä-hwä'tō), a city of southern Mexico, capital of the state of Guanajuato, situated among mountain ranges which are 6,780 feet above sea level. The streets are irregular, but many of the buildings are substantial and modern. It is connected with other cities by railroads, surrounded by one of the richest mineral countries in the world, and has manufactures of implements, clothing, machinery, jewelry, and fabrics. The institutions include several public schools, convents, and churches. Guanajuato was founded by the Spaniards in 1554 and became a city in 1741. Population, 1906, 56,042.

**GUANO** (gwä'nō), the decomposed excrement of fish-eating sea birds, intermixed with the remains of seals and sea fowls. It has accumulated to the depth of eighty to a hundred feet on the Chincha Islands and the coasts of Peru and Chile. For centuries innumerable flocks of sea birds have bred and roosted on these shores, thus causing the deposits. Its value for fertilizing has been known in Peru for centuries, but it was not transported to other countries as a commercial fertilizer until 1846. Eight million tons were taken from the Chincha Islands in 1853-72. Guano contains nearly all the inorganic matter required by plants and, therefore, is one of the best fertilizing agents for the different crops. It has been found in greater or less quantities in various places, but Peru still remains the chief source of supply. However, the available quantity there and elsewhere is becoming considerably limited. The Chilean government has control of the business, which for a number of years has proved a lucrative enterprise. The principal supply of guano used in the United States and Canada is now produced at slaughterhouses from refuse flesh and blood, called *flesh guano* and *blood guano*, and at the fisheries from refuse of edible fish or from undesirable species. The menhaden are utilized largely for this purpose, though the oil is extracted before the fish are converted into fertilizer. Another class of this product, known as *bat-guano*, is obtained in caves from the manure and remains of bats.

**GUAPORÉ** (g̃wä-pō'rā), or **Itenez**, a navigable river of South America, which at its confluence with the Mamoré forms the Madeira. It rises in the province of Matto Grosso, Brazil, forms a portion of the boundary between Brazil and Bolivia, and has a total length of 950 miles.

**GUARANTEE** (gär-än-tē'), or **Guaranty**, a promise or contract to be responsible for the payment of a debt or the performance of an obligation of another. In most countries a verbal promise to assume the debt of another is not binding in law, although it implies a moral obligation, and a valid agreement to answer for the default of another is made legally binding only by a written agreement. Such a contract should state definitely the obligation or extent of liability assumed, since a guarantor can be held only to the extent expressed in the written instrument. The business of guaranteeing risks of others is an important commercial enterprise. It differs materially from the risks taken by insurance companies, since it is based upon the ability of a contracting party to perform certain definitely stated obligations. However, experience has demonstrated that it is less hazardous than the business of insurance companies.

**GUARDAFUI** (gwär-dä-fwē'), **Cape**, a point of land in Africa, next to Ras Hafun the most eastern point of that continent. The southeastern shore is washed by the Indian Ocean and the northwestern by the Gulf of Aden. It forms the headland of an immense promontory.

**GUARDIAN** (gärd'ī-ən), in law, one who has the care and management of the person or property of another. Guardians are appointed by the judge of a court or some other qualified officer prescribed by law, and are intrusted with the care and management of those incapable of directing their own affairs, such as a minor child, a person of unsound mind, a drunkard, or a spendthrift. A person appointed to such a duty must account for all the profits as well as the estate of his ward, whose money can be invested only by the order of the court. It is incumbent upon him to provide for the maintenance and education of a minor ward, but all the estate and profits must be used judiciously, for which the guardian is required to give a good and sufficient bond. When a ward attains majority, the guardianship ceases. Guardians appointed to look after the interests of drunkards, spendthrifts, or persons of unsound mind continue to act under the direction of the court as long as their services are required.

**GUATEMALA** (g̃ä-tē-mä'lä), the most northwesterly republic of Central America, bounded on the west and north by Mexico; east by British Honduras, the Gulf of Honduras, Honduras, and Salvador; and south largely by the Pacific Ocean. It has an area of 48,225 square miles. The surface is largely mountainous and elevated, the principal mountain chains being a continuation of the Andes. They trend from northwest to southeast, sending off a num-



ber of irregular branches. Among the mountains are numerous volcanoes, of which several are active, the most noted being Fuego, 12,075 feet high, and Agua, 14,875 feet. The drainage is in various directions, though mostly toward the east and north. Among the important rivers are the Belize, Dulce, and Motagua, which flow into the Gulf of Honduras, and several tributaries of the Usumacinta, a river system whose waters flow into the Gulf of Campeche.

**PRODUCTIONS.** Agriculture and stock raising are the principal occupations. The fertile and productive districts are largely in the valleys and along the coast, where diversified farming is carried on successfully. Cattle, sheep, mules, horses, and swine are reared profitably. Among the products are tobacco, cacao, maize, wheat, coffee, and many species of tropical fruits. The forests are abundant, yielding quantities of valuable building material, rubber, and fiber products. The minerals are numerous and occur in rich deposits, though mining has not yet developed exceedingly. Among the principal products are sulphur, tin, lead, salt, copper, silver, and gold. Manufacturing has received encouragement from the government, especially the rubber industry. Among the general manufactures are cotton and woolen goods, ironware, earthenware, sugar, cordage, furniture, beverages, and utensils. Much of the traffic formerly carried on by pack mules is being brought to seacoast points by railroads. The principal railroad line connects Santo Tomás, on the Bay of Honduras, with San José, on the Pacific, passing through the capital city and being connected by branch lines in various directions. In 1909 the country had 450 miles of railroads in operation, but the lines were owned by German and American companies. The highways are generally good, while several canals have been cut for the improvement of river navigation.

**GOVERNMENT AND INHABITANTS.** The government of Guatemala is republican in form, of which the president is the chief executive, holding office for six years. He is assisted by a cabinet of advisers, who include the heads of the six departments of foreign affairs, justice, war, public credit, interior, and public instruction. The national assembly of a single chamber is the chief legislative body, the members of which hold office four years and are elected by popular vote. A supreme court and a well-organized system of inferior courts constitute the judicial branch. The army consists of 56,000 men, but the standing army disciplined for immediate service includes only 7,000. Roman Catholic is the dominant religion, but all forms of religious worship are unrestricted and no

state church is recognized. Education is free and school attendance is compulsory. The school system includes elementary and high schools, normal schools, industrial schools, and several universities. About one-third of the inhabitants are Europeans and various classes of mixed descent, while the Indian races include Aztecs, Mayas, and Toltecs. Spanish is the official language, though some of the natives retain their own distinct tongues, which are fast giving way to the general language under a system of public education.

Guatemala ranks as one of the most progressive countries of Central America, due largely to its growth in wealth and the development of its cities. Guatemala, situated about eighty miles from the Pacific, is the capital. Other cities include Cobán, Mazatenango, San Pedro, Santo Tomás, Zacapa, and Quezaltenango. Population, 1904, 1,842,134.

**HISTORY.** The history of Guatemala dates from 1524, when it was conquered by Cortez. After three centuries of Spanish dominion, the country declared its independence and a confederation was formed in 1821, which administered the government successfully for eighteen years. Rafael Carrera, a native Indian, conquered the country in 1839 and ruled until 1865. After his death the country was organized under a constitution modeled after that of the United States, and from that time dates its greatest progress and prosperity. Insurrections have occurred at various times, but they have been successfully suppressed and the republic has maintained its integrity.

**GUATEMALA,** a city of Central America, capital of the republic of Guatemala, about eighty miles east of the Pacific, on an elevation 4,975 feet above sea level. The streets are platted regularly and are paved and drained. It contains several excellent government buildings, a fine cathedral, a university, an archbishop's palace, and numerous modern municipal facilities. Among its manufactures are pottery, woolen and cotton textiles, machinery, utensils, cigars, spirituous beverages, embroidery, furniture, and jewelry. In 1774 it became the capital, at which time Old Guatemala, situated some distance to the southeast, was destroyed by an earthquake. It has railroad connections with the coast, both east and west, and with many interior towns. The public school system is well organized and numerous periodicals and scientific societies are maintained. It has an extensive system of electric railways. The city was first founded in 1524, but it was twice destroyed by earthquakes, hence the present city dates from 1773. Population, 1904, 96,568.



**GUAVA** (gwá'vá), the common name of many small tropical trees found in Asia and America. The larger number of these trees are native to the tropics of America, but the more useful species have been widely acclimated in the warm climates. They yield important dessert fruits, which are fleshy and have the shape of apples or pears. The lemon guava attains a height of twenty feet, has white fragrant flowers, and yields fruit about the size of a hen's egg. The fruit is exported or used in making jelly. Another species, the red guava, is cultivated extensively in the West Indies. The strawberry guava produces small fruit of excellent flavor.

**GUAVIARE** (gwä-vê-ä'rá), a river of South America, rises in the Andes near Bogotá, Colombia, and flows eastward into the Orinoco. The basin of the Guaviare is largely a level country, but it is very sparsely settled. The river has a length of 700 miles and the greater part of it is navigable.

**GUAYAQUIL** (gwī-ä-kēl'), a seaport city of Ecuador, capital of the province of Guayas, on the Guayaquil River, about forty miles from the Gulf of Guayaquil. The site is on low and moist ground, on account of which fevers are common. The noteworthy buildings include a national university, several hospitals, the government buildings, and a number of churches. It has a fine harbor on the river, which is two miles wide at this point, and has extensive railroad connections with interior mining and trading centers. As a port city it is one of the best on the west coast of South America, the principal exports being coffee, cacao, fruits, timber, nuts, India rubber, and mineral products. It has a considerable trade in ivory, live stock, tobacco, and drug materials. A waterworks system and a tramway are among the municipal improvements. It was founded in 1535 and owes its prosperity to its extensive shipping facilities. In 1896 damage to the amount of \$30,000,000 was done by fire. Severe disturbances by earthquake shocks have also destroyed portions of the city at various times. Population, 1908, 74,642.

**GUDGEON** (gǔj'ün), a fish found in the fresh-water lakes and streams of central and temperate Europe. It has a lengthened and rounded body, short dorsal and anal fins, and a labial barbel at each corner of the mouth. The head is flattened, the snout is obtuse, and the lower jaw is somewhat the shorter. It has no teeth in either jaw, but triangular bones near the entrance of the throat serve to grind the food. The gudgeon is a small fish, measuring from five to six inches in length, but it is prized

for its fine flavor. A species of gudgeon about five inches long is found in the Niagara River, while five species occur in Europe.

**GUELPH** (gwělf), a city in Ontario, county seat of Wellington County, on the Speed River. It is on the Canadian Pacific and the Grand Trunk railways and is important as an inland port of entry. The noteworthy buildings include the Ontario Agricultural College, the public library, the high school, and the county buildings. Extensive water power is obtained from a fall of thirty feet in the river. Among the manufactures are flour, woolen goods, sewing machines, farming implements, furniture, musical instruments, soap, and shoes. Building stone of a fine quality is quarried in the vicinity. John Galt, the Scotch author, founded the city. Population, 1901, 11,496.

**GUELPHS AND Ghibellines** (gǐb'ěl-lĭns), the names of two important political parties that contended for supremacy in Germany and Italy from the 11th to the 14th centuries. The party names originated from two families known as the Waiblingen and Welf, who were rival parties in the German Empire, the latter being still represented in the ruling house of England. These names sprang into existence from the Battle of Weinsberg, which occurred between Emperor Conrad of Hohenstaufen and Welf in 1140. The Welfs became known as Guelphs, receiving their chief support in the Italian cities of Bologna, Florence, Vienna, Modena, and Milan, while the Waiblingens took on the name of Ghibellines and were supported principally by the cities of Lucca, Pisa, and Arezzo. During the conflicts many of the cities and communities changed in accord with the interests peculiar to different localities. In the main the Ghibellines supported the imperial authority of Germany in Italy, while the Guelphs were in opposition. Toward the latter part of the 13th century the bitter feuds partook more of the nature of a personal warfare. After the 14th century both parties disappeared from history.

**GUERNSEY** (gěrn'zĭ), the most westerly and the second largest of the Channel Islands. It is located 45 miles southwest of Cherbourg, France, and 69 miles southeast of Start Point, England. The length is nine miles, the breadth is about five miles, and the circumference is thirty miles. The surface is elevated in the southern part, where the coast is picturesque, and the northern part is level. It is the nativity of the Guernsey breed of cattle, which are noted for their rich milk. Other products include flowers, fruits, and granite. Saint Peter Port is the seat of government. The inhabitants speak



a Norman-French dialect. Population, 1907, 41,037.

**GUIANA** (gē-ä'nä), an extensive region lying between the Amazon and Orinoco rivers, South America. It is properly divided into five divisions: Portuguese Guiana, now united with Brazil; Spanish Guiana, now connected with Venezuela; and the three European colonies of Dutch, British, and French Guiana. The entire territory has a length of 1,200 miles from east to west and a breadth of 800 miles, including an area of 690,000 square miles. However, the portions united with Venezuela and Brazil have largely lost their identity, and in modern geographies the name is applied only to the European colonies. These colonies are enclosed by Brazil, Venezuela, and the Atlantic Ocean.

Europeans first explored Guiana in 1499, but settlements were not made until 1613, when the Dutch established themselves at Essequibo. The English founded a colony at Surinam in 1650, and in 1664 the French settled at Oyapok. Following these settlements numerous conflicting claims arose, which were marked by various contests until 1803, when the history of British Guiana begins and the various possessions assumed their present geographical forms. The coast regions and valleys are exceedingly fertile, and the chief wealth consists of an exhaustless soil and many tropical products. As a whole the climate is moist and hot. The rainfall ranges from 70 to 98 inches, and the temperature varies from 75° to 90° Fahr. Within the territory are many navigable rivers, splendid tracts of forest, and rich deposits of gold, silver, iron, and other minerals, especially in the southern region of the country.

**BRITISH GUIANA, or DEMERARA**, is bounded on the north by the Atlantic Ocean, east by Dutch Guiana, south by Brazil, and west by Brazil and Venezuela. The area, including a portion claimed by Venezuela, is 90,277 square miles. Ranges of mountains belonging to the Parima system trend on the eastern boundary and the Awariwa highlands characterize the southern part. The principal rivers include the Essequibo, Guyuwini, Berbice, and Corentyn, the last mentioned forming part of the eastern boundary. The principal products include live stock, tobacco, coffee, maize, indigo, rice, butter, sugar, fruits, and cereals. Gold and silver are mined in the mountain districts on the south and east. The forests are luxuriant and yield large quantities of valuable timber. Among the leading exports are fish, rice, timber, vegetables, and fruits. Several railroads and numerous telephone lines have been built, connecting the sea-coast towns with the interior. The government

is administered by a resident governor, who is appointed by the crown, and he is assisted by an executive council and by a court of policy. Several colleges and many public schools are maintained jointly by taxation and government grants. Georgetown is the capital and principal seaport. Other thriving cities are Hope Town and Amsterdam. The inhabitants consist of natives, Africans, mixed races, and 16,900 Europeans. Population, 1906, 306,959.

**DUTCH GUIANA, or SURINAM**, a colonial possession of Holland, situated between French and British Guiana. It has a seacoast of 240 miles and an area of 46,060 square miles. The government is administered through a resident governor, council, and the colonial legislature. All the coast region and many extensive valleys are highly fertile. Ranges of the Tumuc Humac Mountains extend into the southern part from Brazil. They contain valuable deposits of gold, silver, coal, petroleum, and other minerals. The principal products are sugar, cacao, lumber, live stock, cereals, tobacco, rice, and tropical fruits. Numerous connections have been made by means of telephone, telegraph, and railroads, and schools and institutions of higher learning are maintained by government grants and taxation. The principal rivers include the Corentyn on the western boundary, the Maroni on the eastern boundary, and the Carapion, Surinam, and Coppename flowing through the interior. Its exports and imports are about equal, and the productive resources are developing rapidly. The government is administered by a governor general, who is appointed by the crown, and assisted by a council. Legislative authority is exercised by an assembly, which is constituted of four members appointed by the governor and by one member chosen for each 200 voters. The population includes many Europeans, but it is made up chiefly of Negroes and Indians. Religious liberty is granted to all classes. Paramaribo, on the Surinam River, is the capital and chief city. In 1905 the country had a population of 75,465.

**FRENCH GUIANA, or CAYENNE**, a colonial possession of France, located between the Atlantic Ocean and Dutch Guiana. The surface is largely level, though there are several ranges of mountains in the southern part. Besides the Maroni River on the western boundary, there are a number of smaller streams, among them the Sinamari and Arouague. The total area is 46,697 square miles. Cayenne, a city of 12,000 inhabitants, is the capital. The climate is exceedingly moist and unhealthful. Pepper, cloves, nutmegs, cinnamon, fruits, timber, cereals, gold, live stock, and asphalt are the princi-



pal products. The colony has not been materially prosperous, owing to its unhealthy climate. From 1853 to 1864 it formed a penal colony of France, but since the latter date no convicts have been transported there. However, Captain Dreyfus was imprisoned on Devil's Island, which lies off the coast. The government is vested largely in a governor, who is appointed from Paris and is assisted by a privy council of seven members. The city of Cayenne contains about one-third of the population of the entire possession. It has been improved by public works and is the seat of a good public school system. Besides containing several government buildings, it is the seat of the Royal Astronomical Society's station. Population, 1906, 33,256.

**GUILD** (gıld), the name of various associations that flourished in the Middle Ages, being designed to further commerce, handicrafts, and various business enterprises. These associations were advantageous in obtaining municipal and civil liberty as against the oppression of the nobles and for mutual development and protection in the industrial arts. The German guilds of craftsmen attained the height of their influence in the 13th century, when they were empowered to defend their interests by force of arms, but a decree issued in 1240 by Emperor Frederick II. restricted them in various respects with the intention of destroying further growth in political power. This decree and others issued subsequently were inoperative, and the guilds remained influential in Germany until the beginning of the 19th century, when the practice of all trades became unrestricted in all German states. Austria established freedom of the trades in 1860. The guilds secured a foothold in England early in the 7th century, remaining powerful factors in the trades and arts until Henry VIII. issued a decree confiscating their property. However, they were maintained in a general way until 1835, when every form of restriction on the trades and arts was abolished and since then various corporations have succeeded them. France and other European countries as early as 1739 took like steps for the purpose of giving all parties freedom of choice in the pursuits of trades and business enterprises. At present trades unions take the place of guilds in the matter of protecting the interest of workmen, but they do not restrict the young in the selection of a business or occupation.

**GUILFORD COURTHOUSE** (gĩl'fěrd), **Battle of**, an engagement of the Revolution in America, fought on March 15, 1781. Greene with an American army pursued Cornwallis after the Battle of Cowpens and joined Morgan in the Catawba Valley, and the two American

forces were finally united at Guilford Courthouse, N. C. Cornwallis had an army of 2,215 veterans, while the Americans numbered 4,440. The British made a well-directed charge and at first were successful, but a regiment of Maryland troops was followed by a cavalry charge, causing the British to fall back. Cornwallis retreated toward Wilmington and abandoned the Carolinas. The Americans lost 400 and the British lost 600. This battle is considered a strategic victory for the former.

**GUILLEMOT** (gĩl'lě-mõt), the popular name of several birds of the auks family. The common guillemot is from twelve to fifteen inches long, has almost completely black plumage, and is native to the northern parts of Europe, Asia, and America. A rare species known as the *sooty guillemot* has a white ring about the eye. The bill in all species is straight, the legs are short, and the wings are pointed. Great numbers of these birds breed in the rocky shores of the northern coasts, where their eggs are hunted for the market. The feathers are used for making clothing by the natives, who eat their flesh and eggs.

**GUILLOTINE** (gĩl'lō-těn), an apparatus named from its supposed inventor, Joseph Ignace Guillotin (1738-1814), and used by the French government for executing criminals. A similar invention for beheading was used in the Middle Ages, but the form adopted by the convention at the time of the French revolution contained a number of improvements. A highwayman was executed on April 25, 1792, at the Place de Grede, Paris, being the first to be guillotined. The common guillotine consists of two posts placed upright on a platform about twelve feet square, between which an ax is suspended. In the ordinary guillotine the ax is formed much like a hay knife, running in grooves between the posts, where it is suspended by a loop in the halyards, and held in place by a button at the top. The person to be executed is bound to the platform and the knife is dropped upon his neck by its own weight, which is sufficient to cause the head to be severed from the body. The Persians and Italians used a similar instrument for beheading criminals, and one called the *maiden* was employed in Scotland in the 16th and 17th centuries. It is commonly supposed that the inventor perished by the machine of his own invention, but this is erroneous, since he founded the academy of medicine after the guillotine was abolished and lived until 1814. The name guillotine is commonly applied to a machine for cutting straw, paper, and other substances.

**GUINEA** (gĩn'ě), the name of a region in

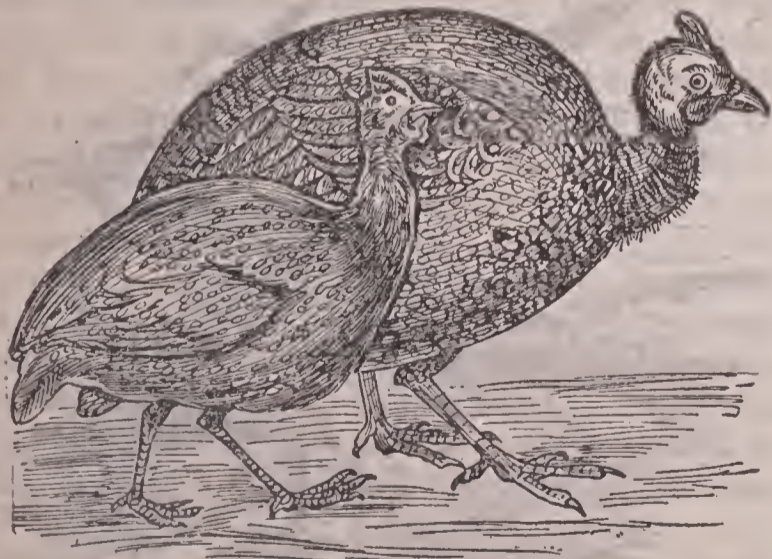


West Africa, bordering on the Gulf of Guinea. As a geographical term it came into use in the 14th century, when the Portuguese explored and traded along the coast, and later the region became the center of a large slave trade. At present it is not used extensively, being displaced by names given to particular localities by European nations, but in a restricted sense it is applied to Angola and Portuguese Guinea. Formerly the region from Sierra Leone to French Congo was known as Upper Guinea and the region south was called Lower Guinea. Anobón, Fernando Po, Principe, and Sao Thomé were known as the Guinea Islands.

**GUINEA**, a coin formerly used in Great Britain, so named because it was first made from the gold brought from the coast of Guinea. It came into use in the reign of Charles II., in 1664, and was superseded by the sovereign in 1817. The value of the guinea was 21 shillings, or about \$5.06. This coin is rare at present, but it is still customary to use the name for various purposes, especially in estimating professional fees and the price of pictures.

**GUINEA, Gulf of**, the name applied to a large portion of the Atlantic Ocean, on the west coast of Africa, washing the shore between Cape Lopez and Cape Palmas. The bights of Biafra and Benin are within the gulf. It receives the waters of the Niger and contains the islands of Saint Thomas, Fernando Po, Principe, and Sao Thomé.

**GUINEA FOWL**, or *Pintado*, a genus of birds of the turkey family, belonging to the genus *Numida*, native to Western Africa. About a



GUINEA FOWLS.

dozen species are included in the group, the best known being the common guinea fowl, which has been domesticated and is reared extensively. It is about the size of a common fowl, has a quarrelsome disposition, a peculiar harsh cry, and seeks to tyrannize other poultry. The species which are grown most extensively are shy.

They have slate-colored plumage with speckled feathers alternating and a naked head, and lay small eggs with a strong shell. The eggs are esteemed for food. Usually the guinea fowl is kept partly as a barnyard ornament and because of its inclination to defend other fowls against their enemies. In the West Indies they are met with in flocks in a wild state, and are seen frequently in numbers ranging from 25 to 50. Some species of Africa and Asia have a pure white plumage. In the time of Roman prosperity the guinea fowl was a favorite bird of the chase and its flesh was highly esteemed.

**GUINEA PIG**, a class of rodent mammals native to South America. They are a species of cavy and are domesticated and grown extensively as pets. Most of these animals are white, reddish, or white and black spotted. They are very small, about twelve inches long, and resemble the pig only in their grunting voice. Among the common characteristics are short and rounded ears, timid habits, the absence of a tail, and a low degree of intelligence. In South America they occur in large numbers on the banks of the La Plata, in Brazil, Bolivia, and other countries. They most commonly frequent the forests during the daytime in a secluded manner and come out in the evening for food. Their stupidity makes them an easy prey to various serpents and flesh-eating animals, though their loss by destruction in this manner is at least partly overcome by their rapidity in multiplying. They begin to bear young, when only two months old, produce from one to five at a birth, and commonly bring forth from three to six litters each year. See illustration on following page.

**GUITAR** (gī-tār'), a stringed musical instrument which has a hollow body somewhat resembling the violin. It is played by plucking or twitching the string with the right hand, while the left is used to form notes by pressing the strings against the frets on the finger board. It is used principally to accompany the voice in singing. The Moors introduced it into Spain, where it has remained a popular instrument ever since. Those of modern manufacture have six strings. The three lowest strings are made of silk, covered with a fine wire, and the three highest are of gut. At present it is used extensively in all civilized countries.

**GULF STREAM**, one of the most extensive and best known of the oceanic currents, receiving its name from the Gulf of Mexico. All the currents of the ocean are so nearly continuous that they in fact resemble one vast movement. Any given current in the ocean is influenced more or less by the movement of all other



oceanic streams. The winds and differences in the density of oceanic waters cause large volumes to pass from near the Equator into the Caribbean Sea, thence through the Yucatan Channel into the Gulf of Mexico, whence it is known as the Gulf Stream, a name applied until



GUINEA PIGS.

it finally disappears as a distinct current, after passing across the Atlantic.

In the Gulf of Mexico it has a temperature of about 50° Fahr., flows as a definite warm current through the Strait of Florida, courses in a northeasterly direction a short distance from the coast of the United States, and has a width varying from 50 to 300 miles. In the Straits of Florida its velocity is about six miles per hour, whence it gradually diminishes, being about four miles per day at its greatest width in the Atlantic. The coast of Europe divides it into two parts, one passing southward along the coast of Spain and to the northeastern part of Africa, and the other flowing to the Arctic Ocean by way of the north coast of Norway. The waters become denser as heat is radiated. On account of this circumstance the stream appears as a middle or lower current farther on in its course.

The effect of the Gulf Stream upon the temperature of the Bermudas is marked, giving these islands a semitropical climate. On the other hand, its union with currents moving toward the northeast along the shores of Europe has a modifying effect upon the climate of Great Britain and the Scandinavian peninsula. However, when considered by itself, it cannot be said to have a material influence upon the climate of Europe, since it is not sufficiently wide or deep to be highly effective. In commerce it is

quite important from the fact that sail-vessels moving in the current are enabled to derive some advantage in navigating portions of the ocean, but in this respect it is of no utility in steamship navigation.

**GULF WEED**, a genus of seaweeds floating in the Atlantic Ocean within an area of about 250,000 square miles, and so called because they are found chiefly in the Gulf Stream. The best known of the large areas covered by seaweeds is the so-called Sargasso Sea, situated north of the Tropic of Cancer, in the north Atlantic, and west of the Azores. They propagate themselves by breakage. See *Algae*.

**GULL**, a widely distributed genus of web-footed sea birds. They are distinguished by large wings, small hind toes, slender legs, and a straight bill. Fully sixteen species of gulls have been studied, of which the color is variegated, though the prevailing hues are blackish-slate, pearl-gray, and whitish. Some species have black and white markings on the head that vary at different seasons of the year. The young are brownish and have a dark bill, but at maturity both sexes are very similar in color. They frequent the shores of lakes and the sea, while some species are seen far out from the land and appear to be tireless in their flight. They feed on fish, insects, and various forms of putrid food with much voracity. Their nests are along the shore or in rushes, where they breed once a year and



GULL.

rear from two to four young. The most common species include the *black-headed gull*, *glaucous gull*, *common American gull*, *common herring gull*, and *sea mew*. Sea mews have a cry quite similar to that of a cat, hence the name.



The flesh of sea gulls is coarse, though their eggs are prized for table use, and the plumes serve as trimming for ladies' hats.

**GUM**, a vegetable secretion that exudes from intercellular spaces of certain trees, among them the peach, plum, and cherry. Gums are viscid. The purest varieties are transparent or translucent and pale yellow in color, but sometimes are several shades darker. Among the more valuable gum products are those known as gum arabic, gum Senegal, East India gum, cherry-tree gum, and Barbary gum. The gum taken from the spruce tree is prepared for chewing gum and sold in the market, and there are various other classes of this product prepared and sold in the form of confections. Gum resins are the inspissate juices of certain plants which contain both gum and resins. They are obtained from various plants either by spontaneous exudations or from incisions. They include asafoetida, myrrh, aloes, and many others.

**GUM ARABIC** (är'á-bīk), a gum obtained from the *acacia arabica*, a plant abundant in Arabia and India. For the purpose of securing a large yield it is necessary to make incisions in the bark, from which the gum exudes spontaneously. The product is transparent, often colored yellow or brown by impurities. It is inodorous and brittle and has a bland taste. Gum arabic is useful in calico printing, for cement, for ink, in pharmacy, and in finishing fabrics.

**GUM RESINS**, the dried products obtained from various plants, consisting of a mixture of gum and one or more resins. Alcohol dissolves the resin, leaving an insoluble residue of gum, while the latter is dissolved by rubbing with water. If gum resins are brought in contact with water, the gum dissolves and the insoluble resin forms an emulsion, hence a gum resin requires both water and alcohol to be completely dissolved. The principal products of this class include ammoniac, asafoetida, gamboge, myrrh, and ivy gum resin. These products are solid and opaque, have a strong taste and smell, and are employed chiefly in medicine. Substitute gums are made from the starch of wheat and potatoes by roasting or baking and are used to some extent as substitutes for the more expensive real gums.

**GUMTI** (gōom'tê), or **Goomti**, an important river of India, rises in a small lake in the Northwest Provinces, and flows into the Ganges near Benares. The course is generally toward the southeast and is remarkable for its many turns and windings. It is about 485 miles long and it is navigable for small craft to Lucknow, about 300 miles.

**GUN**, a term applied to any weapon which

has a barrel designed to receive and discharge a missile, in the projection of which powder, gun cotton, or air may be employed. The various implements ranging from the hand gun or pistol to the largest cannon are described by the name, but in common use it is customary to limit the term to the sporting gun. When gunpowder first came into use different terms were applied, such as *bombards* in Italy and *crackeys* in England. The early cannons were about the size of large muskets and by means of them it was as common to throw stone and iron as leaden balls. They were not only comparatively small, but were hard to manipulate, and firing was slow and ineffective as compared with the newer implements of modern times. The most rapid firing in 1638 by the musketeers was from seven to ten shots per hour. At that time it was quite common to use a *match-firing* gun, but soon after the *flintlock* came into general use, this being an invention of highwaymen, who found that firearms in which matches were employed were liable to lead to their discovery.

The flintlock guns were in common use in Europe until 1840, when more effective and rapid-firing weapons took their place. As early as 1540 it was common to use pistols in warfare and for personal protection, the weapons being confined to a place of concealment and used as a surprise to the enemy. The pistols used in the 18th century contained a cylinder with four barrels, which revolved much like the cylinders of newer implements of a like character. At an early date the art of aiming and firing by holding the implement in one hand developed into a very skillful practice, equaled only by pioneers and herdsmen who usually are adepts in the use of the pistol. The modern magazine gun has a shorter barrel and a smaller bore than the old musket, yet the carrying power is greater and its accuracy is of a much higher character. This is due largely to the rifling or grooving of the barrel, an art developed in the last century. The larger implements of war are classed as cannon, which include mortars, howitzers, and siege guns. In the larger cannon the barrels are about sixty feet long. These implements weigh 125 tons, carry projectiles or shells weighing 1,800 pounds, and consume 900 pounds of powder in a single charge. The cannon commonly used in the army and navy weigh about sixty tons, are forty feet in length and five feet in diameter at the larger end, and have a rifle bore. Beside these, mention may be made of the rapid-firing and machine guns, by means of which it is possible to fire as high as 800 shots per minute.

All the different varieties of guns are made of steel. They are thoroughly tested before being



used in the public service. The Gatling gun, invented in America and adopted in 1866 for the United States service, was capable of firing 1,200 shots per minute in special tests. The Krag-Jørgensen gun is in extensive use in the infantry of many countries, having been widely adopted in 1896 and since. The largest establishment for manufacturing guns is the celebrated Krupp works at Essen, Germany. The guns manufactured there have gone widely into use and are among the best in the world. The most remarkable single gun manufactured at that establishment was completed in 1886, by means of which it was possible to throw a ball weighing 2,300 pounds a distance of nine miles with sufficient force to penetrate iron plates four feet thick. All the modern guns are breech-loading, the projectile being first inserted, after which the propelling force is placed back of the projectile, and the breech is plugged by means of a substantial screw plate.

**GUNBOAT**, a vessel of small size, usually supplied with a single gun. Vessels of this class are employed in war for attacking armored vessels, or for defenses on the coast and in rivers. Those of modern construction are armed largely with one heavy gun, which is mounted on the deck. It is commonly set on a pivot in such a manner that it may be turned in any direction. In other gunboats a single gun is so constructed that it may be raised or lowered by means of an engine, and in maneuvering it is necessary to turn the vessel. Iron-plated steam gunboats are a powerful aid in a fleet and are employed extensively as auxiliaries.

**GUN CARRIAGE**, the vehicle or support upon which a cannon is mounted for service. It may or may not be adapted for transporting the gun. Those used for siege and field purposes have a carriage designed for traveling, which consists of a fore part with two wheels, called a *limber*, and with the carriage proper forms a four-wheeled vehicle. The limber serves for the attachment of horses, but for action it is unlimbered, when it rests on a strong support called the *trail* and its own wheels. Land gun carriages include *casemate*, *barbette*, *siege*, and *field carriages*. The first two are intended to be kept in position at a particular fortification, while the last are adapted for transportation as well as for stationary service. The iron carriages of modern construction contain elaborate mechanical parts, combining convenience in transportation and firing, and are sufficiently substantial to endure elaborate use.

**GUN COTTON**, or **Pyroxylin** (pī-rōks'ī-līn), a powerful explosive substance prepared by the action of nitric acid on cotton wool. It

was discovered by Christian F. Schönbein (1799-1868), a German chemist, in 1845. His experiments in mixing nitric and sulphuric acids with cotton wool demonstrated that the product possesses a highly combustible property and that its burning results in an explosion. It is prepared at present by drying cotton wool at 100°, then submerging it in a mixture consisting of one volume of nitric acid and three volumes of sulphuric acid, and leaving it immersed for 24 hours. Next it is washed with water or a preparation of alcohol to remove the lower nitrates. It explodes at about 165°, if finally divided, though when compressed it burns like tinder, but may be exploded by a mercuric fulminate. If washed in soda, it retains its explosive properties to the best advantage. The principle advantage of gun cotton over gunpowder is that it can be conveyed safely in a moist state without injury and is almost smokeless. In mining and for torpedoes it serves a highly useful purpose. It has been introduced as an effective agent in warfare. In photography an imperfect chemical form of gunpowder, known as *collodion*, is used. This is soluble in a compound of alcohol and ether.

**GUNNERY** (gūn'nēr-ĭ), the branch of science which treats of the construction and mode of firing guns. The term is commonly used in contradistinction to *musketry*, which refers especially to like purposes in small arms. Much has been written on the subject of gunnery, the first standard work being that of Niccolò Tartaglia (1500-1559), an Italian mathematician, who published a treatise called "The New Science" in 1537. Other publications of note are the "Dialogues on Motion" published by Galileo, in 1638, and the "New Principles of Gunnery" by Benjamin Robbins in 1742. The latter writer, besides treating of the resistance of air, bore of guns, methods of taking aim, and force of gunpowder, produced an invention for measuring the velocity of cannon balls, a mechanism not superseded until 1862. By a study of the theory of gunnery it has become possible to solve many problems relative to the best systems of constructing firearms for the purpose of securing the most serviceable motion of projectiles through the air, and for manufacturing implements of the proper length, rifle bore, thickness, weight, and strength. It has aided in solving the problems involved in actual firing, such as calculating the necessary velocity, range, angle of elevation, rotation of projectiles while passing through the air, and other problems involved both in individual firing and in handling a large number of guns in the time of war.

The guns that are manufactured according to



the better methods take into account the necessary velocity of the projectile and the effect upon it by the recoil, as well as the construction most effective in the different kinds of fire, as direct fire, vertical fire, and enfilade fire. By *direct fire* is meant the discharge of projectiles horizontally against the front of a column. In *vertical fire* the gunner aims at a high angle of elevation with the object that the projectile will be caused to fall at a vulnerable point of the enemy. In *enfilade fire* the projectiles sweep against the earthworks or lines of men. Many circumstances must be taken into account in endeavoring to make firing effective. They include the direction and velocity of the wind, the drift due to the rotation of the projectile, the state of the atmosphere as regards heat and moisture, and the movement of the ship and of the enemy. No perfectly satisfactory range finder has yet been discovered, but high classes of guns combined with careful experiments and practice have developed a high degree of proficiency in firing.

**GUNPOWDER**, an effective explosive mixture of charcoal, saltpeter, and sulphur. The composition varies according to the uses for which it is employed. The ingredients are pulverized separately into fine particles and mixed carefully in the proportion of about 75 per cent. of saltpeter, the remaining 25 per cent. being divided equally between sulphur and charcoal. In manufacturing the mixed materials are subjected to great pressure for the purpose of forming a solid cake, which is then ground into fragments and the grains are separated by sieves. The necessary apparatus includes a series of sieves or screens, by means of which the different sizes are separated from each other. The dust particles remaining are again pressed into cakes, the proper sizes being utilized in forming the different grades of gunpowder, and the coarser residue, if any, is broken into finer particles.

The pressure is applied while the material is in a moist state and determines the character of the explosive, high pressure giving violent action, while the milder pressure causes the product to be less violent as an explosive. When the grains are first separated, they contain sharply marked points, but these are worn off by placing the granulated powder in barrels and revolving them for a period of four to twenty hours. This process is accomplished while the powder is still moist and is necessary to give the grains a perfectly smooth surface. After this process, the granulated powder is glazed with graphite and subjected to a process of drying in a large room under a temperature of 135°.

The most common grades of powder are known as mammoth, cannon, mortar, and musket powder. The last mentioned is the finest grained and is used largely in the smaller fire-arms. However, coarser-grained powder is more serviceable in the larger guns, since the strain produced by it tends rather to move the projectile forward than to effect an influence by which its force is lost before the projectile is started, as is the case with small-grained powder. In recent years much progress has been made in the use and effectiveness of smokeless powder. This class is used almost exclusively in small and rapid-fire guns by the principal nations, and many of them employ it for field and heavy cannon. The reason that smokeless powder possesses superior value is that the dense volumes of smoke arising from rapid firing tend to obstruct the view and impede the successful operation in time of battle.

The powders usually classed as smokeless are more properly designated as semi-smokeless, since they produce a small amount of smoke. Powders containing ammonium nitrate as a principal ingredient yield products that are largely gaseous and almost invisible. There are three classes of true smokeless powder, of which the ingredients consist mainly of nitrocellulose, a mixture of nitrocellulose and nitroglycerin, and those containing nitro-derivatives of the aromatic hydrocarbons. Among the objects sought in manufacturing an effective and serviceable powder may be named the property of being smokeless. To this must be added high and uniform velocities with safe and regular pressure, the property of not excessively fouling in the gun, the virtue of not being unusually liable to ignite from the effect of friction or a shock, and that it be not excessively difficult to ignite when placed in the gun ready for use. Besides these essentials, high grade powders must not be impaired by temperature, age, and moisture, and be free from obnoxious and irrespirable gases when used in firing. Manufacturers take into account the chemical and physical effects of powder upon the gun, and seek to produce grades that will not rapidly erode or corrode the barrel.

The history of gunpowder properly dates from the 7th century, when it was employed by the Byzantine emperors to defend Constantinople against the Saracens. However, it is of great antiquity among the Chinese, who employed it for blasting rocks and in manufacturing fireworks long before the Christian era. It is quite certain that the discovery was made by the Chinese while accidentally mixing saltpeter with sulphur and charcoal, and that the products used

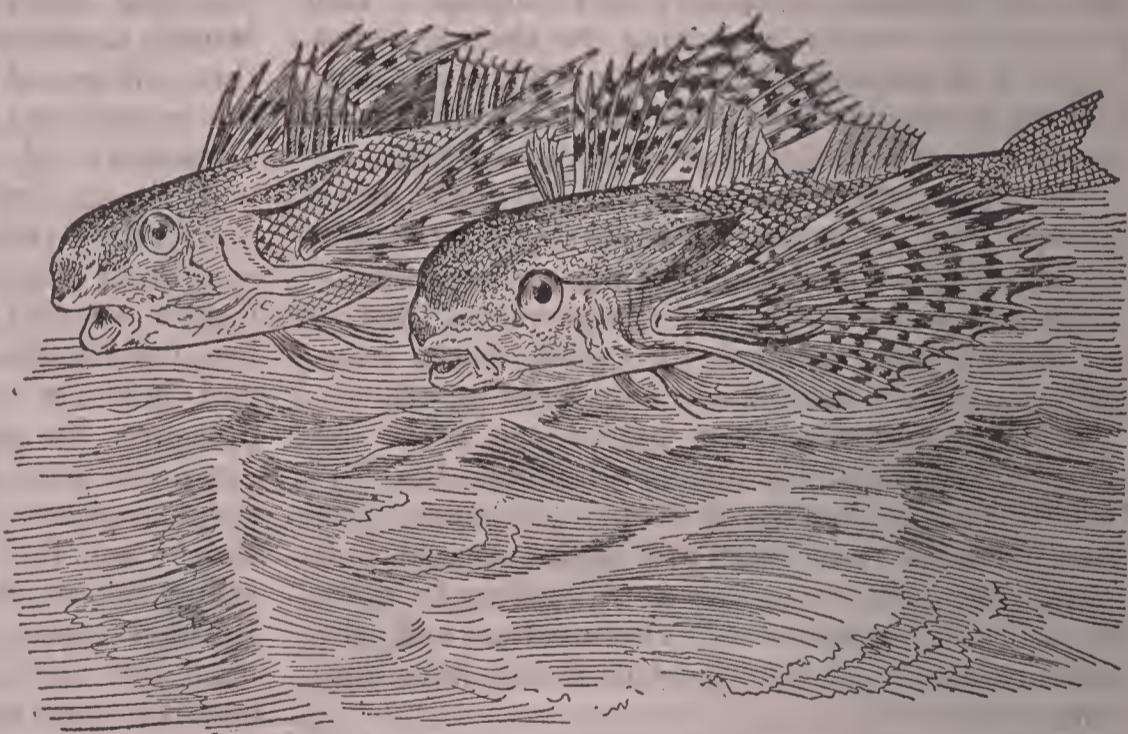


by them were greatly inferior to the varieties in use at present, or even during the Middle Ages in Europe. A German monk named Berthold Schwartz made valuable discoveries in 1336, which greatly facilitated the manufacture and increased its propulsive power. Guns were used by the British as early as 1327, during the invasion of Scotland by Edward III. In 1342 powder was employed at the siege of Algeciras by the Moors and shortly after attracted the attention of various European nations. The manufactories of gunpowder established in Germany and Italy were among the first in Europe and the first in England were founded about 1590. The American colonists brought gunpowder to America, but even before their time it was used extensively by navigators and explorers who cruised on the American shores. At present the United States ranks as one of the principal powder manufacturing countries in the world, its product being both large in quantity and efficient as an explosive projectile agency.

**GUNPOWDER PLOT**, a celebrated conspiracy formed in England in 1604 by Robert Catesby and several Roman Catholics of rank for the purpose of blowing up Parliament and the king as a matter of revenge on account of the passage of the penal laws directed against their faith. The time fixed for the execution of the plot was Nov. 5, 1605, and it was designed to destroy the commons, lords, and king by one blow. The plan was to excavate a channel so as to form an underground passage, but later a cellar under the chamber of Parliament was rented, and in this the powder was stored. An anonymous letter was sent to Lord Mounteagle, a Catholic peer, advising him not to be present at the meeting of Parliament, which that gentleman delivered to Cecil, then Secretary of State, and from this the plot became known. An investigation led to a discovery of 36 barrels of powder and several large quantities of other explosives, together with billets and faggots. Guy Fawkes was arrested while starting to ignite the explosives, while several others were apprehended, tried at Westminster, and executed on Jan. 30 and 31, 1606. A later investigation demonstrated that the Catholics, with few exceptions, were not implicated and knew nothing of the plot.

**GURNARD** (gûr'nêrd), a family of spiny-rayed fishes, including those called grunTERS, cuckoos, and sea robins. The common gurnard has an angular head covered with bony plates and the elongated body is tapering and nearly round. It has many sharp spines and peculiar appendages. The flying gurnard has enormous spreading wings and is able to lift itself out of the water with ease. Most species of these fishes utter a peculiar note when above the water, hence the names piper and cuckoo have been applied to them. They frequent the eastern coast of Canada, and the United States and are found off the coasts of Europe and Asia. None of the species is more than eighteen inches long and some are regarded good food fishes, though their uncouth appearance has caused them to be eaten only to a very limited extent.

**GUTHRIE** (gûth'ri), the capital of Oklahoma, county seat of Logan County, on Cottonwood Creek, 32 miles north of Oklahoma City. It is on the Atchison, Topeka and Santa Fé, the Chicago, Rock Island and Pacific, and other rail-



FLYING GURNARDS.

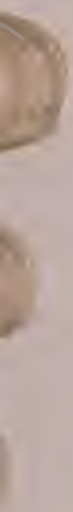
roads. The surrounding country has large interests in agriculture and dairying. Among the noteworthy buildings are the State capital, the Carnegie public library, the city hall, the high school, and the Federal building. Other buildings include the Scottish Rite Temple, a Federal prison, and Saint Joseph's Academy. Among the manufactures are flour, furniture, vehicles, machinery, cigars, and cotton products. It has gas and electric lighting, systems of waterworks and sewerage, and electric street railways. Guthrie was founded in 1889, became the capital of Oklahoma Territory the next year and was made the





PHYSICAL EXERCISES IN SCHOOLS.







capital of the State in 1907. Population, 1907, 11,652.

**GUTTA-PERCHA** (güt'tä-pēr'chà), the inspissated juice of the gutta-percha tree, which somewhat resembles caoutchouc, but differs from it in being more soluble and stronger, but less elastic. The gutta-percha tree has a trunk of two or three feet in diameter, grows to a height of sixty or seventy feet, and abounds in south-eastern Asiatic islands, principally in Borneo, Singapore, and Sumatra. The juice is extracted by tapping. It is brownish-red in color when pure, becomes hard and tough below a temperature of 90°, and can be molded into various designs at a temperature of 145° Fahr. Its principal use is for coating submarine telegraph wires as a protection against salt water. In a modified form it is used for the soles of boots, ear trumpets, door handles, bottles, and hose tubes.

**GWALIOR** (ḡwā'lê-ôr), a fortified city of India, capital of the state of Gwalior, about sixty miles south of Agra. Its fortifications are situated on an elevated rocky eminence and are accessible only by steps, the whole constituting the most formidable strategic point in India. The older portion of the city is situated at the base of the rocky heights. It contains a preponderance of stone buildings and is noted for its ancient temples of interesting Hindu architecture. The old town has narrow and illy improved streets, but the newer part, known also as Sashkar, is situated toward the southwest and is well graded and drained. It has systems of pavements and electric street railways. Gwalior has had a long and eventful history and took a leading part in the mutiny of 1857. Population, 1906, 120,208.

**GYMNASIUM** (jīm-nā'zī-ŭm), a name applied by the Greeks to the public places and buildings where the Grecian youths exercised themselves by running, leaping, wrestling, boxing, and throwing the spear. The most noted of these were located at Athens. That city contained seven resorts classed as gymnasiums, which were frequented not only for gymnastic exercises, but likewise for instruction by rhetoricians, philosophers, and the eminent teachers who delivered their lectures as a means to cultivate the intellectual faculties of youth. The term *gymnasium* is used to designate a system of schools in Germany, which occupy a place immediately between the elementary schools and universities, serving as feeders of the latter. Collectively they are known as *Gymnasia* or *Realgymnasia*. In these institutions the youth of Germany are trained especially for admission to the universities, and before completing the

course are required to take a critical examination in at least one modern language, history, Greek, and Latin.

**GYMNASTICS** (jīm-nās'tiks), a word derived from gymnasium and used to designate any system designed to discipline the physical and muscular powers of the body by exercising in feats of bodily skill. Games for the purpose of encouraging outdoor exercises by children are as old as human history, though the various games have been characterized by marked differences in the various ages. Among the most common games to develop physical strength and skill which are popular at present are those of baseball, football, tennis, croquet, rowing, and others designed especially for children younger than those adapted to playing the recognized standard games. However, the term *gymnastics* is applied more strictly to indoor exercises, usually those that involve muscular activity under system, and are performed in special rooms or departments set aside for the different sexes in many of the schools, colleges, and universities. It has been found that these exercises are helpful in invigorating especially the students of sedentary habits, giving greater strength to muscles and frame, and imparting such a degree of general vigor to the system that intellectual development becomes more marked and rational.

Perhaps the ordinary infantile and childhood pastimes are sufficient to engage the attention of most children until twelve years old, but from that time to the age of thirty-five it is highly beneficial to take rational and suitable exercise at regular intervals, though much care is necessary lest the system be overtaxed and the vital organs fatigued. For this reason it has been found highly profitable to place the gymnasium under special supervision of competent directors and guide the gymnastic training of each pupil in accordance with individual needs. This is true especially in beginners for the reason that some experience is necessary in order to estimate the proper amount of invigorating exercise wholesome to the system.

**GYPSIES** (jīp'sŷz), a peculiar race of people found widely distributed in most parts of the world. They are known among themselves as Romani. The name Romani was derived from *Rom*, the Egyptian word meaning man, and *Romni*, meaning woman. Formerly the French called them Bohemians for the reason that they regarded them banished Hussites from Bohemia, while to the Germans they are known as *Zigeuner*, a term thought to have been derived from the Italian *Zingari*. The name Romani seems to imply their descent from the early Egyptians, but the language, which is the same among the wan-



dering companies in all countries, indicates descent from the people of India, probably from the Hindus. Like the Jews, they have been able to preserve their identity and language in a remarkable degree.

The color of the typical Gypsies is yellowish-brown, the hair and eyes are jet black, the limbs are symmetrical, the teeth are extremely white, and the size is medium. They are rarely content to make permanent settlements, but prefer to wander in emigrant wagons or live in tents. The older women turn a few pennies by telling fortunes, the younger women engage extensively in selling wares and fruits, while the men vend notions, trade horses, perform sleight of hand tricks for exhibition purposes, or engage as general traders. Their musical skill is remarkable and many of their melodies have become incorporated with the most noted operas and cantatas.

The vocabulary of the Gypsy language is limited to about 5,000 words, which are taught by vocal sounds, and no idea of a general education is possessed. They marry and divorce without much ceremony, have no particular religion, exhibit much delight at turning a good bargain, and are given to amusements and games. As a rule the children are reared in indolence and ignorance, while traits of superstition and boastfulness are common. Historical writers generally agree that they appeared as a wandering people in Germany, Italy, Switzerland, and France about 1417, thence moved into Spain about 1445, into Russia about 1500, and into Sweden and England about 1514. The kings and princes of many countries have been friendly to them on account of their harmless disposition, though in some localities they were charged with being spies and kidnaping children for the purpose of securing ransom. Straggling parties emigrated to America shortly after permanent settlements were made, and at present the Gypsy population in the United States is considerable. The total number of Gypsies in the world is estimated at 650,000, though this does not include those that have become assimilated by other peoples, which, however, does not occur with much frequency.

**GYPSUM** (jĭp'sŭm), a mineral occurring in monoclinic strata as alabaster in a compact state and as selenite in a crystallized form. It is found extensively in the form of a soft, chalky stone, this being transformed into plaster of Paris by kiln-drying. The common characteristics of gypsum are its color, which includes white, gray, yellow, blue, reddish-brown, and black. It is often transparent, though usually opaque. The grade designated as soft and

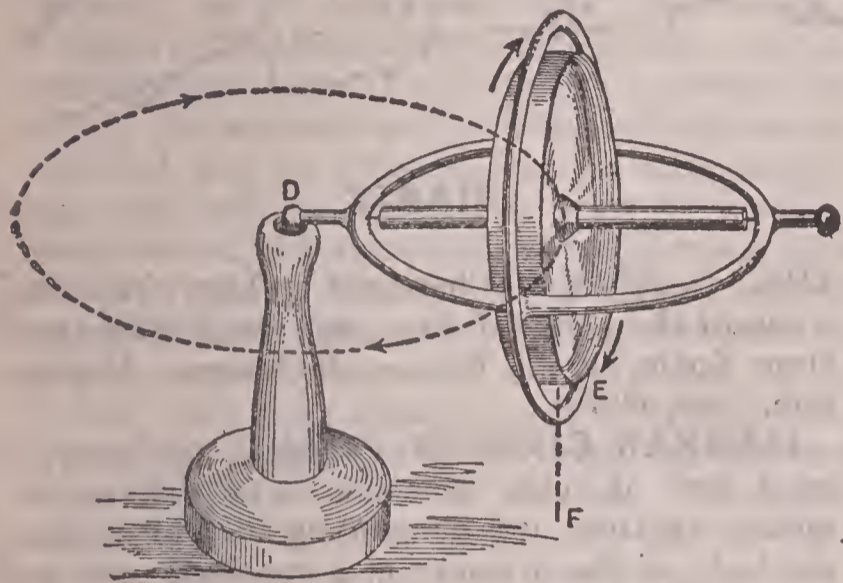
chalkish stone occurs largely in Michigan, Kansas, Texas, New York, Iowa, Ohio, Canada, Austria, Germany, France, Arabia, and elsewhere. At Paris, France, it is found in extensive masses, hence its name, *plaster of Paris*, when manufactured. The rock masses containing gypsum may be found in any geological age, but occur most frequently in the alluvial formations of the more recent periods. Gypsum is still being formed by the action of water, which holds in solution different ingredients, such as calcareous rock particles carried by mineral waters in volcanic regions, from the combination of sulphuric acid, from iron pyrites, or as a deposit from water in which it is held in a soluble state. It occurs most abundantly in combination with water and is the substance to which the hardness of water is due. Among the uses of gypsum are its employment for fertilizing, cornice moldings, interior decorations for buildings, models in statuary, and in preparing articles for ornamentation, though for most of these purposes it must be subjected to varied forms of treatment. France is the leading producer of gypsum and its products, but it is followed closely by both Canada and the United States.

**GYPSY MOTH**, an insect native to Europe, where it is highly destructive to the fruit and shade trees. In 1869 specimens were brought to America by Leopold Trouvelot of Massachusetts, who experimented to find some hybrid that would be free from certain diseases of silkworms. Several specimens escaped and the authorities were notified, but efforts to exterminate the insect proved futile, although several million dollars were expended for the purpose. These insects lay their eggs on fences, trees, and other objects in August. The eggs hatch the following spring, when the caterpillars attack the leaves of trees and many plants. In July they become full grown caterpillars, when they form loose cocoons and after two weeks more the moths emerge. The female is white and does not fly, while the male is brown and flies quite rapidly.

**GYROSCOPE** (jĭ'rō-skōp), an instrument used to demonstrate various properties of rotation. It consists of a circular disk so balanced in gimbals that its axis is free to take any direction with the least possible resistance. A reasonably clear idea may be obtained from the *toy gyroscope*, which differs from a top in that both ends of its axis are supported by being mounted in a circular frame. When the disk is put in motion, the entire apparatus not only retains its position as long as the disk revolves rapidly, but it takes up a slow horizontal mo-



tion (gyration) in the reverse direction to that in which the upper periphery of the disk is moving. In the illustration, one end of the outer frame, or gimbal, rests on the support D, the arrows indicating the direction of the two movements, which, as long as they continue, prevent the instrument from falling from the position E to the ground at F. This action is due to the principle that a mass set in rotation about its principal axis of inertia continues to revolve



TOY GYROSCOPE.

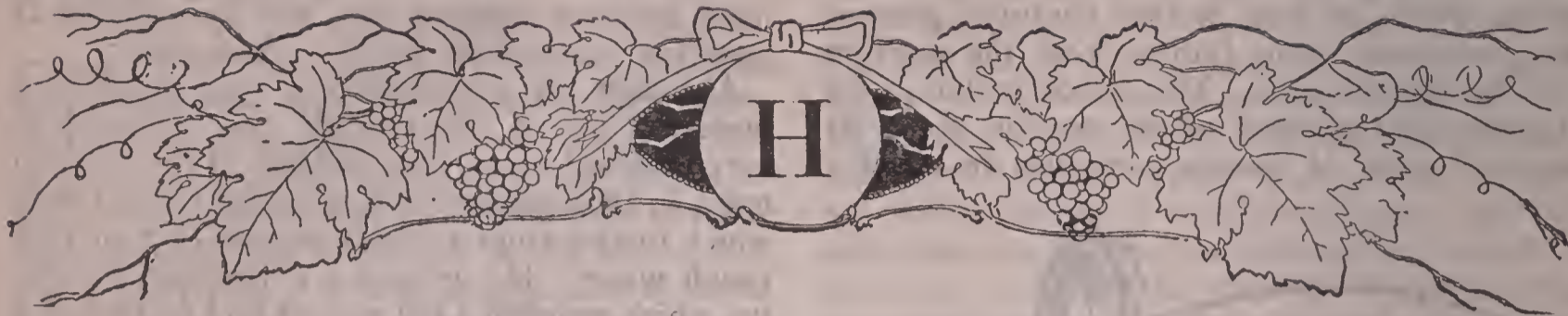
about it, the direction of the axis remaining unchanged unless extraneous force is applied.

The gyroscope was invented by Johann Bohnenberger (1765-1831), a German astronomer and mathematician. He first described it in 1817, after employing it in astronomical experiments to show that the apparent rotation of the stars about the earth is due to a real rotation of the earth itself in the opposite direction. In 1862 Jean Foucault, the French physicist, made a similar application. He set a large gyroscope in rotation and, by using a telescope, observed the apparent change in the plane of its rotation

due to the movement of the earth. Sir William Thompson devised the *gyrostat*, a modification of the gyroscope, and used it to illustrate the dynamics of rotating rigid bodies. It consists essentially of a fly wheel, the axis of which is fixed within a massive rim, and the rotation is upon fine steel pivots inside a rigid case.

Although the gyroscope was long considered merely a toy, it has recently been adapted to very practical uses. Otto Schlick of the German navy, in 1904, suggested it as an instrument with which to give ships a steady motion even in very rough water. He devised a gyroscopic apparatus which weighed 1,100 pounds and rotated at a velocity of 1,600 revolutions per minute. The first experiment was with the torpedo boat *Seebär*, which is 115 feet long and has a displacement of 56 tons. The results obtained were entirely satisfactory. Subsequently many passenger vessels have been equipped with the apparatus, the object being to secure greater stability and correspondingly reduce the cases of seasickness. - Another notable instance of applying the gyroscope is that of Louis Brennan (b. 1852), an Australian inventor of Irish descent, who is the first to suggest the *monorail railway*. In 1907 he exhibited at London a locomotive which moved rapidly and safely on a single rail, being held in position by two gyroscopes located in an air-tight case. A partial vacuum was maintained in the case and the revolutions were at the rate of 7,500 per minute. Subsequently locomotives and trains of cars have been constructed for experimental purposes, the gyroscopic apparatus being driven by electric power and weighing about five per cent. of the weight of each engine or individual car. In such a train, when it moves rapidly around curves, the gyroscopes lean inward in the manner of a cyclist when rounding a curve.





## H

**H**, the eighth letter and sixth consonant of the English alphabet. It is usually classed as an aspirate rather than a consonant for the reason that its sound is a mere breathing or aspiration of vocalized breath. Its distinctive sound occurs when it is written as the first letter of a word and when it follows *w*, as in *help*, *heavy*, *hope*, *where*, and *whither*. In combination with other letters it is used to represent sounds in digraphs, such as *child*, *this*, *than*, and *shift*, and in others in which the digraph is silent, as in *plough* and *bough*. In some cases it is combined with consonants to represent the sound of *f*, as in *tough* and *enough*. In words taken from the Greek, *ch* generally has the sound of *k*, as in *chyle* and *chemistry*. *H* is used in chemistry as the symbol of *hydrogen*.

**HAARLEM** (här'lem), a city in the Netherlands, capital of the province of North Holland, ten miles west of Amsterdam, on the Spaarne River. It is connected by important railroad lines and traversed by a system of canals, and its buildings are largely of the typical style found in the Netherlands. The cathedral of Saint Bavon, one of its finest buildings, is an ancient and famous structure. It was erected in the 15th century, is 425 feet long, and is crowned by a tower 253 feet high. Other buildings include the public library, the townhall, and the meat market. It has numerous scientific schools, associations of general learning, and fine parks and statuary. The manufactures include machinery, beverages, woolen goods, clothing, silk, laces, and embroidery. It ranks high as a center of trade in flowers and merchandise, and is noted as the seat of the most extensive type foundry and printing establishment in Holland. Among the celebrated men born in Haarlem is Lourens Coster, an accredited inventor of movable types for printing. Haarlem dates from the 13th century and obtained municipal rights in

## HABIT

1245. In 1572 it was besieged by Don Frederico, a son of the Duke of Alva, but was finally freed from Spain by the Prince of Orange. Population, 1906, 69,701.

**HABEAS CORPUS** (hā'bē-ās kôr'pūs), a legal writ of relief directed to the person detaining another, and demanding him to produce the body of the prisoner at a specified time and place. The term is of Latin origin, meaning you may have the body. A writ of *habeas corpus* may be issued in all cases where a person in custody claims to be illegally detained or wrongfully refused bail, or who desires to be removed to a different court than the one in which the case is pending. In England, where this writ is called the *writ of right*, it is based upon the Magna Charta, which declares that "no freeman is to be deprived of his life, liberty, and property except by the judgment of his peers and the law of the land." The writ of *habeas corpus* is assured to all persons by the Constitution of the United States and by those of most of the states. It can be withheld only in cases of rebellion or invasion, or when the public safety may require its suspension.

**HABIT** (hăb'it), the tendency of the body or mind to repeat the same action more or less involuntarily. Habits are acquired through the inclination of the nervous system to repeat its own acts in the same way from time to time. They have a wide range in all our mental and bodily acts, and are likewise concerned in the improvement or debasement of our moral and spiritual nature. It has never been satisfactorily explained why singular facility is acquired by repeated action in accomplishing what at first was either difficult or impossible, but it is generally thought to be due to a condition of nerve force as influenced by the movement of its currents. That is, when a current traverses a nerve tract, it produces a tendency in the nerve



center to induce a similar current again under like conditions, and as the currents are reproduced from time to time the nerves become habituated to their passage. Some psychologists find a reason for this power of habit in the sympathetic nerves and others trace it to the association of ideas. However, it is universally recognized that both mental and bodily habits depend upon the repetition of the same act. This gave rise to the useful educational maxim, "Practice makes perfection."

Children and youth need special care to influence the formation of right habits. At that time of life the nervous system is in a plastic condition and may be influenced to act with facility, hence the training should aim to inculcate a tendency toward the formation of wholesome habits with the view of inducing the highest possible physical, intellectual, and moral development. It is important to detect and eradicate bad habits, if such have been acquired, and to replace them with those which tend toward right thought and action. This is important for the reason that right habits economize both time and strength and at the same time tend toward proper and right action. The man for whom education has done all that it can do, who has received the extent of its benefits, finds habit not his master but his most useful servant. Rosenkranz says in this connection: "Education must procure for the pupil the power of being able to free himself from one habit and to adopt another. Through this freedom, he must be able not only to renounce any habit formed, but to form a new one; and he must so govern his system of habits that it shall exhibit a constant progress of development into greater freedom. We must discipline ourselves, as a means toward the ever-changing realization of the good in us, constantly to form and to break habits."

**HACK**, or **Hackney Coach**, a coach or carriage which is let out for hire. It is usually a vehicle with two seats inside facing each other. The term is commonly applied to a cab.

**HACKBERRY** (hăk'bër-rÿ), a tree of the nettle family, sometimes called sugar berry, nettle tree, and hoop ash. The common hackberry of North America ranges from Canada to Tennessee, extending westward to the Pacific. It is about three feet in diameter and from 80 to 120 feet high, and has rough bark and nearly horizontal branches. The wood is coarse-grained and heavy and in value may be classed with that of the elm. Other species are found in different parts of Canada and the United States, including the species usually known as *sugar berry*. The lotus tree of Europe and Asia is a species of the hackberry. It attains a height of about

70 feet, and the wood is used in carving and for making furniture.

**HACKENSACK** (hăk'ən-săk), the county seat of Bergen County, New Jersey, on the Hackensack River, eight miles southeast of Paterson. It is on the New Jersey and New York and other railroads and has communication by several electric lines. Among the conveniences are city lighting, pavements, a public library, and several fine school and church buildings. It has manufactures of brick, silk, jewelry, and utensils. Many business men of New York City have their residences at Hackensack. The place was settled about 1640 by the Dutch. Washington, while retreating through New Jersey, stopped here in 1776, but it was afterward occupied by the British. Population, 1905, 11,098.

**HADDOCK** (hăd'dŭk), a fish belonging to the same family as the whiting, coalfish, and cod. In size it is smaller than the cod, but it resembles that fish. It has three dorsal fins and a pale-brown back, but the under part is silvery-white. The forehead is flattened between the eyes. This species of fish is valued for food, weighs from two to eight pounds, and breeds in the northern seas in February and March. The haddock is a common fish on the Atlantic coast of North America and Europe. An allied species called the *Norway haddock* is smaller and is abundant off the coast of Newfoundland. The salted and smoked flesh of the haddock, known as *finnan haddie*, was first prepared by the Scotch, whence the name.

**HADES** (hă'dēz). See **Hell**.

**HADJ**. See **Hajj**.

**HADRIAN** (hă'drĭ-ən), **Arch of**, a triumphal arch at Athens, southeast of the Acropolis, erected by Hadrian or his successors. It is in a good state of preservation. The structure is 44 feet wide and 59 high. It was erected to divide Hadrianopolis from the ancient city of Theseus. Another structure erected by Hadrian is his tomb in Rome, which is now known as the Castel Sant' Angelo. It was completed under the direction of the emperor about 135 A. D. and was surrounded by beautiful gardens which extended to the Tiber. Though in a good state of preservation, the *Tomb of Hadrian* is partly concealed by works of fortifications that were erected in comparatively recent times. The *Villa of Hadrian* was located near Tivoli, about fifteen miles from Rome, and had an area of several square miles. It contained fine baths, theaters, terraces, libraries, and gardens, and the decorations were largely those obtained from Greece or made specially in imitation of Greek masters. The most important treasures now extant are in the museums of



Rome, but many ruins are still found where the villa was located.

**HAGEN** (hä'gĕn), a city of Germany, in the Prussian province of Westphalia, 42 miles from Cologne. It is located on the Volme River and several railroads and is surrounded by a productive agricultural country. The manufactures include cotton goods, tobacco, iron and copper products, and machinery. It has electric lights and railways, stone and asphalt pavements, and a large trade in produce and merchandise. It is the seat of several technical schools. Population, 1905, 77,567.

**HAGERSTOWN** (hä'gĕrz-toun), a city in Maryland, county seat of Washington County, in the Cumberland valley, 86 miles northwest of Baltimore. It is on the Baltimore and Ohio, the Norfolk and Western, and other railroads. The chief buildings include the county courthouse, the Kee Mar College, the Washington County Library, and several schools and churches. The city is noted for its social refinement, beautiful streets, and electric and steam railway facilities. Among the manufactures are vehicles, farming implements, cigars, fertilizing, flour, pottery, brooms, and machinery. The surrounding country is agricultural and fruit growing. Hagerstown was settled about 1740 and is governed under a charter issued in 1885. Population, 1900, 13,591.

**HAGFISH** (häg'fish), or **Hag**, the name of a class of fishes structurally related to the lamprey. They live as parasites upon other fishes. The shape of the body resembles that of an eel, but they have no visible eyes and the mouth is round and formed for suction. Eight tentacles or barbels surround the mouth, which has a single tooth in the upper part, and two rows of strong teeth are attached to the tongue. The body is slimy and has no scales or bones, but is membranous and cartilaginous. They attach themselves to fishes and bore their way to the inside by means of the mouth, and in the course of time consume the body, leaving only the skeleton and entrails. The common hagfish is about fifteen inches long. It is very abundant off the west coast of North America and on the east coast from Cape Cod north, where it is known as the *slime eel*.

**HAGUE** (häg), **The**, a city in the province of South Holland, capital of the Netherlands, fifteen miles northwest of Rotterdam. It is pleasantly situated three miles from the North Sea, 23 miles southwest of Amsterdam, and is connected in all directions by canals and railroads. It has communication by steamship lines with the leading ports of Europe. Among the noteworthy buildings are the palaces of the

general government, several historic churches, a system of public schools, a number of colleges, and a university. The royal library contains 525,000 volumes, besides which are other public institutions, such as a public museum of antiquities and modern art, several parks and zoölogical gardens, an electric street railway system, and stone and asphalt pavements. The Hague is the most fashionable and modern city in Holland, and about three miles from it is the celebrated Scheveningen, a favorite bathing and pleasure resort on the coast. The royal villa of Huis ten Bosch, located in a forest near the city, has costly decorations and valuable collections of art.

The Hague does not rank high in commerce, but it is the seat of many industries. Among the manufactures are firearms, jewelry, furniture, musical instruments, clothing, hats, machinery, and textile fabrics. Owing to its excellent facilities for entertaining visitors, it has been a favorite place for holding international congresses. Among the most recent held here is the peace conference suggested by the Czar of Russia in 1899. This conference was called for the purpose of considering the gradual disarmament of civilized nations, whereby, if consummated, the burdens of vast standing armies would be lessened greatly.

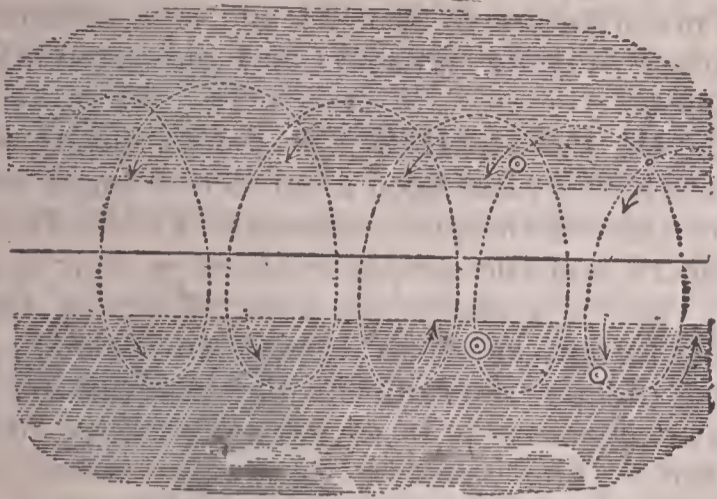
The Hague was made a princely residence under William II. in 1250. In the 16th century it became the seat of the stadtholder of Holland and from the 17th to the 18th centuries it was the diplomatic capital of Europe. The Treaty of Ryswich, concluded in 1697, was signed at the castle of Ryswich. About three-fourths of the inhabitants are Protestants. Population, 1906, 248,995.

**HAIL**, the small masses of frozen rain or congealed vapor falling from the clouds in showers or storms, constituting pellets or hailstones of variable size and shapes. Hail results when considerable differences of temperature exist between the lower and higher strata of air, and the presence of intense cold causes the moisture to condense suddenly. Usually there are several layers of dark, grayish clouds which move in different directions and have a varying temperature. Two kinds of hail are generally recognized, one consisting of small grains, which usually precedes the fall of snow, and the other being composed of hailstones. The latter class occurs most commonly in the spring and summer, but reaches its greatest severity and frequency in tropical climates. It is probable that the small hail pellets are formed by raindrops freezing as they fall through strata of colder air than those in which they were formed as rain-



drops. The larger class of hailstones are thought to be due to the coming together of clouds of vastly different temperatures.

On examining a large hailstone it is found to be constituted of concentric layers, similar to



THEORY OF HAIL BY ROTARY MOVEMENT.

those of an onion, arranged around a central nucleus formed generally of snow, but sometimes of ice. The stones are more or less spheroidal in shape and weigh from a few grains to several ounces, though hailstones weighing several pounds sometimes occur. The theory that accounts for the layers is that there are currents of wind which rotate like cyclones, but instead of having vertical axes, the movements are horizontal. In such cases several horizontal and almost parallel strata of clouds form some distance apart, the upper layer of snow and the lower of rain. The nuclei of the hailstones are formed in the upper layer in the form of snowflakes, are caught in the rotating currents of wind and carried alternately through the two layers of clouds, and in this way receive successive coatings of snow and ice until they finally fall to the ground.

Some naturalists attribute the influence of electrical attraction and repulsion as formative agencies of hail, since thunder and lightning invariably attend hailstorms. Other writers hold the view that there are many alternate layers of different clouds during the formation of large hailstones, and, in falling from the upper stratum through the different lower strata, they take on the peculiar characteristics by whirling through the successive cloud formations. Hailstones measuring about one-fourth of an inch in diameter are most frequent, but stones having a diameter of from two to five inches sometimes occur. In hot climates they are frequently of the larger size and effect much damage to growing crops. Noteworthy hailstorms are those which occurred in New Hampshire in 1851, at the Cape of Good Hope in 1860, and in Moravia in 1889. At the time of these historic hail-

storms stones weighing from eighteen ounces to four pounds fell to the ground, destroying much vegetation and some human life. In many localities hailstorms occur in which the bark of trees is punctured, the heaviest plate-glass windows are broken, and the shingles of houses are destroyed.

**HAINAN** (hī-nān'), an island in the China Sea, east of the Gulf of Tonquin, belonging to the province of Kwangtung, China. It is separated from the mainland by the Strait of Hainan. The area is 13,600 square miles. It is well wooded and has fine groves of palm and coconut trees. Cotton, tobacco, rice, sugar cane, and fruits are grown profitably. A large majority of the inhabitants are Chinese. Kiang-chow, an important seaport on the northern coast, is the capital. Population, 1908, 2,450,850.

**HAIR**, one of the threadlike structures that grow from the skin or outer covering of mammals, serving as a protection similarly to the feathers and down of birds and the scales of fishes and reptiles. All species of mammals in an adult state have hairs, which vary greatly in structure, as is noticed by comparing the finer kind of wool with the *bristles* of the hog and the *quills* of the porcupine. The hairs of the human head furnish a protection in heat and cold and serve as a shield against blows. All parts of the body, except the palms of the hands and the soles of the feet, contain more or less hair growths, and the parts usually described as destitute of hairs are covered with a small colorless growth. In some males the breast, arms, shoulders and other portions have hairs much like those common to the head.

Each hair is hard and compact on the outside, and contains layers of colorless scales overlying one another like the shingles of a roof. The interior is porous and is thought to contain the liquids by which it is nourished. It is a modified form of the epidermis, growing from a tiny bulb called the *papilla*, which is an elevation of the cutis at the bottom of a little hollow in the skin. The hair is produced from the surface of the bulb, like the cuticle, by the constant formation of new cells at the bottom, the old cells being pushed forward to constitute a portion of the hair shaft. Minute pigment granules, which are contained in the cells of the hair, determine its color.

Race characteristics greatly influence the color of the hairs, but it is likewise modified by age, sex, climatic conditions, and various other circumstances. In infancy the color is light and with age it becomes darker and less fine. A growth of hairs commences in the armpits and on the breast at the age of puberty in both sexes



and in males a beard begins to appear. If the hair bulb is destroyed, the hair never grows again, but, if uninjured when a hair is pulled out, a new one is produced. Baldness is due usually to an affection of the papillae, which results generally from an impairment of the blood circulation in the scalp, and grayness is attributed to the same cause, or to a deficiency in the amount of pigment granules in the hair cells. The hairs themselves are destitute of feeling, but nerves are located in the hollow in which each hair is rooted, thus accounting for the pain experienced when a hair is pulled. Small glands are connected with the hairs, which serve as lubricators to them and the skin by secreting an oily substance.

The tendency of hairs to stand erect under the influence of cold or electricity is due to muscles interlacing among the fibers of the skin. In some animals these muscles are so well developed that the hairs may be moved to drive away flies, as is the case in horses, cattle, and

Italy, Germany, France, and other European countries peasant girls sell their hair to dealers for the purpose of manufacture, these products being best when taken from living subjects. Other purposes to which hairs are put include the manufacture of brushes and hair pencils for painters, dusting brushes, and numerous fancy articles.

**HAIR DRESSING**, the art of taking care of the hair. It has been a subject of much study from remote antiquity, especially by the fashion mongers and the people engaged in hair dressing. In the costume of some classes it forms an important agent to convey an idea of personal dignity or rank in the community, but more frequently it is entirely decorative to the person. The ancient Egyptians were extremely careful in taking care of the hair, as may be seen from their paintings and bas-reliefs, which show that the hair was carefully curled or plaited. False hair and beards were worn in many parts of Western Asia, where the



HAIR DRESSING.

Egyptian

Roman

15th Century

16th Century

17th Century

18th Century

sheep. Next to the bones and teeth, the hairs are the most indestructible portions of the body and the color is preserved for many years after death. The hair structure in plants is an outgrowth of the epidermis and may be either a single cell, a cell row, a cell surface, or a cell mass. These hairs usually consist of minute transparent tissues more or less elongated, arranged in a single row, and are of various types, such as scabrous, stellate, and uncinated hairs.

Hairs constitute an important material for manufacturing, but those taken from horses, cattle, goats, sheep, hogs, camels, and alpacas are the most valuable. The purposes to which hairs are best adapted include the manufacture of upholstered furniture, haircloth, brushes, and fishing lines. They are employed in plastering, spinning, and weaving various kinds of textile fabrics. Human hairs are used extensively in the manufacture of beards, wigs, watch chains, and other articles of dress and ornament. In

Hebrews and others considered a bald head very unbecoming. The custom was taken to Greece and Rome, where the hair was worn short by artisans and warriors, but many of rank prided themselves on having a fine growth of long hair.

The practice of elaborate hair dressing reached its height in the 15th and 16th centuries. At that time the men had their beards tightly curled and gummed, while the women took pride in wearing the hair on cushions or supports, giving the appearance that the growth of hair was very prolific. In the 18th century, during the reign of Louis XVI. of France, the women wore the hair in a fantastic style. It was combed upward and stiffened with wire, hence gave the appearance of being about twice as large as the head, and at the upper part were decorations of beads, ribbons, and feathers. The practice of wearing wigs continued during this period and is still fashionable, but the forms are much smaller than those of former times.

The *chignon*, or waterfall, worn formerly is



not fashionable at present, but the so-called *rat*, a form of dressing the hair above the forehead to give it the appearance of fullness, is used extensively in costumes by women. Men almost universally wear their hair cut short and the majority shave the face smooth or wear a small mustache. As a whole there has been a tendency toward simplicity in hair dressing, with the design that it serves for ornamentation to suit the individual. *Hair dyes* are used to a considerable extent to conceal approaching age or retain the natural color of youth. Substances used for this purpose include preparations made of sulphur, bismuth, and various vegetable juices, such as the juice of oak bark and of green walnut shells.

**HAIRLESS DOG**, a kind of dog whose skin is almost entirely naked, or whose body has a few hairs scattered in different parts. The hairless dog of Mexico is the best known American species and is frequently seen at the exhibits of pet dogs. It somewhat resembles the black-and-tan terrier, but is less active and lacks the keen eye, and the skin in most specimens is wrinkled. The African hairless dog resembles the greyhound in form and is entirely naked, except that it has a few tufts of hair on the legs, around the mouth, and near the tail. A naked dog of China, known as the Oriental hairless, is formed like the small greyhound terrier and is cooked and eaten by the Chinese as a delicacy. The hairless dog of the Philippine Islands is another well-known species. It is popular as a pet among the natives, especially the Tagals.

**HAITI**. See *Hayti*.

**HAJJ** (häj), or *Hadj*, the pilgrimage to the Kaaba at Mecca, performed by the Mohammedans. One who makes the pilgrimage becomes known as a *hadji*, which Orientals regard a respectable salutation or a title of honor. The pilgrimage dates from the time of Mohammed, who grew more fond of the Kaaba as his years increased, and he visited it for the last time the year before his death. The institution of the pilgrimage as one of the five cardinal duties of every Mohammedan dates from that time. While the visit may be made any time, the full rites of the Hajj, which includes a visit to Mount Arafat, is carried out only in the twelfth month of the Mohammedan calendar, called *Dhul Hajjeh*. Some of the pilgrims begin the journey one or two months before the appointed time of the meeting, depending upon the distance to be traveled. The number of pilgrims varies greatly, but a concourse of 100,000 is not uncommon. Many travelers have made the pilgrimage in disguise, including T.

F. Keane, in 1878, who published an account of the journey.

**HAKODADI** (hä-kō-dä'dê), or *Hakodate*, a seaport city of Japan, near the southern extremity of the Island of Yezo. It is located on a bay extending inland from Tsugaru Strait, has an extensive harbor, and is strongly fortified. The architecture is singularly Japanese, including a naval school and a commodious townhall. Transportation is facilitated by tramways. It has electric lighting, waterworks, and well-paved streets. The city is a treaty port, hence has a large foreign trade. It is the seat of several mission schools and consulates. The port was opened for commerce in 1859. Population, 1903, 85,313.

**HALBARD** (höl'bērd), or *Halberd*, a weapon employed in warfare during the Middle Ages. It consists of an ax blade balanced by a pick, having an elongated pike head at the end of a staff from five to six feet in length. The earliest halberds were used in the 14th century. The English *halbardiers* were troops who performed special duties, such as defending the colors, and reached their height of efficiency in the 16th century.

**HALBERSTADT** (häl-bēr-stät'), a city of Germany, in Saxony, 28 miles southwest of Magdeburg. It is located on the Holzemme River and several railways, and has considerable trade in merchandise and manufactures. The chief buildings include the Cathedral of Saint Stephen, the Church of Our Lady, the market, and a number of schools. Among the manufactures are leather, sugar, cigars, soap, gloves, and machinery. The city became a part of Brandenburg in 1648. Population, 1905, 45,529.

**HALCYON** (häl'si-ön), the poetical name applied to the kingfisher from early historic times. According to Greek mythology, Halcyone and her husband, King Ceyx, were transformed into kingfishers, hence the name halcyon. The idea of the ancients was that these birds lay their eggs in nests floating on the surface of the sea in calm weather, before and after the shortest day of the year, when the gods were supposed to keep the water smooth and tranquil for their benefit. Hence, the term *halcyon days* signifies a period of rest and untroubled felicity. This Grecian legend is mentioned by Shakespeare, Socrates, Aristotle, and other writers.

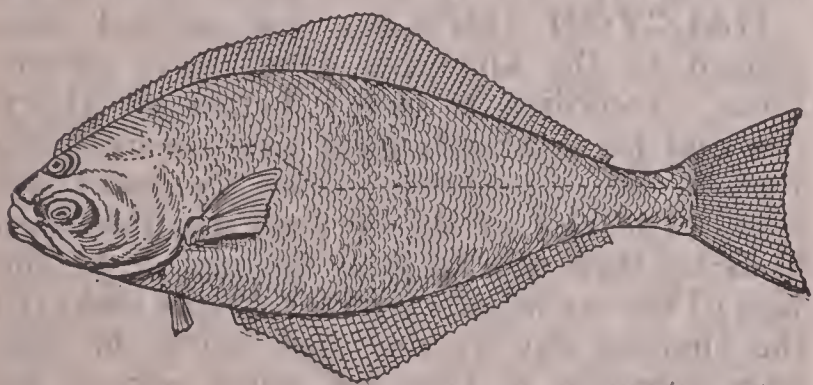
**HALF TONE**, a kind of plates made from photographs and engravings, used extensively in the illustration of books and periodicals. The best half tones are made from photographs, but they can be obtained by the reproduction of engravings and drawings. The process consists



mainly in making a negative of the picture to be reproduced, which is done by a camera having a screen of two glass plates that are ruled diagonally with very fine parallel lines. When the plates are placed together, the lines form diamond-shaped checks. They are held together with some resinous substance, such as Canada balsam, and in the camera are placed near the plate that is to contain the negative. The purpose of the screen is to produce the shadow effect in the half tone.

The negative is developed and placed face downward upon a sensitized copper plate, which is prepared by carefully polishing the surface and covering it with a thin film of sensitized material. The action of light causes this material to harden. When the negative and the plate are exposed for a short time to a strong electric light, certain chemical changes take place and the picture is reproduced upon the copper. It will be seen that some portions of the sensitive film were not acted upon and that different parts were affected differently, hence by washing, the portions not acted upon are reduced, while those acted upon remain to protect the surface of the copper. After placing the plate thus prepared in an acid bath and etching it, the surface is cleaned and the plate is mounted on a block for printing. Screens having about 200 lines to the square inch make good half tones, but coarser screens are generally better when the surface of the paper used in printing is not of a fine quality.

**HALIBUT** (hōl'i-būt), a genus of fish allied to the turbot, so called because it was formerly eaten extensively on holidays. It is among the



HALIBUT.

largest of flat fishes, specimens often weighing 600 pounds or more. Though esteemed for its food qualities, it is considered inferior to the turbot. The genus is characterized by having both eyes on the same side of the head. The lips are large and fleshy. Nearly all species are dark brown on the upper surface, have small smooth scales, and the lower surface is white. The oil is valued and is extracted largely from the bones. Halibut fisheries are especially pro-

ductive off the northeastern coast of North America, Iceland, the Scandinavian peninsula, and Western Europe, though various species are distributed widely in the Pacific.

**HALIFAX** (hāl'i-fāks), a town in the County of York, England, situated on the Hebble River, 38 miles southwest of York. It contains numerous substantial buildings, has municipal facilities of importance, and is connected by important railroad lines. The noteworthy buildings include All Souls' Church, the townhall, the Blue Coat School, the Heath Grammar School, and an observatory. It has a public library, a market house, public baths, and electric railways. Among the manufactures are woolen goods, carpets, chemicals, ironware, and machinery. The large output of carpets and worsted goods has given the town an extended reputation. Halifax was governed under the manor rule until 1848, when it received its charter. Population, 1907, 110,138.

**HALIFAX**, a seaport city and the capital of Nova Scotia, on a small peninsula in Halifax harbor, on the Atlantic coast. It is on the Cana-



VICINITY OF HALIFAX, N. S.

dian Pacific, the Inter-Colonial, and the Nova Scotia railways. The harbor offers easy access and anchorage for the largest sea-going vessels. It is the principal harbor and naval station of the British possessions in America, is strongly fortified, and has an extensive export and import trade. The noteworthy buildings include the Dominion Building, the Provincial Parliament, the Saint Paul's church, the Roman Catholic cathedral, and the Dalhousie University. It has several scientific associations and



institutions for the blind, deaf, and dumb. The manufactures include tobacco, machinery, paper, leather, soap, and canned fish. Halifax was founded in 1749 and supplanted Annapolis as the seat of government in 1750. Population, 1906, 42,807.

**HALLE** (hăl'lē), a city of Germany, in Prussian Saxony, on the Saale River, twenty miles northwest of Leipzig. It is an important railroad center, has well-improved and wide streets, and is the converging center of many electric lines. As an educational center it has long taken high rank. The celebrated university located here has been famous since the 17th century. Other noteworthy buildings include the Church of Saint Maurice, the Market Church, the townhall, the normal school for teachers, and the central railroad station. It has fine statues of Handel, Roland, and other prominent personages. The city has fine public school buildings and several equestrian monuments. Among the manufactures are chemicals, machinery, dies, oil, and malt. Within the vicinity are extensive mineral springs that yield great quantities of salt. Halle contained a castle as early as the 8th century. It was important as a member of the Hanseatic League and was a stronghold of Lutheranism in the Reformation. The French captured it in 1806, but it was annexed to Prussia in 1813. Population, 1905, 169,916.

**HALLE, University of**, an institution of higher learning at Halle, in the province of Saxony, Germany. It was founded as a Lutheran center of education in 1694, when it had over 700 students. It has taken high rank as a theological school since the beginning. During the Napoleonic wars it was twice suspended, but was shortly after reopened, and the University of Wittenberg was united with it in 1817. The library has over 215,000 volumes. In 1909 it had 2,150 students, including a large number from foreign countries. The names of Francke, Gene-sius, and Schleiermacher are closely associated with this institution.

**HALLELUJAH** (hăl-lē-lū'yä), or **Halleluiah**, an ascription of adoration to God, occurring at the commencement of many psalms, meaning praise ye Jehovah. It is a doxology in the Jewish synagogues and was probably retained in Christian translations on account of its signification and poetic sound. The name has been adopted for many musical productions, as the *Hallelujah Chorus* in Handel's "Messiah," which is considered a masterpiece of choral music.

**HALL OF FAME**, a building at University Heights in New York City, on the grounds of

the New York University. It is one of the buildings inclosing the campus, consists of a colonnade about 500 feet in length, and is built about the library. It contains 150 panels, in which will be set bronze tablets for the names of that number of great Americans. The selection of the subjects to be honored is intrusted to a committee of 100, made up of college presidents, educators, chief justices, and others, the selections finally to be approved by the senate of the New York University. Originally only persons born in the United States and deceased at least ten years were eligible, but in 1904 an apartment was set aside for women and foreign-born Americans. Twenty-nine names were chosen in 1900, eleven others were selected in 1905, and five will be added every fifth year, until in the year 2000 the roll of 150 shall be complete. Helen Gould made a liberal gift toward constructing the Hall of Fame, which will cost \$250,000 when fully completed.

The names selected in 1900 and 1905 are: George Washington, John Adams, John Quincy Adams, Benjamin Franklin, Thomas Jefferson, Alexander Hamilton, James Madison, Henry Clay, Daniel Webster, Abraham Lincoln, John Marshall, James Kent, Joseph Story, John Paul Jones, Ulysses S. Grant, William T. Sherman, Asa Gray, David G. Farragut, Robert E. Lee, Robert Fulton, Eli Whitney, Samuel F. B. Morse, John Audubon, Louis Agassiz, Jonathan Edwards, Horace Mann, William E. Channing, Henry Ward Beecher, Washington Irving, Nathaniel Hawthorne, Ralph Waldo Emerson, Henry W. Longfellow, James R. Lowell, John G. Whittier, Gilbert Stuart, Peter Cooper, George Peabody, Mary Lyon, Emma Willard, and Marie Mitchell.

**HALLOWEEN** (hăl-lō-ēn'), an abbreviation of *Alle halowene tyd*, meaning all hallows tide, and applied to the evening of October 31 on account of that day being the eve or vigil of All Saints, which occurs on November 1. It is known in America principally on account of the practical jokes and youthful pranks that are played upon unsuspecting neighbors. In many countries it forms a time for evening fireside meetings and was made the subject of Burns's poem, "Hallowe'en."

**HALLUCINATION** (hăl-lū-sī-nā'shūn), a mental sensation which has no corresponding external cause, or the perception of objects which have no reality. This phenomenon is due to a disorder of the nervous system, as in a case of delusion or delirium tremens. In general, delusions differ from hallucinations, especially in that the former may arise from an error in interpreting a real sensation, while a hallucination



arises from a derangement of some mental faculty. While all the senses may be affected, hallucinations are most closely associated with the sense of hearing. Rest and regularity in habits are recommended as essentials in the treatment.

**HALO** (hā'lō), a circle of light seen frequently around the sun and moon, caused by the presence in the air of small particles of ice and snow, by which the rays of light are reflected, refracted, dispersed, and diffracted. Smaller and less distinct halos are caused by raindrops and vapors constituting clouds. There are at least three distinct forms of these phenomena; *halos* proper, caused by the snow and ice particles; *coronas*, circles of light caused by condensed vapor; and *paraselenae*, mock moons that appear on a lunar halo and resemble suns or moons. A fourth halo, observed by aëronauts on the upper surface of clouds, is called *aureola*.

**HAM**, the thigh of an animal, such as that of the hog, sheep, or ox, but especially the thigh of the hog when cured by salting and smoking. The curing of hams is an important part of slaughtering and meat packing, since this class of meat is considered among the best obtained from domestic animals. Hams are first pickled in brine and then smoked by burning wood, hickory being preferred, and in some cases powdered mahogany is added to the burning. See **Bacon**.

**HAMATH** (hā'math), or **Hamah**, an ancient city of Syria, on both sides of the Orontes River, frequently mentioned in the Old Testament. It is situated in a fertile valley, about 110 miles north of Damascus. The manufactures include flour, clothing, carpets, woolens, and jewelry. Though once a city of vast importance politically and commercially, it is now less fortunate. About 10,000 of the inhabitants are Greeks and fellahs. Population, 1909, 48,503.

**HAMBURG** (hām'bûrg), a free city of Germany, on the north branch of the Elbe, about eighty miles from the North Sea. The site of the city proper has an area of 30 square miles, but the region included in the state of Hamburg embraces 159 square miles. With it are included a number of contiguous districts and the island of Neuwerk, in the estuary of the Elbe. Many orchards, gardens, and dairy farms surround the city.

Hamburg is the most important commercial city of continental Europe, having a fine harbor, wharves, and steamboat connections. It contains excellent public institutions, numerous centers of higher learning, several libraries, observatories, and botanical gardens. Among the chief buildings are the Exchange, the govern-

ment house, the townhall; the churches of Saint Michael and Saint Nicholas, and the public library of 115,000 volumes. It has monuments of Lessing, Schaper, Schilling, and the soldiers who fell in the Franco-German War. Besides electric railways, it has waterworks, electric lighting, boulevards, sewerage, and many parks. The importance of its harbor is increased by convenient railroad and canal facilities. As a money exchange it is, next to London, the most important of Europe. Among the manufactures are sugar, spirituous beverages, scientific instruments, cured meats, engines, machinery, cotton, woolen, and silk goods, cordage, and tobacco. Its shipbuilding yards are extensive and of vast importance.

Educationally Hamburg is in a flourishing condition. In religion the people are largely Protestant. It dates from 809, when it was founded by Charlemagne. However, its commercial importance began in 1189, at which time it was made a free city. In 1241 it led in the formation of the Hanseatic League of towns and soon after increased its territory. It was occupied by the French in 1806, annexed to France four years later, and, when French dominion ceased in 1814, it had lost much of its commercial importance. In 1815 it became one of the four free cities of the German Confederation, and since then has enjoyed phenomenal prosperity, though vast damage was done by a fire in 1842. It includes the suburban towns of Cuxhaven, Ritzebuttel, and several others. These and Hamburg proper constitute the most important passenger and emigrant center of Northern Europe. Population, 1905, Hamburg City, 802,793; Hamburg State, 874,878.

**HAMILTON** (hām'il-tūn), a town of Australia, capital of Dundas and Normanby counties, in the western district of Victoria. It is located on Grange Burn Creek, fifty miles northeast of Portland, and is surrounded by a fertile farming and stock-raising country. It has electric lights, waterworks, and railroad connection with the principal cities of Australia. The chief buildings include several churches and schools and a number of structures erected for city and county governmental purposes. Population, 1901, 4,026.

**HAMILTON**, a town on Hamilton Island, capital of the Bermudas. It has a safe and commodious harbor and is the seat of a considerable trade in fruit, sugar, and merchandise. The place was founded in 1790. Population, 1901, 2,246.

**HAMILTON**, a city in Ohio, county seat of Butler County, on the Great Miami River, 25 miles north of Cincinnati. It is on the Miami



and Erie Canal and on the Pittsburg, Cincinnati, Chicago and Saint Louis, the Cincinnati, Hamilton and Dayton, and other railroads. Many of the streets are finely paved, lighted by gas and electricity, and improved by sewerage, waterworks, and avenues of trees. The noteworthy buildings include the county courthouse, the public library, the high school, and several charitable institutions. The chief manufactures are stoves, steam engines, candy, laundry machinery, hosiery, earthenware, vehicles, furniture, cordage, spirituous beverages, and textile fabrics. It has a large trade in farm produce and merchandise. The place was settled in 1791, when Gen. Arthur Saint Clair built Fort Hamilton, and it was incorporated in 1810. Population, 1900, 23,914; in 1910, 35,279.

**HAMILTON**, the capital of Wentworth County, Ontario, Canada, at the west end of Lake Ontario, seventy miles northwest of Buffalo, N. Y. It is on the Grand Trunk, the Canadian Pacific, and other railways. The site is a



VICINITY OF HAMILTON, ONT.

fine tract on Burlington Bay, an inlet from Lake Ontario, and the port is connected with deep water by a canal through a sand bar, which serves as a breakwater for the inner harbor. It has regularly platted and well-graded streets, many of which are paved with stone and macadam. The chief buildings include the county courthouse, the Dominion post office, the town-hall, and many fine schools and churches. It has a public library, gas and electric lighting, systems of waterworks and sewerage, and intercommunication by electric railways. The race course is one of the finest in America. As a manufacturing center it takes high rank among Canadian cities, the products including canned goods, flour, ironware, machinery, glassware, cotton and woolen goods, shoes, and musical in-

struments. Hamilton was platted in 1813, but its larger growth has been realized within the past two decades. Population, 1901, 52,634.

**HAMITES** (häm'its), or **Hamitic**, the name of a race of people in the northern part of Africa, so named because they are supposed to have descended from Ham. They belong to the white or Caucasian branch of the human family and were the earliest to develop a high civilization. In language they are related to the Semites, but there are three principal dialects, those known as the Berber, Egyptian, and Ethiopian. Though Egypt is supposed to have been their original seat, they extended their settlements to the Canary Islands and southward on the continent to the southern limits of German East Africa. At present they are divided into numerous branches, many of which are strongly negroid. They include principally the Copts, Gallas, Berbers, Kabyles, Tuaregs, Tubus, Falashas, Somalis, Danakils, and Guanches.

**HAMM**, a city of Germany, in Westphalia, on the Lippe River, 23 miles northwest of Arnsberg. It is important as a railway junction and manufacturing center. The streets are regularly platted and well paved. It has a church which dates from 1510. The manufactures include gloves, leather, machinery, clothing, and brick and tile. It was for many years an important member of the Hanseatic League. Population, 1905, 38,429.

**HAMMER**, an instrument for driving nails or beating metals, consisting of the head and the handle. The small hammers in use among blacksmiths have an iron or a steel head fixed to a wooden handle. One end of the head is usually larger than the other, one being fitted for drawing nails or for hammering larger pieces of metal than the other. The larger use of steam and electricity has caused power hammers to come into general use for manufacturing purposes, some of which are large machines, especially those used in forging iron and steel. See **Steam Hammer**.

**HAMMOND** (häm'münd), a city of Lake County, Indiana, on the Grand Calumet River, three miles from Lake Michigan and twenty miles southeast of Chicago. It is on the Erie, the Baltimore and Ohio, the Wabash, the Monon, the Michigan Central, and other railroads, and has direct connection with Chicago by electric railways. The noteworthy buildings include the Carnegie library, the Federal building, the courthouse, the public high school, and a number of fine churches. Among the industries are starch works, machine shops, iron foundries, flouring mills, meat-packing establishments, and publishing houses. Many of the highways adja-



cent to the city have been finely macadamized. Among the public utilities are sewerage, waterworks, and street pavements. Hammond was settled in 1869 and incorporated in 1883. Population, 1900, 12,376.

**HAMPTON** (hämp'tün), a town of Virginia, county seat of Elizabeth City County, on the Chesapeake and Ohio Railroad. It is located on the north side of Hampton Roads, about two miles northwest of Fortress Monroe, and has considerable trade in oysters, fish, vegetables, and agricultural produce. The public institutions include the Hampton Normal and Agricultural Institute. It has the Church of Saint John built in 1660, a national soldiers' home, and a national cemetery where 3,325 bodies are buried. The first settlement on its site was made about 1610. Population, 1900, 3,521.

**HAMPTON COURT CONFERENCE**, a conference held at Hampton Court, an English royal palace on the north bank of the Thames. It met in 1604, shortly after the accession of James I., for the purpose of discussing religious differences with the Puritans. The latter had presented a petition for a more liberal use of the Prayer Book and other reforms within the church, but the king, angered by the use of the word presbyter, refused to grant the points petitioned for by the Puritan party. The last of the three sessions of the conference, held on Jan. 18th, was the beginning of Puritan opposition to the house of Stuart.

**HAMPTON NORMAL AND AGRICULTURAL COLLEGE**, an institution of general learning and industrial arts at Hampton, Va., to which only Negroes and Indians are admitted. It was opened in 1868 under the auspices of the American Missionary Association, under the direction of Gen. S. C. Armstrong, and received a state charter in 1870. The grounds contain 185 acres on the Hampton River, on which about 60 buildings are maintained, and five miles distant is a farm of 600 acres that is worked by students. Besides teaching the fundamental courses in educational work, instruction is given in carpentry, painting, blacksmithing, horticulture, agriculture, stock raising, and other industrial arts. The industrial department continues throughout the year, but the schools of general education have a vacation during the summer. About 60 per cent. of the graduates engage in teaching, but a large number become successful farmers, carpenters, blacksmiths, and workers in other lines. Booker T. Washington, president of the Tuskegee Institute and Normal School, is one of the graduates. The institution has about 600 stu-

dents, an annual income of \$170,000, and a library of 15,000 volumes.

**HAMPTON ROADS**, an inlet from Chesapeake Bay, in Virginia, forming the mouth of the James River. The channel is wide and deep, amply sufficient to accommodate the largest vessels, and on its shores are many good harbors, including those of Norfolk and Newport News. On the northern shore is Fortress Monroe, which on March 8, 1862, was the scene of an important naval battle between the Confederate ironclad *Virginia*, previously called the *Merrimac*, and the Union vessels *Congress* and *Cumberland*, which resulted in the destruction of the latter two. On the following day the *Monitor*, a Union ironclad of a new type, appeared on the scene of battle, and after a fight of four hours compelled the *Virginia* to withdraw.

**HAMPTON ROADS CONFERENCE**, an informal conference of the United States, held on board of the *River Queen* near Fortress Monroe on Feb. 3, 1865. The purpose was to discuss the differences arising from the Civil War between the two sections of the country. President Lincoln consented to this meeting as a means of perpetuating the Union, in which he was aided by Secretary Seward, while the Confederacy was represented by Alexander H. Stephens, Vice President, Robert M. T. Hunter, and John A. Campbell. The meeting had been promoted by Francis P. Blair as a means of uniting the two sections with the view of abolishing slavery and expelling the French from Mexico. While Lincoln declared himself in favor of admitting the Southern States after their surrender, he expressed himself opposed to modifying the Emancipation Proclamation and to any treaty with the Confederate States as an independent government. No agreement was reached during the four hours that the conference was in session.

**HAMSTER** (häm'stēr), a genus of rodent animals closely allied to the rat, but belonging to the family of mice. The tail is short and the body is from eight to twelve inches long. They have large cheek pouches in which they carry grain and other food into their burrows. The food consists chiefly of cereals, vegetables and other forms of plant growth. Several of the species are noted for carrying corn and other seeds into their subterranean abodes for use as food in the winter. The common hamster ranges throughout the dry region of Europe and Asia.

**HANCOCK** (hän'kōk), a town of Michigan, in Houghton County, on Lake Portage, opposite Houghton. It is located on the Duluth, South Shore and Atlantic Railroad and has



transportation facilities by water through a ship canal to Lake Superior. The surrounding country is noted for its rich deposits of copper and near it are the famous Calumet and Hecla mines. It has foundries, smelting works, machine shops, and a large trade in merchandise. It is the seat of a Finnish college, has electric lighting and waterworks, and contains Montezuma Park. The place was settled in 1859 and incorporated in 1863. Population, 1910, 8,981.

**HAND**, the part of the fore limb which is attached to the lower extremity of the forearm and is adapted for grasping. It is possessed by man, apes, monkeys, and lemurs, but in its highest perfection belongs only to man. The hand of apes and kindred animals serves partly for prehension and grasping, and to some extent it is necessary for support and locomo-

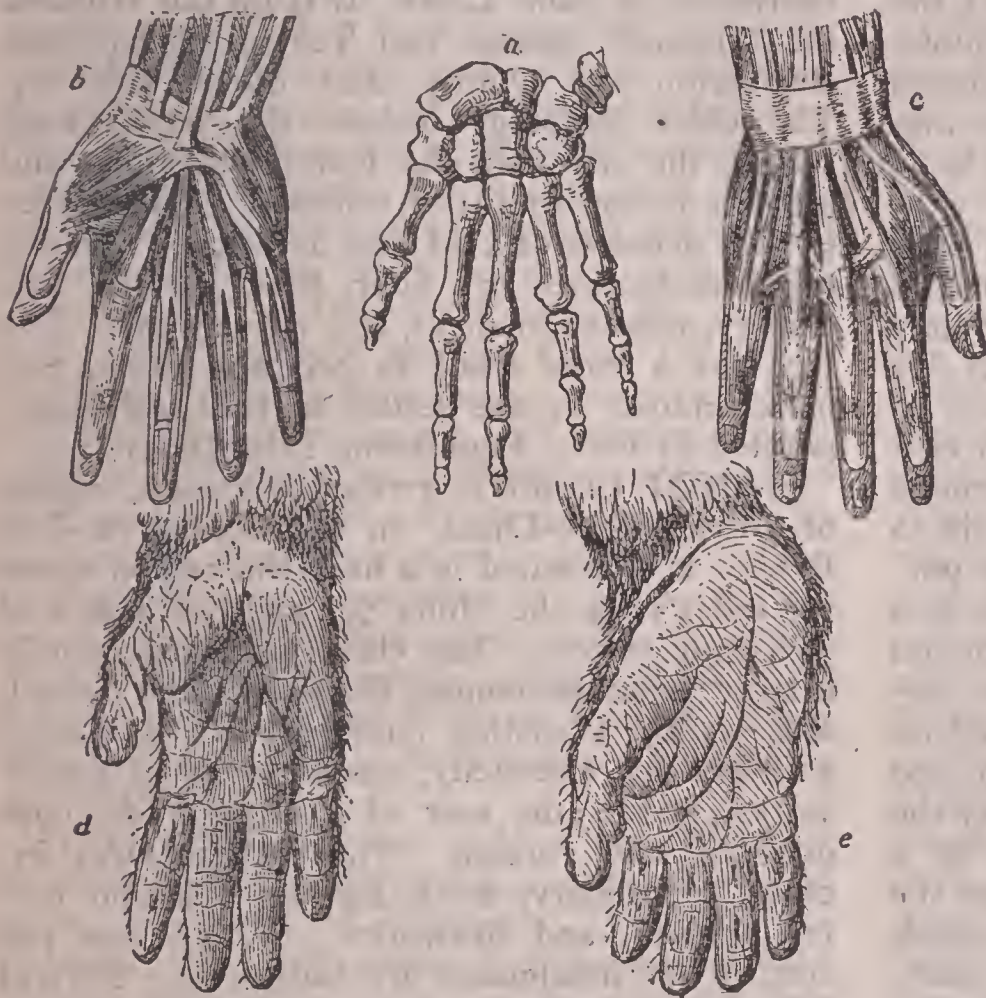
contact with the fingers. The outer phalanges form hinge joints, but the first bone of each finger is attached to the corresponding metacarpal bone so as to be movable in several directions. Fingers are named in order—the little, ring, middle, and index finger, and the thumb. When closed they fit the hollow of the hand, and are thus capable of more easily grasping objects of varying size. When clasping a ball, the tips of the fingers are in a straight line.

All parts of the hand are supplied with strong ligaments and muscles, thereby giving much freedom of motion, elasticity, and power of activity in numerous directions and for a great diversity of purposes. Artists have studied the elegance of outline, beauty of color, and delicacy of mold in the human hand, while its extraordinary mobility and adaptation to various

uses have led many philosophers to attribute superiority to man fully as much on account of the hand as for his higher intellectual powers. The numerous nerves of the hand and fingers give the latter a more acute sense of touch than is found in any other part of the body. In linear measure the hand is assumed to be four inches and is frequently used in measuring the height of horses. Palmistry relates to the lines of the inner hand. Those who make it a study claim to be able to predict regarding the future.

**HANG-CHOW** (häng'chou), a port and city in China, capital of the province of Che-kiang, on the Tsién-tang River, at the place where it flows into Hang-chow Bay. It is the southern terminus of the Grand Canal, which furnishes transportation facilities to Tientsin. Walls about twenty feet thick and from thirty to forty feet high surround the older parts, but the finest buildings are outside the walls, in the suburbs. The city has some of the most beautiful monuments, temples, and edifices of China. It ranks as one of the leading

literary, religious, and commercial centers and is noted for its public improvements and well-paved streets. Among the manufactures are silks, tapestry, furs, lacquered ware, carpets, porcelain, jewelry, fans, and machinery. The foreign trade is transacted chiefly at Chapu, its seaport, about twenty miles nearer the sea. At the time of its greatest prosperity it had a population of over 2,000,000. The Taipang rebellion of 1861 caused temporary decline, but it is rapidly gaining in population and industrial rank. Marco Polo visited the city in the 13th



HAND.

a, Bones; b, c, Muscles; d, e, hand of the Chimpanzee.

tion. Twenty-seven bones comprise the framework of the human hand. In the wrist are eight separate bones, called the *carpal*, consisting of two rows, each containing four bones. The five bones of the inner hand and lower part of the thumb are called *metacarpal*, while in the fingers and thumb are fourteen bones, three in each finger and two in the thumb, these being known as the *phalanges*. The thumb, standing apart from the rest, possesses a well-known freedom of motion, and is thereby especially useful in seizing and grasping when brought in



century and described it as a center of much grandeur and wealth. In 1896 it was opened to foreign commerce. Population, 1906, 768,550.

**HANGING**, a mode of inflicting capital punishment. This method is of great antiquity and was first practiced by hanging a murderer upon a gibbet near the place where the crime was committed. It was first used in England in 1241, when the son of a nobleman was hanged for piracy. At present it is the ordinary mode of executing in the United States and Great Britain, but in a few of the states in the former country electrocution has been adopted. Hanging causes the windpipe to become compressed by the rope or cord, which prevents the flow of blood to a considerable extent and in some instances causes a fracture or dislocation of the vertebrae. Although attended by violent struggles in some cases, it is considered one of the most humane methods and is usually administered without unnecessary publicity. The courts that pronounce the sentence usually direct that the convict "be hanged by the neck until he is dead."

**HANGING GARDENS**, a structure built at Babylon and classed among the seven wonders of the world. The construction of these gardens is attributed to Nebuchadnezzar about five centuries B. C., although others ascribe them as the work of Queen Semiramis, fully seven centuries earlier. Several historians who attribute them to Nebuchadnezzar think they were built to gratify his Median queen, Amytis, for the purpose of making the plains of Babylonia less dreary to her when contrasted with the mountain scenery of her native land. The gardens covered an area of four acres, were supported on arches of masonry of terrace construction, and rose to a height of 75 feet. A reservoir at the top supplied water, which was pumped by a force of men from the Euphrates, to irrigate the flowers, shrubs, and trees by artificial channels and fountains. Banqueting rooms were maintained in various parts of the gardens, and beautiful scenic walks and resting places were located at convenient localities.

**HANKOW** (hän-kou'), a river port and city in China, at the junction of the Yang-tse-kiang and the Han River, in the province of Hupeh. The site is mainly in the angle formed by the two rivers, hence is quite level and not well drained. It is on the line of the trunk railway which is eventually to connect Canton on the south with Peking on the north. Regular steamship communication is maintained with the leading ports of China. It is important as a commercial center and is the chief industrial city in the green tea district. The manufac-

tures include porcelain, clothing, jewelry, earthenware, and silks. It was opened to foreign commerce in 1862. The trade is chiefly with Great Britain, Japan, and Germany. Population, 1906, 585,500.

**HANLEY** (hän'li), a manufacturing city of Staffordshire, England, near Stoke-upon-Trent, about 148 miles northwest of London. It is on a branch of the Trent and Mersey Canal and has extensive steam and electric railway connections. The municipality maintains a market, public baths, a cemetery, and a public library. Among the manufactures are chinaware, clothing, pottery; and machinery. Hanley was granted a municipal constitution in 1857. Population, 1907, 67,174.

**HANNIBAL**, a city of Missouri, in Marion County, on the Mississippi River, 112 miles northwest of Saint Louis. It is on the Wabash, the Missouri, Kansas and Texas, the Chicago, Burlington and Quincy, and other railroads. The chief buildings include the public high school, the city hall, the Federal building, and a public library of 15,000 volumes. In the vicinity are deposits of coal and limestone. Among the manufactures are flour, lime, pottery, machinery, tobacco, utensils, and railway cars. The city has a large trade in produce, grain, and merchandise. It was settled in 1819 and incorporated in 1839. Population, 1910, 18,341.

**HANOI** (hä-noi'), a city of Annam, capital of French Indo-China, on the Sonkoi or Red River. It is situated in a beautiful region about 110 miles from the China Sea and has wide and well-built streets. The chief buildings include a large Buddhist temple, the palace, the citadel, and several Christian churches. It is lighted with gas and electricity, has a system of waterworks, and is the seat of a large trade, both domestic and foreign. The manufactures include embroidery, mats, leather, silk and cotton textiles, and fireworks. About one per cent. of the inhabitants are Europeans. Several French newspapers are published within the city and it is the seat of many European public and missionary schools. It has been a possession of France since 1882. Population, 1906, 110,508.

**HANOVER** (hän'ö-vēr), or **Hannover**, a province of Prussia, in the northwestern part of the German Empire. It has an area of 14,869 square miles. The surface is an undulating plain, with alluvial flats and moors in the northern portion. It is well watered by the Weser, Elbe, and Ems rivers and their numerous tributaries. Nearly one-half of the province is arable and about one-seventh is covered with timber. Farming and stock raising are extensive industries, but it likewise has considerable



interests in fruit culture and fishing. It is penetrated by many steam and electric railways and is noted for its production of beet sugar. The mines yield vast quantities of copper, iron, lead, asphaltum, coal, zinc, and silver. Among the chief manufactures are clothing, canned fish, paper, glass, linen, woolen, and cotton goods, sugar, machinery, and musical instruments.

Hanover is divided into the six administrative districts of Lüneburg, Hanover, Stade, Hildesheim, Aurich, and Osnabrück. These districts are divided for local government into 78 circles. It holds high rank in education, its system of schools culminating in the famous University of Göttingen. Hanover was formerly an independent kingdom, but, siding with Austria in 1866, it was annexed to Prussia in the same year. Hanover is the capital. The inhabitants are chiefly Protestants. Population, 1905, 2,759,544.

**HANOVER**, a city in Germany, capital of the province of Hanover, at the confluence of the Leine and Ihme rivers, 65 miles southeast of Bremen. It is noted for its beautiful streets, extensive railroad connections, and commercial importance. The chief buildings include the royal palace, the Church of Christ, the railway station, the townhall, and the Royal Theater of Hanover. Among the manufactures are machinery, chemicals, cotton and woolen goods, tobacco and cigars, musical instruments, porcelain, and toys. Gas and electric lights, stone pavements, electric street railways, and systems of waterworks and sewerage are among the improvements. It is first mentioned in history in 1163, joined the Hanseatic League in 1481, and became the capital of Hanover in 1486. Since 1866 it has belonged to Prussia. Population, 1905, 250,024.

**HANOVER**, a town of New Hampshire, in Grafton County, on the Connecticut River, 55 miles northwest of Concord. It is opposite Norwich, Vt., with which it is connected by a bridge. Hanover is noted as the seat of Dartmouth College (q. v.), which was established here in 1769, and is one of the important educational institutions of America. The town is a beautiful place, having an advantageous site, scenic gardens, and many fine churches and residence buildings. Population, 1900, 1,884.

**HANOVER**, a borough of Pennsylvania, in York County, forty miles northwest of Baltimore, Md., on the Pennsylvania and the Western Maryland railroads. It is surrounded by a productive agricultural region. Deposits of iron ore and clay are worked in the vicinity. The manufactures include shoes, cigars, carriages, clothing, and machinery. It has a large trade in merchandise and farm products. The first

settlement on its site was made in 1730. Population, 1900, 5,302.

**HANSEATIC LEAGUE** (hän-sē-ät'ik lēg'), or **Hansa**, an association of certain German and adjacent cities formed in the 13th century for the purpose of mutual protection and the development of commercial interests. The first steps in the direction were taken by Hamburg, Hadeln, and Ditmarsh in 1219 to protect themselves against pirates that infested the North Sea. In 1241 the city of Lübeck was added with the view of joining Hamburg in protecting travel on the highway across Holstein between the Baltic and the North Sea. Brunswick joined in 1247, when the general name applied to the league originated. During its most prosperous period the association included 85 cities, embracing both inland and maritime towns from Amsterdam to Reval, and from Cologne to Breslau and Cracow. Lübeck was recognized as the principal member and was the meeting place of the deputies who governed the league. The association attained much political influence by supplying money and extending trade to various countries.

The Hanseatic League, as a safeguard and for mutual protection, maintained armies and navies. It constructed canals, developed the principles of mercantile law, adopted a system of weights and measures, and made treaties with various countries to further commercial interests. In 1370 its army gained victories over the kings of Norway, Sweden, and Denmark, and for a time the association claimed the power to choose the sovereign of the last mentioned country. Since the seaport cities possessed advantages over inland towns, the league began to lose power in the 16th century, and most of the countries with which it had treaties revoked them before the beginning of the 17th century. After 1628 the only cities to maintain an organization were Hamburg, Lübeck, and Bremen, but these were joined by Frankfort-on-Main in 1813. In 1866 Frankfort was incorporated with Prussia and the other three became a part of the German Empire in 1870. Since 1889 these cities have belonged to the German customs union.

**HAPSBURG**, **House of**, the reigning dynasty of Austria. The name was derived from the castle of Hapsburg in the Swiss canton of Aargau, on the Aar River. Bishop Werner of Strassburg built the castle in 1027, and his successor, Werner II., was the first to assume the title of Count of Hapsburg, about 1090. From him descended Albert, who is mentioned as Count of Hapsburg in 1152, and Emperor Frederick I. appointed him landgrave of upper Al-



sace. The family attained to much power in Swabia under his son, Rudolph I., and in 1273 Rudolph, son of Albert IV., secured the election as Emperor of Germany. He became hereditary monarch of Austria in 1282. From him descended all the Hapsburg monarchs of Austria to Charles VI. With the marriage of Marie Theresa to Francis Stephen of Lorraine, it became known as the house of Hapsburg-Lorraine, and Francis II. assumed the title of Emperor of Austria. The house of Hapsburg has furnished numerous sovereigns of Austria, Germany, and Spain, Francis Joseph I. being one of its most distinguished members.

**HARA-KIRI** (hä'rä-kē'rī), or **Seppuku**, a method of committing suicide, formerly permitted by the government of Japan. It was practiced by those of the Samurai and nobles who preferred self-disembowelment to some disgrace. At first it took the form of a custom, but in 1500 it was adopted as a mode of punishment, and noblemen and gentlemen were permitted to demand the hara-kiri instead of being executed like common criminals. Afterward this mode of punishment developed into execution by the best friend of the accused, who usually beheaded the criminal in the presence of friends and several official witnesses. Hara-kiri has been abolished as a mode of punishment, but suicide is sometimes committed by this method.

**HARBOR** (hä'r'bēr), a port for ships, natural or artificial, on the coast of a sea, lake, or some other body of water. The importance of a harbor depends upon the depth of its water, freedom from breakers, and natural protection against storms. Inlets and indentations on the shore of lakes and the ocean ordinarily furnish the best roadsteads for ships. Many governments have made liberal expenditures to dredge and otherwise improve the harbors located on rivers, lakes, and the ocean. Indeed, the designing and construction of harbors constitute one of the most difficult departments of civil engineering. Among the essential parts of harbors are docks, quays, piers, jetties, wharves, and breakwaters. A harbor which is designed primarily for shelter, usually called a *harbor of refuge*, must have an artificial or a natural breakwater. Commodious docks are maintained in many harbors, whereby loading and unloading is facilitated by keeping the water surface practically at a common level.

**HARBOR GRACE**, a port of Newfoundland, on the west coast of Conception Bay, 27 miles northwest of Saint John's. It is connected with the interior by the Newfoundland Railway. The chief buildings include the cathedral, the public library, and the courthouse. The harbor

is well protected by the beach. It has many mercantile establishments, fishery supply houses, and manufactures of clothing, earthenware, and machinery. The place is noted for its fine scenery, well graded streets, and extensive facilities for bathing and boating. It has an important commercial trade, both inland and foreign. Population, 1908, 8,264.

**HARBURG** (hä'r'böörg), a city of Germany, in the province of Hanôver, on the Elbe River. It has extensive railroad and electric railway facilities and a large trade in farm produce and merchandise. An old castle on the Elbe, a real gymnasium, and several schools and churches are among the noteworthy buildings. The manufactures include chemicals, jute, linseed oil, cement, boilers, glass, machinery, and gutta-percha wares. An electric railway connects it with Hamburg, which is seven miles north. It has been a part of Prussia since 1866. Population, 1905, 55,676.

**HARDNESS** (härd'nēs), the property of matter which causes bodies to resist being scratched or worn by other bodies. Since there is no such thing as an absolutely hard or soft body, it follows that hardness is a relative property. Heating and cooling change the degree of hardness of some metals. If iron and steel are heated and then cooled slowly, they become softer, but they are hardened by being cooled quickly after raising the temperature to a red heat. On the other hand, copper is softened by cooling quickly and hardened by cooling slowly. The diamond is the hardest of all natural substances and diamond dust is used to cut other stones. Glass, which is harder than wax, is softer than the diamond. Both glass and steel are hard, but the former is brittle while the latter is tough.

**HARE**, a class of rodent quadrupeds which belong to the genus *Lepus*. They are characterized by a short tail, long ears, a cleft upper lip, and long hind legs. Hares are similar to rabbits in all general respects, but differ from them in that the latter are inclined to burrow more extensively and show more sociability in living in families, while hares are solitary and prefer to find an abode in grasses and underbrush. About forty species have been described, fully half of which are indigenous to America. The *polar hares* of North America are noted for their pure white color in winter and large size, while the *prairie hares*, a class embracing the *jack rabbits*, are distinguished for their large body and long limbs. The timidity of these animals is proverbial, though their lack of courage and cunning is overcome largely by marked acuteness of hearing and sight and by their remarka-



ble swiftmess in leaping and running. Most species lie secluded during the day and come out at twilight in search of food, which consists mainly of green vegetation, roots, and the bark of trees, but in populated districts they feed also on cereals. The voice somewhat resembles that of a child, but it is never heard except when they are wounded or seized. The flesh is prized as an article of food, but it is much more valuable



HARE.

during the fall and winter than in the summer season. It is rare sport to pursue the hare, especially after a light fall of snow, when it may be tracked to its place of hiding. The fur of hares enters into the manufacture of hats, and is used to a limited extent for linings and garments.

**HAREBELL** (hâr'bĕl), or **Bluebell**, the name of a plant native to Europe and America, so named from its bell-shaped flower. The stem is slender and about five inches high and the flowers are variously colored. Most of the species have blue flowers, hence they are called *bluebells* in some localities. The harebell thrives in cold regions and the flowers are often seen among the snow and ice on the rocky slopes of mountains. It is believed they generate sufficient heat to permit their growth and endurance under such conditions.

**HAREM** (hâr'rĕm), the set of apartments reserved for the female members of a Mohammedan family, at which all males are forbidden entrance, except the husband and near relatives. Harems are maintained only by the richer Moslems and in them the wives, concubines, and children have their abode, being attended by female slaves and eunuchs. The inmates spend their lives largely in dressing, bathing, pleasurable occupations, and in the society of other

Turkish women. It is commonly reported that the Sultan of Turkey maintains the greatest harem in the world, most of his women being Circassians and Georgians. The apartments occupied by them are of magnificent architecture and contain elaborate decorations and furniture. At the time of the Spanish-American War much interest centered in the Sultan of the Sulu Islands, one of the Philippines, who maintained a harem of considerable size.

**HARLEM RIVER** (hâr'lĕm), the name given to the tide channel that separates Manhattan Island, on which New York City is mainly situated, from the mainland. It connects the Hudson River with the channel called East River, which separates Manhattan from Long Island. Harlem River begins at Kingsbridge, where Tibbet's Brook flows into Spuyten Duyvil Creek, and extends for a distance of seven miles toward the southeast to Randall's Island, near Hell Gate. At low water the depth is nine feet and at high water fifteen feet. The Speedway, a beautiful roadway, extends along the western shore of the Harlem and the buildings of New York University are on the lofty eminence on the opposite shore.

**HARMONICA** (hâr-mŏn'ĭ-kâ), an instrument for producing musical sounds by means of glasses of different sizes. The glasses are fixed to a spindle, which is set in motion by a treadle worked with the foot, and they are touched by the moistened finger of the player as they revolve. This instrument was improved by Benjamin Franklin, who invented the revolving spindle, and in this form the instrument became fashionable in America and England. Miss Davis, a relative of Franklin, became celebrated as a player on the harmonica. However, the instrument was known at the time Goldsmith mentioned the musical glasses in his novel. The name harmonica is applied to a flat instrument with delicate brass reeds, which is played by the inhalation or exhalation of the breath, and is sometimes called *mouth organ*.

**HARMONICS** (hâr-mŏn'iks), in music, the attendant or secondary tones produced by the vibration in aliquot parts of the same body or string that gives, by its complete simultaneous vibration, the primary or fundamental tones. They are sometimes called *overtones*. The vibration of a piano is so regulated that higher harmonics than the seven are not present. Harmonics serve to modify tones and give them their distinctive quality or timbre, and may be detected without difficulty by the practiced ear.

**HARMONY OF THE SPHERES**, a kind of music supposed by the ancients to be produced by the motion of the heavenly bodies.



Pythagoras and a number of early philosophers taught that the harmony of the spheres is audible at all times, but that it cannot be contrasted with absolute silence, since the latter is a condition entirely unknown. It was the general impression that this music was produced under fixed laws, which could be expressed in numbers like those used in designating the harmony of sounds.

**HARNESS**, the equipment of a horse for drawing a coach, wagon, or a vehicle or load of any kind. It consists essentially of leather straps, either simple or padded, fastened or united by sewing, buckles, or rings. Formerly harnesses were either sewed or riveted by hand, but at present they are made almost entirely by sewing machines. The principal parts of a harness consist of the saddle, collar, tugs, bridle, checkrein, hames, and lines. Harnesses intended for heavy work are usually plain and strong, while those for light driving are mounted or ornamented with silver or gold plate.

**HARP**, a stringed instrument of triangular form. It is of great antiquity. The sculptures and ruins of the Egyptians and Syrians give evidence that it was a favorite instrument among



ANCIENT EGYPTIAN HARPS.

them. It is mentioned at numerous places in the Scriptures, and long remained in popular favor among the Greeks, Romans, and various peoples of

Western Europe. The instruments of this class used in ancient times were about seven feet high, and, like those of more modern manufacture, were furnished with gut strings. The harp mentioned in the Bible was somewhat smaller and could be carried easily from place to place by strolling musicians. In Western Europe the harps were similar to those of Eastern peoples, and formed a popular musical accessory for many centuries. The *Italian harp*, a kind popular in Italy several centuries ago, is rarely used at present, and the triangular harp of mediaeval construction has likewise gone out of general use. The so-called *pedal harp*, in which pedals are utilized to raise the pitch of all the strings chromatically, is the one now generally preferred. A harp on this plan was patented in 1810. It is provided with seven pedals, contains 43 strings tuned according to the diatonic scale, and may be readily adjusted to produce beautiful and diversified tones.

**HARPER'S FERRY**, a town of Jefferson County, West Virginia, at the confluence of the Potomac and Shenandoah rivers, 55 miles northwest of Washington. It is on the Baltimore and Ohio Railroad. The surrounding country is fertile, producing cereals, tobacco, and vegetables. It is the seat of Storer College, a normal school for Negroes. Harper's Ferry is celebrated on account of the historic raid made by John Brown in 1859 for the purpose of forcibly liberating the slaves. When Virginia seceded, in 1861, it was abandoned by the Union garrison, consisting of only 45 men. The following year it was again occupied by the Federals, but General Jackson captured it on Sept. 15, 1862, and procured about 12,500 prisoners. Population, 1900, 896.

**HARPOON** (här-pōon'), an implement of iron used in killing large fish and whales. It consists of a shank terminating at one end in a socket, to which a long rope is attached, and at the other end is a broad flat head, sharpened so as to penetrate with facility. It is furnished with barbs or withers. The rope, called the *whale line*, is coiled in the boat and is quite long, so the whale may dive after the harpoon, which is about three feet long, has been fastened into its body. Whalers may throw the harpoon by hand, or it may be shot from a harpoon gun. More recently the bomb lance has come into use. It is shot from a gun and explodes when the body of the whale is entered, causing almost instant death.

**HARPSICORD** (härp'si-körd), a stringed instrument with a keyboard somewhat resembling a modern pianoforte, and now largely superseded by it. A superior kind of harpsichord had two keyboards, one for producing the soft notes and the other the louder tones. They contained stops for modifying the tones, being thereby rendered suitable for different classes of music. The sounds were produced by the keys raising oblong slips of wood, called *jacks*, which were supplied with appendages that struck the wires in a manner quite similar to the hammers used in the modern pianoforte.

**HARPY** (här'pÿ), a large eagle of South America, considered one of the most powerful birds of prey. The bill is strong and curved at the tip, the toes have powerful claws, and the spread of wings is from five to six feet. The feathers of the breast are long and loose and the general color is black above and white below. The Indians use its feathers in making arrows and for decorative purposes. It lives in the dark forests, especially near the border of great rivers, and subsists on large birds, sloths, monkeys, young deer, and other quadrupeds. Nat-



uralists agree that it is one of the most powerful and bold birds of prey, but the current idea that it attacks man is not well founded. The harpy is most numerous in South America, but is met with in various parts of Central America and Mexico.

**HARRISBURG** (hă'rîs-bûrg), the capital of Pennsylvania, county seat of Dauphin County, on the Susquehanna River, 104 miles west of Philadelphia. It is on the Pennsylvania, the Philadelphia and Reading, the Cumberland Valley, and other railroads, and has communication by suburban and interurban electric railways. The site is a beautiful tract along the river, which is spanned by many bridges. It has broad and regularly platted streets and many fine public buildings, among them the State capitol, an arsenal, an insane asylum, a Roman Catholic cathedral, a State library of 105,000 volumes, and numerous beautiful churches. The State capitol, erected at a cost of \$5,000,000, has a frontage of 520 feet and a dome 241 feet high. It was dedicated to public use in 1906, when President Roosevelt delivered the dedicatory address before a large concourse of people. Other noteworthy buildings include the high school, the county courthouse, the Federal building, the Grand Opera House, the Y. M. C. A. building, and many tall bank and office buildings.

The importance of Harrisburg as a manufacturing center is to be attributed to large deposits of coal in the vicinity, and to its excellent transportation facilities by river navigation and railways. Among the manufactures are railroad engines and cars, hats, ironware, machinery, cotton and woolen goods, flour, shoes, pottery, silk textiles, musical instruments, and brooms. The extensive iron and steel interests are worthy of special mention. It has a large trade in grain, lumber, coal, building stone, and merchandise. The streets are well graded and paved with stone and asphalt. Harrisburg was first settled in 1726 by John Harris, an English trader. It was platted in 1785, became the capital in 1812, and was chartered as a city in 1860. Population, 1900, 50,167; in 1910, 64,186.

**HARRISON** (hă'rî-sûn), a city of Hudson County, New Jersey, on the Passaic River, opposite the city of Newark. It is on the Erie, the Pennsylvania, and the Lackawanna railroads. The surrounding country is agricultural and fruit growing. Among the manufactures are cutlery, linoleum, thread, electric fixtures, wire, machinery, and clothing. It is the seat of the State Soldiers' Home, has communication by electric railways and maintains a system of waterworks. Harrison was settled in 1668 and incorporated in 1873. Population, 1910, 14,498.

**HARROW**, an implement for pulverizing and smoothing plowed land, either before or after sowing the seed. It consists of an iron or a wooden frame, either square or rhomboidal, to which iron teeth are fastened by bolts or otherwise. Originally the harrow was made entirely of wood, but later iron teeth were driven through the woodwork, projecting downward about eight inches, and now many harrows are entirely of metal. Revolving disks of steel, fastened to heavy iron bars, have to some extent displaced the common harrow. The work with these implements is done by dragging them across the land with horses or mules.

**HARTFORD** (hărt'fêrd), a city and the capital of Connecticut, county seat of Hartford County, on the Connecticut River, 110 miles northeast of New York City. It is on the New York, New Haven and Hartford and the Connecticut Valley railroads. The large vessels reach it from Long Island Sound, which is 50 miles distant, and it has communication by many electric lines. It has a fine site, which commands a view of the Connecticut valley. The streets are regularly platted and improved with grading and stone and asphalt pavements. Charter Oak Park contains the race tracks and fair grounds. The State capitol is located in Bushnell Park, which embraces 46 acres.

Hartford is generally well built and has many large and modern structures. The State capitol, which is built of white marble, is a large and imposing building. The city hall, which was formerly the State house, is famous as the seat of the Hartford Convention. Other noteworthy buildings include the post office, the Hartford Theological Seminary, the Cheney building, the Saint Joseph Cathedral, the Wadsworth Athenaeum, and the buildings of the Aetna Life, the Phoenix Mutual Life, and the Connecticut Mutual Life insurance companies. It is the seat of asylums for orphans, for the insane, and for the deaf and dumb. Trinity College, an Episcopal institution, is located near the city. The library of Trinity College has 50,000 volumes, and, besides it, there are several other libraries. Hartford has been a port of entry since 1887 and has an extensive commercial and insurance business. The manufactures include sewing machines, silk and woolen goods, firearms, vehicles, machinery, hardware, flour, bicycles, stoves, and furniture. In 1633 the Dutch built a fort on its site and in 1635 a colony settled here from Massachusetts. It was incorporated as a city in 1734 and until 1873 was the joint capital of the State with New Haven, but in that year became sole capital. Among the sights of interest shown visitors for



a number of years was the celebrated Charter Oak, the tree in which the charter of Connecticut was hidden when Governor Andros demanded its surrender. Population, 1910, 98,915.

**HARTFORD CITY**, a city and the county seat of Blackford County, Indiana, 72 miles northeast of Indianapolis. It is on the Pittsburg, Cincinnati, Chicago and Saint Louis and the Lake Erie and Western railroads. The chief buildings include the courthouse, the high school, and several fine churches. It has manufactures of flour, paper, glass, vehicles, and machinery. Electric lights, telephones, waterworks, and a library are among the facilities. Population, 1900, 5,912.

**HARTFORD CONVENTION**, an association of delegates proposed by the Legislature of Massachusetts. It convened at Hartford, Conn., Dec. 15, 1814, and adjourned Jan. 5, 1815. The Federalists of the New England states opposed the war with Great Britain, which was then in progress. The war was especially injurious to the interests of New England because it operated to destroy the commercial importance and the fisheries of that region. The object of the convention was to devise means for security that would prevent total destruction, but it met behind closed doors, and was carefully watched by a government military officer. From time to time the conclusions of the convention were published in the form of measures looking to the protection of the citizens against compulsory military service, but there was a widespread suspicion that the members of the convention designed to disseminate a sentiment favorable to the establishment of a kingdom in New England. Since the delegates consisted of leading Federalists who had favored an eastern confederacy in 1804 and the work of the convention was designed against the Democratic administration, a public sentiment was formed against the Federalists and entirely ruined them as a party in the election of 1816. Subsequently it was shown conclusively that the reports of treason were not well founded and that the delegates had in mind only the interests of their section of the Union.

**HARTSHORN** (härts'hörn), a volatile preparation of ammonia, now obtained from carbonate of ammonia and other sources, but formerly prepared from the horn of the common stag. The product was derived by distillation and sold as oil of hartshorn or spirits of hartshorn. It is employed for many purposes in medicine, especially in cases of fainting and nervous weakness. The scent is very strong, serving as a relief in headache.

**HARVARD UNIVERSITY**, an important

institution of higher learning, situated in Cambridge, Mass. It was founded under an appropriation of \$2,000 voted by the general court of the Massachusetts Bay Colony and established on Oct. 28, 1636, being the oldest university in the United States. No material advancement was made until 1638, when John Harvard bequeathed half his estate valued at \$4,000 and his library of 300 volumes to the proposed institution. In the same year it was organized as Harvard College. The first class of nine graduates completed the course in 1642. Henry Dunster, the first president, succeeded in obtaining a charter on May 31, 1650, when it was legalized as the President and Fellows of Harvard College. This document was signed by Gov. Thomas Dudley and is now in the custody of the trustees. It provides for the management under a board of overseers, but the character of this board has been changed by several acts of the State Legislature. At present the candidates for members of the board are nominated by postal ballot, both residents and non-residents of the State being eligible, and the election is held annually on commencement day.

The name Harvard College is still used to designate the central portion, which grants the degree of A. B., while the entire complex institution is known as Harvard University. As a whole it includes seventeen departments, each of which is finely equipped with such aids in teaching as are demanded in its particular line. At present there are about 25 college buildings, an endowment fund of \$23,500,000, and departmental libraries with 790,800 volumes and 485,500 pamphlets. In 1908 it had 558 instructors and 6,472 students, of whom 143 were from foreign countries. The courses include those of law, divinity, medicine, zoölogy, veterinary, dental science, and liberal arts. In connection with it is a college of liberal arts for women. The laboratories and observatory are thoroughly equipped. Its museum of comparative zoölogy is known as the Agassiz Museum, from the circumstance that it was endowed by Professor Agassiz. In 1907 the university celebrated the 300th anniversary of the birth of its founder.

**HARVEST BUG**, the name of a mite of a bright red color, so called from the fact that it attacks the workmen at harvest. It makes its appearance in July, when it is found on blades of grass, whence it comes in contact with the legs and thighs of persons in the field. It is annoying both to man and various animals, such as dogs and sheep. The mite is very small and causes an intolerable itching of the skin.

**HARVESTING MACHINERY**, the implements used in harvesting the crops of agricul-



turalists. The first machines of this character known in history were used by the Gauls before the Christian Era. It consisted of a box fixed on wheels and had a cutting apparatus in front that gathered the heads of standing grain as an ox pushed the machine from the rear. At present three principal classes of machines are used for harvesting small grain. These are known as headers, reapers, and harvesters. *Headers* are utilized for cutting the heads of standing cereals, as wheat and oats, and some of the more modern structures thresh and bag the grain while the machine is propelled forward, though in most cases the heads are gathered and threshed afterward. In *reapers* the grain is cut, bound by hand, and, after being stacked, or stored in barns, is threshed by machines. *Harvesters* consist either of self-binders, which bind the grain with sisal or manilla cord and carry the bundles into rows upon the field, or machines on which two men bind the grain by hand, though the latter form has gone practically out of use. Besides the implements employed in harvesting small grains, there are numerous machines for cutting grass, clover, and corn.

Among the earliest of the modern machines were those of Patrick Bell, who patented a harvester in Scotland in 1826, and the machine invented by Cyrus H. McCormick in the United States in 1834. Since then various excellent implements have been invented for harvesting many grains and grasses with the result that all classes of farming have become more profitable. They give the advantage that harvesting may be carried on with much less physical exertion than formerly. As a consequence agricultural enterprises have been extended over vast areas formerly not cultivated. In the manufacture of harvesting machines the United States has long occupied the foremost position. Its products have gone into all the markets of the world. The machines of newer manufacture are almost exclusively of steel, which has been made serviceable because of improved methods of tempering metals. The improvements due to the general use of ball bearings has greatly lightened the draft of machines on the one hand and increased their durability on the other. See **Corn Harvester**.

**HARVEST MOON**, the name given to the moon at the time she is in that part of her orbit where she makes the least possible angle with the ecliptic. This occurs about the autumnal equinox, in September, in high northern latitude and during March in southern latitude. Ordinarily the moon rises about fifty minutes later each succeeding evening, owing to her changing position in the sky, this difference being called

*retardation*. At the time of full moon, during the autumnal equinox, when the retardation is at a minimum, the farmers have the advantage of moonlight nearly the entire night on several successive nights. Before harvesting machinery came into general use, they worked nearly all night to take care of the grain, hence the harvest moon was looked upon as of much benefit.

**HARVEY**, a city of Illinois, in Cook County, twenty miles south of the courthouse in Chicago, on the Illinois Central, the Cleveland, Cincinnati, Chicago and Saint Louis, the Grand Trunk, and other railroads. It is a residential and manufacturing suburb of Chicago. Among the chief industries are machine shops, stove works, and machine and automobile factories. The city was incorporated in 1892. Population, 1900, 5,395; in 1910, 7,227.

**HARZ** (härts), or **Hartz**, the most northerly mountain chain of Germany, extending between the Weser and Elbe and trending from the northwest to the southeast. The range is about twenty miles wide and sixty long, rising quite abruptly from the plains in irregular ridges. It is covered in many places with native forests. The average elevation is about 1,500 feet. Brocken, the predominating peak, is elevated 3,741 feet above sea level. The range is divided into two portions, the southeasterly being known as the Lower Harz and the remainder as the Upper Harz, the latter being the higher and including Brocken. Many historic incidents are connected with these mountains, chiefly because they form a natural boundary between the High and Low German peoples. They have entered largely into German literature, lending a realistic vividness to poetic imagination. The mineral deposits are exceedingly rich, including zinc, copper, silver, iron, arsenic, lead, marble, granite, slate, alabaster, and porphyry. The region has valuable forests, fertile valleys, and fine pasture lands.

**HASHISH** (häsh'ēsh), or **Hasheesh**, a term applied to the tops and tender sprouts of a variety of hemp native to India and to an intoxicating preparation made of this plant. Hashish, in various forms, is smoked, drunk, and taken in confections. The habit of using hashish prevails extensively in the East, where it enters to some extent into the practice of medicine. The juice of the plant contains narcotic properties and exudes from it in the form of resinous matter. Whether taken as a beverage, with confections, or smoked, it has a marked stimulating influence. When taken in excessive quantities, it has an intense intoxicating effect, which is accompanied by results quite similar to those affecting persons using alcoholic beverages ex-



cessively. The effects partake largely of the nature of hallucinations and merriment, but are frequently accompanied by boisterous, quarrelsome tendencies.

**HASTINGS** (hāst'ingz), a seaport of England, on the Strait of Dover, in Sussex County, 54 miles southeast of London. It forms, together with Saint Leonards, an important railroad and trade center. The principal industries are fishing and boat building. During the greater part of the year it is frequented by large numbers of invalids, who bathe in its waters or take treatment for pulmonary complaints. The town is of great antiquity, possessing importance in the early times of the Anglo-Saxons. King Harold garrisoned it as a means of defense against William the Conqueror, but it surrendered to the latter without much resistance. He made it his permanent base of operations and on Oct. 14, 1066, the celebrated Battle of Hastings occurred between the two leaders at Senlac Hill, in which Harold was defeated and his army was destroyed. This battle is classed among the fifteen decisive engagements of the world. Population, 1907, 67,477.

**HASTINGS**, a city in Nebraska, county seat of Adams County, situated in a fertile agricultural country, 95 miles west of Lincoln. It is on the Missouri Pacific, the Chicago and Northwestern, the Chicago, Burlington and Quincy, and other railroads. Among the public buildings are the city hall, the Masonic temple, the county courthouse, the State asylum for the insane, a Roman Catholic academy, Hastings College, and the high school. It has a large trade in live stock, cereals, and fruits. The city has waterworks, electric lights, street railways, and a public library. The manufactures include flour, canned and packed goods, pottery and brick, machinery, utensils, and cigars. Hastings has an extensive jobbing trade. It was incorporated in 1874. Population, 1910, 9,338.

**HAT**, a covering for the head, generally with a crown and brim and of various materials, shapes, and styles. The manufacture of hats originated with the ancients, who employed different fibers for making outdoor covering for the head. Hats began to resemble those now worn at the time of Alexander the Great, when the Greeks made hats of round felt called *petasos*. Extensive manufactures of headwear began in Western Europe in the latter part of the 15th century. In 1760 silk hats were made and came into style at Florence, but the manufacture did not assume its present aspect until 1828. The exhaustion of certain fur products and many changes of style in hats for both men and women has led to the use of various classes of

material. At present they are made largely of cloth, felt, silk, splints, grass, and straw. They serve as a protection for the head or as an ornament, or for both purposes.

**HAVANA** (hà-văn'á), in Spanish, *La Habana*, the capital of Cuba and the largest city of the West Indies; situated on the northwestern coast of the island and on an extensive natural harbor. The entrance to the harbor is about 350 yards wide. It is defended by Punta Castle on the west and La Cabaña and Morro Castle on the east, all of which occupy convenient heights above the place where vessels pass. The old portion of the city has narrow streets, but the newer part contains many excellent buildings and is adorned by beautiful avenues of palm trees. All the principal streets



AVENUE IN HAVANA.

are improved by pavements, street railway lines, waterworks, and sewerage. Railroad and telephone connections are extensive and the streets are lighted by electricity. The public buildings include a cathedral built in 1724, an orphan asylum, the governor's palace, the public library, the Tacón Theater, and the government buildings. It has many parochial and public schools, at the head of which is the University of Havana. Colón Park is the largest of the many public grounds:

Havana ranks as the most important sugar market in the world. It has extensive manufactures of cigars and smoking tobacco. Other products include molasses, hats, woolen fabrics, clothing, wax, earthenware, machinery, and im-











plements. The shipyards of Havana for many years produced the principal portion of the vessels for the Spanish fleet. At present the export and import trade is important, especially with the United States. Since the Spanish-American War the city has made rapid improvements. Many of the streets have been repaved and a new system of sewers has been installed. Havana was founded by the Spanish in 1515, under the direction of Diego Velasquez, but its growth dates from 1519, when it was replatted and improved by public buildings. Buccaneers burned it in 1528. It was taken by the English in 1762, at which time it was the center of trade in the West Indies, but it remained under Spanish dominion until 1898, when it was occupied by the United States and the revolutionists. On Feb. 15, 1898, the United States battleship *Maine* was destroyed in the harbor of Havana while on a friendly visit and 262 officers and men were lost. About one-fifth of the inhabitants are of foreign birth. Population, 1902, 262,395.

**HAVERFORD COLLEGE** (häv'ēr-fērd), an institution of learning established by the Society of Friends at Philadelphia, Pa., in 1830. It was opened for instruction in 1833. The purpose is to supply the need of religious training as well as literary culture. It has a faculty of 25 instructors and about 200 students. At present the endowments amount to \$1,050,000. The library contains 40,000 volumes.

**HAVERHILL** (häv'ēr-īl), a city of Massachusetts, in Essex County, on the Merrimac River, 32 miles north of Boston. It is on the Boston and Maine Railroad and has an extensive system of electric railway lines. The site overlooks the river, which is crossed by a number of iron bridges, connecting it with Groveland and West Newbury. Among the noteworthy buildings are the public library, the city hall, the Masonic Temple, the Hale Hospital, and a number of fine churches and schools. Haverhill is the birthplace of John G. Whittier. It contains a monument to commemorate the historic liberation of Hannah Dunston from her Indian captors in 1697. The city takes high rank in the manufacture of boots and shoes. Other products include fine hats, leather, brick, clothing, woolens, and machinery. It has a large trade in merchandise. The place was settled about 1640. It was chartered as a town in 1645 and incorporated as a city in 1870. Population, 1905, 37,818; in 1910, 44,115.

**HAVERSTRAW** (häv'ēr-strā), a village of Rockland County, New York, on the Hudson River, 35 miles north of New York City. It is on the West Shore and the New Jersey and

New York railways. At this place the river expands to form Haverstraw Bay. The town has manufactures of brick, paper, and copper products. It was settled by the Dutch and became a precinct in 1719. The home of Thomas H. Smith, known as the "Treason House," was the meeting place of Arnold and André. Population, 1905, 6,182; in 1910, 5,669.

**HAVRE** (hä'vēr), a city and seaport in the department of Seine-Inférieure, France, on the estuary of the Seine, about 108 miles northwest of Paris. Besides numerous steamboat lines, it has connections by a network of railroads. The noteworthy buildings include the palace of justice, the customhouse, the museum, the Church of Notre Dame, and the commercial exchange. It dates from 1516, when it was a small fishing village, but its harbor was improved and fortified by Francis I., after which it grew to importance. At present it ranks next to Marseilles as the most extensive commercial center of France. It has manufactures of paper, cotton and woolen goods, clothing, earthenware, chemicals, cordage, oil, glass, beet sugar, and machinery. Its export trade with the United States is extensive. It is noted for its large emigration traffic, the most important of France. The city has beautifully improved streets, including electric lights and street railways, waterworks, public parks, and stone pavements. Population, 1906, 132,430.

**HAWAII** (hä-wī'ē), or **Hawaiian Islands**, an archipelago of twelve islands in the Pacific ocean, formerly called Sandwich Islands, and now known politically as the Territory of Hawaii. They are located about 2,200 miles southwest of San Francisco and 4,890 miles from Hong Kong. Geographically they form the extreme northeastern group of Polynesia and extend in a chain from southeast to northwest for about 400 miles. Eight of the islands are inhabited. The entire group has an area of 6,450 square miles. The following is a list of the eight inhabited islands, in which are shown the area and population as reported in 1910:

	AREA, SQ. MI.	POPULA- TION
Hawaii...	4,015	55,382
Kahoolawe.....	69	85
Kauai.....	544	13,400
Mauai.....	728	25,856
Lanai.....	135	1,460
Molokai.....	262	3,146
Niihau.....	97	10,552
Oahu.....	600	82,028
Total.....	6,450	191,909

**DESCRIPTION.** The islands are volcanic in origin, having been raised by eruptions from the sea, but considerable surface has been added



through the growth of coral reefs. Groups and chains of mountains occur in the larger islands, the most elevated peaks being in Hawaii, the largest island, where Mauna Kea rises to a height of 13,805 feet and Mauna Loa, 13,675 feet. Kilauea, one of the most noted volcanoes in the world, is situated on the eastern slope of Mauna Loa. The most recent eruptions of this crater occurred in 1880 and 1887, when lava flowed for a period of eight months, spreading in a stream from two to forty miles in width. Some of the coasts are low and sandy, but nearly all the islands have bold cliffs that rise quite abruptly from the sea. Kauai and several other islands are eroded with deep ravines and gorges and the coast is more or less indented with deep bays. Fertile plains and valleys extend between the mountains and the coasts. Few lakes and rivers characterize the surface and the streams are chiefly short mountain torrents. Most of the rivers are located on the northern slopes.

The climate is mild and temperate and the thermometer seldom falls below 50° Fahr. and rarely rises above 90°. In the lowlands the average temperature is 70° in January and 78°

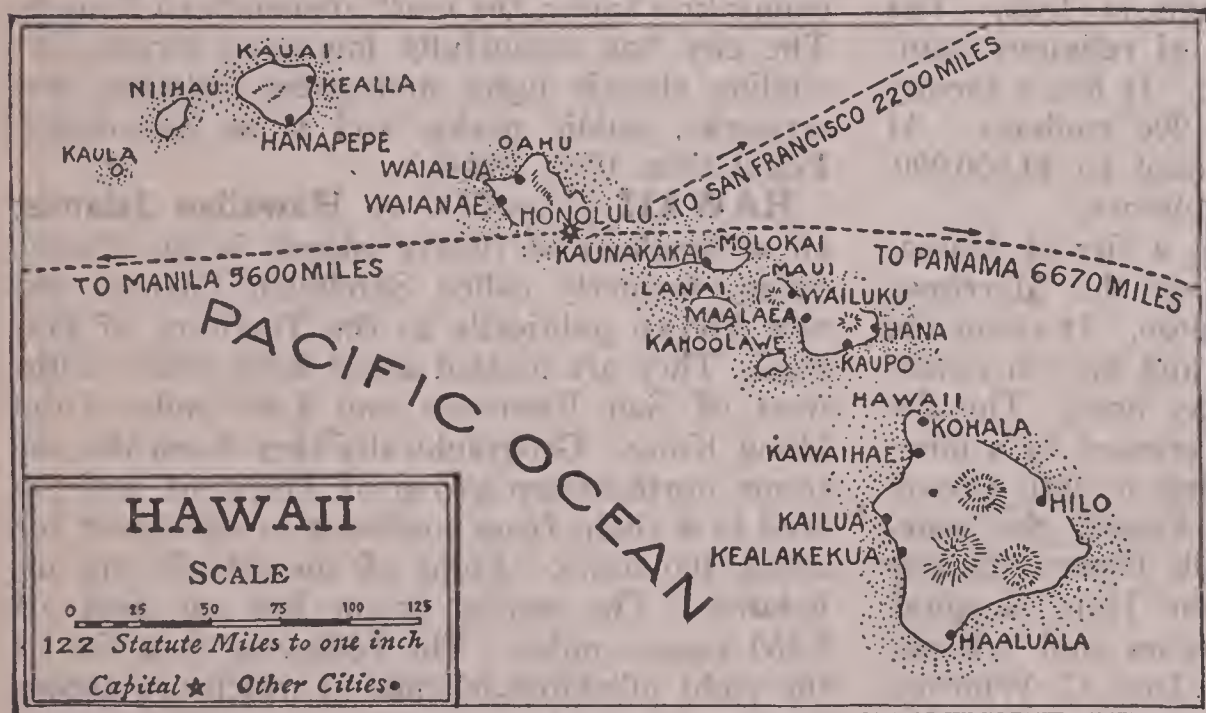
and thunderstorms are rare and frosts occur only on the mountains, where snow sometimes remains the entire year, though only on the highest peaks.

**FLORA AND FAUNA.** The plants resemble those of Australasia, but include some species common to America. Many flowering plants have been described, of which fully 600 are peculiar to the islands. Formerly the forests were very abundant, especially those of the screw pine, and large areas of the uplands still have considerable timber. Tree ferns are especially numerous and all of the vegetation is luxuriant. Birds of song and plumage are abundant, but the mammals are not well represented. Aside from a species of lizards there are no reptiles. The mammals include wild swine, rats, dogs, and a species of bat that flies by day.

**TRANSPORTATION.** The harbor of Honolulu is protected by a coral reef and is counted one of the best in the Pacific. Pearl Harbor, a short distance north of Honolulu, may ultimately be made the chief center of commerce, as it has unlimited port facilities. In general the islands have good landing places, since the water near

many of the shores is deep. Steamers land regularly on routes out of San Francisco, Hong Kong, Vancouver, Yokohama, and ports in Australia and New Zealand. Railways have been built on several of the islands, the largest mileage being on Oahu, where a line extends from Honolulu along the coast to Kahu-ku. Several short lines are in operation, including a number that transport commodities from and to the sugar plantations.

**INDUSTRIES.** Agriculture is the chief industry. The climate and soil are favorable to the cultivation of a large variety of plants, but considerable of the surface is mountainous and much of the area is covered with lava. Sugar cane is cultivated extensively and the sugar industry is the most important industrial enterprise. It is confined largely to the low plains, where the soil is exceptionally fertile, and the higher lands are utilized for raising fruit, coffee, and vegetables. The level lands near the sea are well adapted to the cultivation of rice, which takes rank next to sugar cane in the acreage, but nearly the entire crop is con-



in July. Summer and winter make up the two seasons. The rainfall is greatest in winter, when the northeast trade winds cause considerable precipitation. Vegetation is most abundant on the northeastern side of the highlands, owing to this fact, and in Hawaii Island an almost arid tract is located on the southwestern sides of the mountains. The rainfall at Honolulu is 32 inches per year, but in some localities it ranges from 80 to even 240 inches. Europeans find the climate agreeable and healthful, though it is not favorable to those who are afflicted with pulmonary diseases. Hurricanes



sumed at home. Bananas and pineapples are grown most extensively of the fruits and large quantities are exported. Potatoes thrive and corn can be raised profitably in many localities.

The islands do not contain coal deposits, hence the supply of fuel is quite limited. This has had a marked influence upon manufacturing enterprises, which are confined chiefly to the products obtained through the sugar plantations. Sugar is the principal manufactured product, and next are fertilizers, machinery, and clothing. Among the chief minerals are basalt, sandstone, and coral rock, but no metals abound. The export and import trade is chiefly with the United States and has been augmented by the fact that home manufactures are limited. Coal is the most important import and is followed by machinery, clothing, and utensils. The chief exports include sugar and fruits. Cattle, hogs, horses, mules, and sheep are reared, but they do not furnish a large volume of materials for export.

**EDUCATION.** Education is free, universal, and compulsory. A department of public instruction, consisting of a superintendent of public instruction and six commissioners appointed by the Governor, have control of education throughout the Territory. It has 155 public schools with 18,206 pupils and employing 466 teachers. There are 51 private schools with 4,881 pupils and employing 154 teachers. A college of agriculture and mechanic arts, established by the Territory at Honolulu in 1908, is maintained jointly by the Territory and the Federal government. A normal school, a high school, and a girls' industrial school, at Honolulu; a boys' industrial school at Waialua; Lahainaluna School, an industrial and manual training school for boys, at Lahaina; and a high school at Hilo, are maintained by the department of public instruction. Of schools on private foundation are Oahu College, Kamehameha Schools, Saint Louis College, Iolani College, Mills Institute, Kawaiahao Seminary, Convent of Sisters of the Sacred Heart, and Saint Andrew's Priory, at Honolulu; Maunaolu Seminary for Girls, at Makawao; Hilo Boarding School, at Hilo; and Kohala Seminary, at Kohala. The English language is the basis of instruction in all schools.

**GOVERNMENT.** The government has been that of a territory since 1900. It has a territorial representative in Congress and the chief executive is a Governor, who is appointed by the President of the United States. Legislative power is vested in a senate of fifteen, elected for four years, and a house of representatives of thirty members, elected for two years. The chief charitable institution is the leper settle-

ment on the island of Molokai, at which about 900 are provided for by public grants. This settlement is on a peninsula which is isolated from the mainland by mountains and those confined here are permitted a large measure of local self-government. A large majority of the people of Hawaii are Protestants, but the Catholics and various Oriental faiths are represented.

**INHABITANTS.** The inhabitants are greatly diversified, consisting of Japanese, Chinese, Caucasians, Hawaiians, and South Sea Islanders. Immigration from the United States has been considerable since the islands were annexed. At present there are about 4,250 inhabitants who were born in the United States and the total foreign born population is placed at 12,500. In 1778, when Captain Cook visited the islands, the native population was estimated at 400,000, but the census of 1900 shows that the purely native inhabitants number only 29,834. In the same year the total population was 153,727, which included 25,767 Chinese, 28,533 Caucasians, and 61,111 Japanese. Honolulu, on the island of Oahu, is the capital and principal city. Hilo, on the island of Hawaii, has a population of about 2,500. The inhabitants have increased within recent years. In 1910 the population was 191,909.

**HISTORY.** The island group was discovered in 1542 by Gaetano, a Spanish explorer. It was visited by Captain Cook in 1797, who was killed by the natives the following year. The government previous to the last century was vested in separate kings resident on the different islands, but in the early part of the century Kamehameha I. consolidated them into one monarchy, in which form they were governed by him and his successors until about 1886, when the people secured numerous concessions. Kamehameha II., who was friendly to Europeans and encouraged missionary work, visited England and in 1824 died at London. A constitution was granted to the people in 1840 by Kamehameha III., and the former despotic government was succeeded by a limited monarchy, in which the affairs were in the hands of the king and an assembly of nobles. During his reign Europeans governments came to look upon the islands as important on account of their position, and France and England united in guaranteeing their independence in 1843. Kamehameha IV. ascended the throne in 1854 and was succeeded by Kamehameha V. in 1863, but the latter died ten years later and the Kamehameha dynasty became extinct.

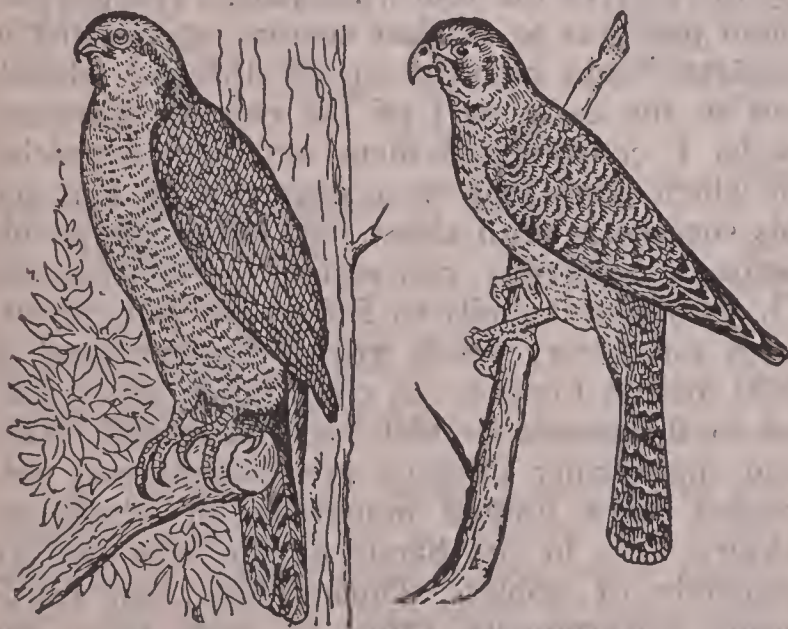
In 1874 Kalakaua was elected as king. He reigned successfully until 1891, when he was



succeeded by his sister, Queen Liliuokalani. The government of this queen did not meet with the approval of the large foreign element and the progressive party, since she adopted a policy to set aside the constitution. She was deposed in January, 1893, when a republic was organized. Sanford B. Dole was chosen provisional president and was confirmed chief executive of the islands on July 4, 1894, when the new government was officially proclaimed.

Annexation to the United States was advocated immediately after the republic was proclaimed. President Dole visited Washington to promote an interest in making the islands territory of the United States. Congress soon after passed a joint resolution, which was approved by President McKinley, and the islands were officially annexed on July 7, 1898. To carry out the provisions of annexation, a commission was sent to the islands with instructions to formulate a plan of government. On August 12, 1898, Annexation Day was celebrated at Honolulu with imposing ceremonies, and the islands were formally declared a possession of the United States in the presence of a great crowd. In 1900 the islands were organized as a territory and in that year Sanford B. Dole became the Governor. He was succeeded by W. F. Frear in 1905.

**HAWK**, the name of several species of birds. It is frequently applied to all birds of prey, except the vultures, owls, and eagles. The fal-



GOSHAWK.

SPARROW HAWK.

cons are included with the hawks proper, though the latter differ from them in that their beaks are smaller and the wings are shorter. The goshawk and sparrow hawk are widely distributed in the continents and islands. They are noted for their rapacious and fierce habits and the swiftness with which they pursue animals and birds for the purpose of catching them.

The American hawk preys upon insects, small quadrupeds, and domestic chickens. It is a common bird in many parts of the United States and Canada. The color of most species of hawks is grayish-brown. See **Falcon**.

**HAWKSBILL**, or **Caret**, the name of a large sea turtle. It is found in the tropical sea and different species inhabit the Indian and Pacific oceans. The beak is horny and formed somewhat like that of a bird of prey and the tail is used as a weapon of defense. This turtle furnishes the tortoise shell of commerce.

**HAWTHORN** (hă'thörn), a shrub or small tree found in Europe and Asia, but naturalized in many parts of North America. The plant reaches a height of 25 feet, has deciduous leaves, and bears crimson flowers. It produces a red fruit with yellow pulp which remains on the tree after the leaves fall off in autumn. The hawthorn is cultivated to some extent as a hedge, since it bears pruning, and the fruit is used in making a fermented liquor. An American plant, the *thorn apple*, belongs to the same genus of plants.

**HAY**, the stems of grasses and other plants cut and dried for fodder. The United States is the principal hay-producing country of North America. It has an area of 42,500,000 acres cultivated in hay, which yields an annual product of 65,500,000 tons, the crop being valued at \$450,500,000. Among the states producing the largest crops of hay are Iowa, New York, Kansas, Pennsylvania, Missouri, Illinois, and Nebraska, but the annual output varies largely on account of the difference in the amount of rainfall, it being quite necessary that the early part of the growing season be favored with an abundance of moisture. Canada holds a high rank in the output of hay, the largest yield being in Ontario and Manitoba.

The best quality of hay from the different plants is secured when the saccharine matter is most abundant, which occurs when they are in full bloom. The grasses are harvested by mowing machines, which cut swaths four to six feet wide. On large farms the hay is allowed to cure a short time and is then tedded mechanically and loaded on wagons by means of machinery, to be stored in stacks or haymows. In many of the larger western hayfields it is customary to push the hay by means of hay sweeps to the stacks, where it is lifted by horse power under roofing. To obtain a nutritive quality of hay it is necessary that the weather be dry, since grasses are more or less damaged by moisture in the process of curing, and thereby lose much of their flavor and nutritive qualities. Timothy, clover, alfalfa, red top, and native



grasses are the chief plants utilized to make hay. Other plants that yield hay include oats, barley, cowpea, vetch, and orchard grass. Some plants, such as clover and alfalfa, yield *rowen*, which is made by cutting the second growth or aftermath.

**HAY FEVER**, an affection that is similar to a severe cold, sometimes called hay asthma or autumnal catarrh. It is so called for the reason that it affects some people in July, at the time of the haying season, but is more prevalent in August. It usually disappears in October, or on the approach of autumn. The disease is characterized by sneezing and discharges from the nose and the patient usually has weeping eyes, headache, irritability, slight fever, and a loss of appetite. Those affected are likely to have it with more or less regularity every summer. It is caused by the pollen of some plants or the dust arising from molding vegetation, and in some persons is due to nasal deformity. The disease seems to be more violent in America than in Europe, and the best method of obtaining relief is to change climate. Hay fever patients usually find it advisable to go to higher altitudes or a region that has a colder climate than the place of their residence.

**HAY-PAUNCEFOTE TREATY**, the name of a treaty negotiated in 1901 between the United States and Great Britain. It was so named because John Hay acted for the former and Lord Pauncefote for the latter country. Its purpose is to control the policy of the United States in the construction and maintenance of a canal between the Atlantic and Pacific oceans. Attention was called to the necessity of constructing an isthmian canal by President McKinley in his message to Congress in 1898, which led to the opening of negotiations by which the Clayton-Bulwer Treaty would be modified so that the American government could proceed with the construction of the canal without affecting the general policy of neutrality. This treaty gives to the United States control of the canal, vesting the sole power of guarantee of its neutrality in this country. Under this treaty the work was taken up and promoted without interruption.

The Hay-Pauncefote Treaty was agreed upon by the two representatives on Nov. 18, 1901, and was transmitted by President Roosevelt to the Senate on December 5th, in which body it met some resistance but was duly ratified on December 16th. The following provisions are contained in this treaty:

I.—The Clayton-Bulwer Treaty is abrogated, but the neutralization of the canal is maintained on the same basis as the Suez Canal.

II.—Neither Great Britain nor any other power is to guarantee neutrality of the canal, but it is to be constructed and managed by the United States.

III.—The canal is to be free and open to all nations for commercial purposes, but the United States is allowed certain undefined rights of control in time of war. While the canal must be kept open and free from blockade, the United States is permitted to erect fortifications with the view of commanding the canal, or its adjacent waters, and it may maintain a military force to protect it against lawlessness.

**HAY RIVER**, a river of Canada, rises in the northeastern part of British Columbia, and after a course of 350 miles flows into Great Slave Lake. It has a general course toward the northeast, and in the northwestern part of Alberta passes through Hay Lake. Alexandria Falls, about 250 feet high, occur in its course. It is navigable for small boats about 135 miles.

**HAYTI** (há'ti), or Haiti, a republic which occupies the western part of the island of Hayti, the eastern portion being the republic of San Domingo. The island of Hayti is, next to Cuba, the largest of the West Indies. It is separated from Cuba by the Windward Passage and from Porto Rico by Mona Passage. Its length from east to west is 400 miles; width, 155 miles; and area, 28,250 square miles. The coast lines are irregular and afford good landings for vessels. Much of the surface is mountainous, but there are extensive valleys, savannas, and coast plains. The highest mountain chain trends through the central part, Loma Tina, with an elevation of 10,165 feet, being the culminating peak. The climate, like that of other West Indian islands, is variable, the seasons being designated as wet in May and June and dry during the time of lower temperature, but it ranks as the most healthful of the entire group. Numerous small streams drain the interior, but most of them are swift and only a few are fitted for navigation by small boats. Several large lakes, including Lake Enriquillo, are in the western part. Extensive and valuable forests abound.

Hayti was discovered by Columbus in 1492, when about 2,000,000 natives inhabited the island, but under Spanish rule they were reduced to slavery and many perished. The French settled in the western part in 1630 and secured a cession of that portion from Spain in 1697. Under the leadership of Toussaint l'Ouverture, who was recognized as the generalissimo by the natives, the Negroes led a revolt against France in 1791. An independent republic was established, but this was suppressed by Napoleon in 1801, when Toussaint was captured



and deported to France. Another revolt was led by Dessalines in 1803, when he was made emperor, but was assassinated three years later, and Spain again gained possession of the entire island. After many years of war and bloodshed the two portions became separated and now maintain their integrity as independent republics.

The republic of Hayti has an area of 10,204 square miles. In 1909 the country had 25 miles of railways, the principal line being between Cape Haytien and Grande Rivière. The official language is French and the prevailing religion is Roman Catholic. Public schools of an elementary nature are maintained in most of the districts, but are in a backward condition. The government is vested in an assembly of two chambers, the senate and the commune, and a president, whose term is seven years. Among the industries are agriculture, lumbering, commerce, mining, and manufacturing. The soil being productive, agriculture is the principal in-



ISLAND OF HAYTI.

dustry. Among the chief products are rum; coffee, tobacco, cotton, sugar cane, cacao, and many species of tropical fruits. Gold, silver, tin, iron, clay, and granite are the principal minerals. The forests yield logwood, pine, satinwood, mahogany, and dyewoods. Among the domestic animals are cattle, swine, mules and horses. The export and import trade is largely with the United States, Germany, France, and Great Britain. Hayti has extensive pearl and other fisheries, but they have not been developed to their full capacity. The manufactures include soap, matches, candles, cigars, utensils, fabrics, toys, and machinery.

The inhabitants are Negroes and mulattoes, about ninety per cent. being of the former class. Port au Prince is the capital and largest city. Other cities include Cape Haytien, Aux Cayes, Gonaves, and Port de Paix. Population, 1906, 1,503,048. See **San Domingo**.

**HAZE**, a slight obscuration in the atmosphere, causing objects to appear dim and obscure. When the haze is very dense, it obscures the light of the sun to a considerable extent, and a light haze deadens the blueness of the sky so objects in the distance appear dim or dull. It is due to the presence of small particles of solid matter, which are raised by ascending currents of hot air or by wind. This kind is ordinarily called *heat haze*. The presence of small particles of water or ice give the sky a light gray color, when the haze is said to be *aqueous*. Other forms are those caused by smoke from peat bogs or forest fires, or by the particles of matter thrown into the air during volcanic eruptions. Many parts of India and China are frequented by dust clouds and dust haze is seen frequently in autumn in most countries, especially if the season is somewhat dry.

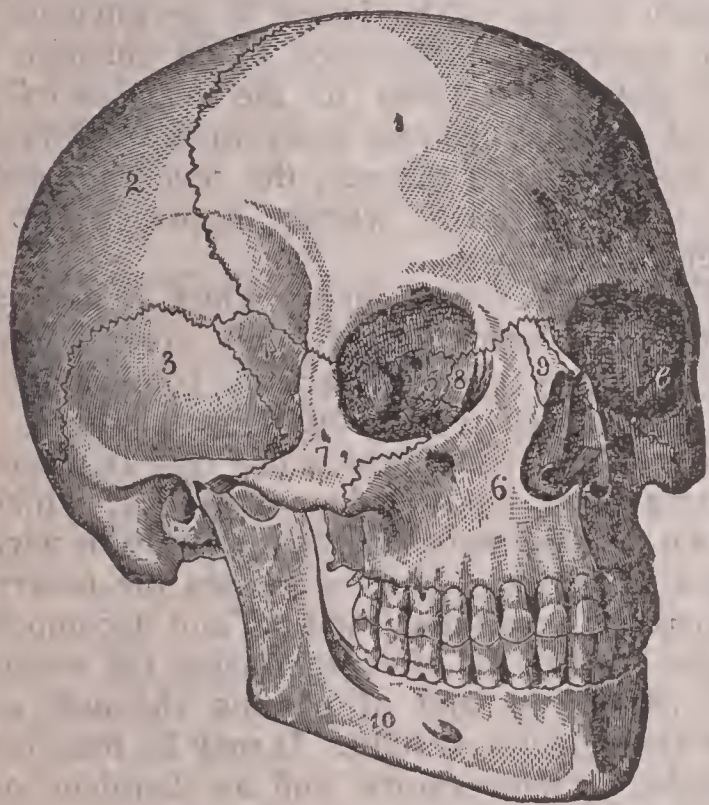
**HAZEL**, a class of shrubs or small trees which belong to the genus *Corylus*, widely distributed in North America, Eurasia, and Africa. Twelve recognized species have been described. They bear nuts much favored as food and for the production of hazelnut oil. The larger nuts borne by the hazel tree are called *filberts* and the smaller are known as *hazelnuts*. They have staminate and pistillate flowers and are among the first plants to bloom in the spring. The wood of many species is used for making baskets, hoops, crates, and charcoal, and the roots are serviceable in veneering.

The charcoal of the hazel tree is valuable for painting and in the manufacture of gunpowder. A species common to Italy yields woods useful in refining turbid wine. See illustration on following page.

**HAZLETON** (hā'z'l-tŏn), a city of Pennsylvania, in Luzerne County, 98 miles northwest of Philadelphia, on the Lehigh Valley and other railroads. The surrounding region is noted for its immense production of anthracite coal. It has a State hospital for miners, the Hazleton Seminary, a fine high school, and the Saint Gabriel's Academy. Among the manufactures are ironware, machinery, coffins, brushes, and earthenware. Street railways, telephones, waterworks, and pavements are among the improvements. Hazleton was settled in 1820 and incorporated as a city in 1890. Population, 1900, 14,230; in 1910, 25,452.



**HEAD**, that part of the body of an animal which contains the brain and the organs of the special senses. The head of man has 22 bones, which form a cavity for the protection of the brain and the organs of smell, hearing, sight, and taste. These bones are immovable, except the lower jaw, which is hinged at the back so as to allow the mouth to be opened and closed. The skull bones are composed of two compact plates, with a spongy layer between. These bones are joined at the outer portions by sutures in a way termed dovetailing by carpenters. Within the skull is the delicate brain, peculiarly protected by the oval shape of the bones. The smaller and stronger structure of the skull is toward the front, where danger is greatest, while the spongy packing between the layers serves to deaden a blow that might fall upon the head. Nerves pass through openings in the skull and communicate with the brain. The skull proper consists of eight bones—two temporal, two parietal, and a frontal, occipital, ethmoid, and sphenoid. Fourteen bones constitute the framework of the face, including the vomer and the inferior maxilla, and two each of superior maxillae, nasal, malar, lachrymal, turbinated, and



HEAD.

1, frontal bone; 2, parietal; 3, temporal; 4, sphenoid; 5, ethmoid; 6, superior maxillary; 7, malar; 8, lachrymal; 9, nasal; 10, inferior maxillary.

palate. Many animals of the lower forms of life are destitute of heads.

**HEADACHE**, or **Cephalalgia**, the name applied to any pain in the upper or back part of the head. In itself it is not a disease, but is a symptom of many widely differing conditions, though the seat of the disease causing the head-

ache may be seated at a place remote from the pain. An unhealthy liver may cause a general headache, while typhoid and many other fevers



HAZEL.

1, Flower. 2, Leaves and Fruit.

have a severe headache as a symptom. Those suffering with Bright's disease are frequently sufferers of frontal headache. Gastric dyspepsia, malaria, gout, indulgence in alcoholic beverages, and eye-strain are other prolific causes. Careful diet and regularity in habits should be adopted by persons suffering from an attack, but a skillful physician is needed in chronic headache. Meningitis or brain diseases cause very severe headache and need the most careful treatment. Drugs usually given, such as morphia, aconite, belladonna, quinine, and antipyrine, are frequently very dangerous and tend to produce drug habits. Drugs of this kind should be taken only upon the advice of a physician.

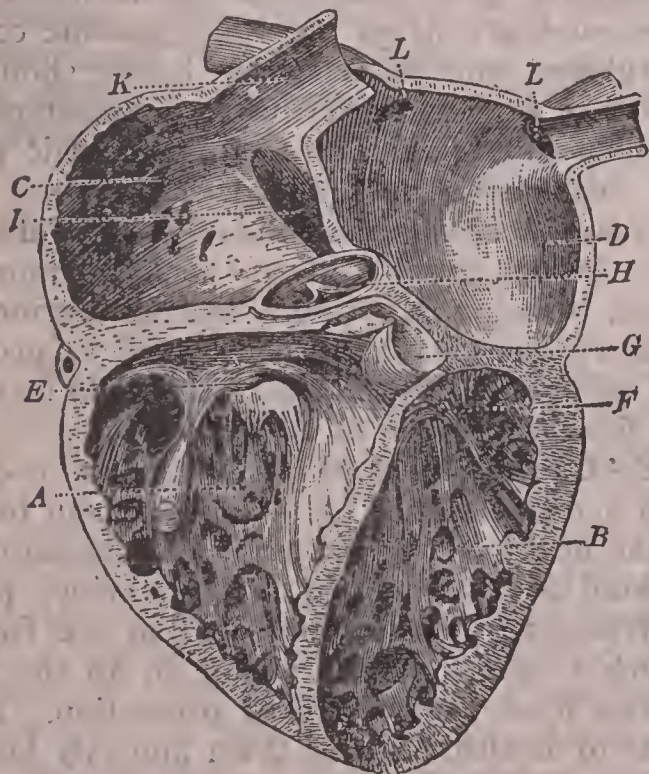
**HEALTH, Board of**, an organization established and maintained by the government to protect the health of the citizens. Organizations of this kind are maintained in the various political divisions of most countries and are formed on such a basis that the people in all the communities have some form of protection. Local boards of health, such as town and city boards, are more or less subject to the regulations of the state or general boards of health, and the latter work in harmony with various departments of the national government. The function of a State board in most cases is advisory, and its requirements are carried out by the boards of townships and municipalities. A county or parish physician is usually the advisory officer of a township board, while municipal



boards are aided by a health officer, who is required to be a physician, and is appointed or elected for that purpose. In most countries, as in the United States, though no national board of health is maintained, the duties devolving upon such an organization is performed under the direction of the Department of the Interior.

The duty of the board of health is not to provide for the treatment of diseases, but rather to prevent the spread of influences that are harmful to health in a general way. It consists mainly in enforcing vaccination and quarantine regulations to prevent the spread of contagious diseases, to prevent fraud in preparing medicine and food, to control drainage and plumbing, to look after the ventilation and fire escapes of buildings, to regulate the slaughtering of animals, to provide for the removal of dirt and filth, and to consider and direct in regard to any matter that may injuriously affect the health of the community. In many cases the local board of health has exclusive charge of disinfecting the buildings in which patients were treated for contagious diseases, and in some instances provide for medical treatment of those unable to secure a physician. See **Hygiene.**

**HEART**, the organ that propels the blood and causes it to circulate through the arteries,



HEART.

A, right ventricle; B, left ventricle; C, right auricle; D, left auricle; E, tricuspid valve; F, bicuspid valve; G, semilunar valves; H, valve of the aorta; I, inferior vena cava; K, superior vena cava; L, pulmonary veins.

veins, and capillaries. It is muscular, pear-shaped, and about the size of the fist. The heart has four chambers, the two upper being called *auricles* and the two lower, *ventricles*.

The auricles are receiving chambers and the ventricles are expelling chambers, but the auricles and ventricles on each side communicate with each other, while the right and left halves of the heart are distinct and perform different offices. The red blood is propelled by the left side and the dark blood by the right. In man the heart hangs point downward in the left central part of the chest and is inclosed by a loose sack of serous membrane, called the *pericardium*. It is held in place by the attachment of the pericardium to the diaphragm and by the large blood vessels that communicate with it. The heart has an alternative contraction and expansion movement; the former is called the *systole* and the latter the *diastole*. Blood flows into the heart during the diastole movement and is expelled by the systole. The beating of the heart is due to these movements and may be distinctly heard between the fifth and sixth ribs.

The impure blood coming from the system enters the *right auricle* through the *inferior* and *superior vena cava*, thence passes into the *right ventricle* through the *tricuspid valve*, and is then driven past the *semilunar valves* through the *pulmonary artery* to the lungs to be purified. It next returns as bright-red blood through the four *pulmonary veins* to the *left auricle*, is forced past the *bicuspid valve* to the *left ventricle*, and is driven through the *semilunar valves* into the *great aorta*, whence it passes into the general circulation.

**HEAT**, a form of energy which is generated by the transformation of some other form of energy, as by chemical action, combustion, or the stoppage of mass motion by friction. All bodies possess some heat, since *cold* is merely a relative term, but the degree of heat which is known as *temperature*, differs greatly in various forms of matter. Heat possesses the power of vaporizing, expanding, melting, and decomposing bodies. It has the effect of raising the temperature of objects and of passing through space with the velocity of light. It may be manifested as light, as temperature, and as chemism, or in all of these ways at the same time.

The theory of heat now generally accepted is that of Macedonio Melloni (1798-1854), an Italian physicist. This theory is called the *theory of undulation*, and supposes that heat is caused by a vibratory or oscillatory motion of the particles of the body and is a condition of matter, not a substance. The hottest bodies are those in which the vibrations move quickest through the widest space. The theory implies that the molecules of solid bodies are in constant vibration. When this oscillation is increased,



the body becomes heated; when it is decreased, the body is cooled. Ether fills the vacant spaces between the molecules. The ether puts the molecules in motion, or it is thrown into vibration by them, in the same manner as the air moving through the leaves of a tree sets its boughs in motion, and in turn may be kept in motion by the waving of branches. The sources of heat are chemical and mechanical energy, the stars, and the sun.

That friction and percussion produce motion may be illustrated in bringing a moving mass in contact with one at rest, by which the motion of the mass is changed into motion among molecules. Chemical action is seen in fire, in which the oxygen of the air has an affinity for the carbon and hydrogen of the fuel, and, by combining the chemical energy, there is a transformation into that of sensible heat. The cause of heat coming from the sun and stars is the rapid vibration of the molecules. By them waves of ether are set in motion, which are propagated across the intervening space, and give up their motion when they meet the earth. The effect of heat upon all solid, liquid, or gaseous bodies is to expand them, while a material reduction of the temperature causes them to contract. This gives rise to the popular term, "Heat expands; cold contracts." The only partial exception to the rule is water (q. v.). At a certain temperature heat vaporizes liquids, but in solids it produces fusion. By conduction and radiation it may be transmitted to other bodies. The term *radiated heat* implies the heat produced by radiation, which gives rise to the terms thermal ray, ray of heat, and calorific ray, these being used in correspondence to the terms luminous ray and ray of light.

In propagating radiate heat from a hotter to a colder body the intervening medium is not heated. Both heat and light are transmitted by the same medium. They are similar in that they are the vibrations of an elastic medium, obey the same laws of reflection, interference, refraction, and polarization, and are subject to the general laws of wave motion. Two bodies placed in contact with each other give off heat to each other. If they are equally hot, the exchange of heat is mutual, and it appears as if no heat passes between them, and they are then said to be of the same temperature. However, if one of them is more highly heated than the other, it gives more heat than it receives, and is therefore at a different temperature. Instruments used to measure temperature are called *thermometers*. Different scales or units of measurement may be adopted for measuring heat and various chemicals, such as mercury and

spirits, serve in the preparation of thermometers. The branch of science that treats of the measurement of quantities of heat is called *calorimetry*.

**HEATH** (hēth), the common name of any plant of the heath family, which includes about 500 species. They are widely distributed in Europe and South Africa, but only a few species are native to North America. The common heath of England, a low evergreen shrub with small leaves and clusters of rosy flowers, is found chiefly on the waste lands. It grows in beds on the sides of mountains, and the stems are from three to four feet in length. The flesh-colored heath is found on the mountains of Europe. In this plant the leaves come out early in the spring, causing it to be looked upon as a harbinger of the growing season. Several species native to South Africa are cultivated extensively as greenhouse plants and are favorites for the beauty and variety of their flowers. Small tracts of land in which small evergreen shrubs comprise the dominant plant types are commonly called *heaths*. Small regions of this kind are found in Canada and the northern part of the United States, in which the junipers and bearberry are the prevailing plants. The huckleberry, cranberry, and trailing arbutus are familiar species allied to the heath.

**HEAVEN** (hēv'n), in science, the expanse which surrounds the earth and seems like a great dome or arch containing the sun, moon, and stars. It appears to rest on the horizon, and is in reality merely the aspect that a spectator sees when looking into the immeasurable space of the universe. In theology, heaven signifies the abode of God, where the Most High and the angels dwell and are especially manifest. Among the Jews heaven is regarded as the special abode of God and it is held to be high above the earth. Christians believe that Christ came from heaven, and, after fulfilling His mission on earth, returned there to prepare a place for the saved. Those who reach heaven shall not experience hunger or thirst, nor feel undue heat nor any sorrow. This condition is to be reached after the resurrection, when mortality shall become immortal and incorruptible.

**HEAVES.** See *Broken Wind*.

**HEBREWS** (hē'bruz). See *Jews*.

**HEBREWS**, *Epistle to the*, one of the canonical books of the New Testament. It was addressed to the converted Jews for the purpose of fortifying them in the Christian faith. The chief purport of it is to demonstrate the preëminence of Christ over Moses and the angels and of the Gospel over the law, and to show that the latter was typical of the former and was abol-



ished by it. Luther suggested Apollon as the author, and this view was held by a number of prominent Christian writers. However, the Greek fathers ascribed the authorship to Paul, though no Latin writer attributed it to him until about the 4th century.

**HEBRIDES** (hĕb'ri-dĕz), or **Western Islands**, a chain of islands off the western coast of Scotland. The total number includes about 500 islands and islets, of which only 90 are inhabited. They are classed in two groups, known as the Outer and the Inner Islands. Barra, North Uist, South Uist, Benecula, and Saint Kilda belong to the Outer Islands, while Skye, Mull, Jura, Coll, and Tiree belong to the Inner Islands. They belong to the counties of Inverness, Ross, and Argyle. The climate is humid and the soil is largely poor. Agriculture, cattle rearing, and fishing are the principal industries. The Hebrides were colonized by the Norwegians in the 9th century and remained subject to Norway until 1266, when they were annexed to Scotland. They were governed by chiefs for a number of decades, who assumed the title of *Lord of the Isles*, and were made a crown possession of Scotland in 1540. Population, 1908, 98,045.

**HEBRON** (hĕ'brūn), an ancient city of Palestine, located in the valley of Eschol, twenty miles south of Jerusalem. It is situated in the region which anciently belonged to the tribe of Judah. The streets are narrow and crooked. It has tombs which are alleged to be those of Abraham, Isaac, Jacob, and others of the patriarchs. The surrounding country is noted for its fruits, especially grapes and olives. Abraham and David resided in Hebron a number of years. It was captured by Saladin in 1187. Population, 1906, 19,020.

**HECLA** (hĕk'là), or **Hekla**, an Icelandic volcano, situated 20 miles from the southwestern coast, elevated 5,100 feet above sea level. It is covered with snow perpetually, contains several craters, and is composed largely of lava and basalt. The most extensive eruption on record occurred in 1783, when a stream of lava was thrown out which extended a distance of 45 miles and was 15 miles wide. Other notable eruptions were those of 1845 and 1878. The discharges consist largely of ashes, lava, and masses of pumice stone.

**HEDGEHOG** (hĕj'hōg), a mammal native to Eurasia and Africa, belonging to the insectivorous animals, and remarkable for its covering of spines instead of hair. It has small black eyes and short legs. The body is about ten

inches long. It defends itself against its enemies by contracting special muscles whereby it is rolled into a ball, causing the spines to stand quite rigid. The hedgehog inhabits small thickets and feeds on insects, worms, snails, and sometimes on vegetable matter, which it seeks at night. During the winter it hibernates. From three to eight young are born in a litter. The spines develop soon after birth. Fourteen species have been described, most of which have only a rudimentary tail and none is native to America or Australia. A closely related spine-bearing mammal, called the Canada porcupine, is native to the northern part of North America.

**HEGIRA** (hĕ-jī'rà), **Hejra**, or **Hijra**, an Arabian word, meaning *going away*, and used to describe the flight of Mohammed from Mecca on Sept. 13, 622 A. D. This is the beginning of the Moslem era. A calendar made by Caliph Omar in 639 begins with the first day of the month in which the flight occurred. The Mos-



HEDGEHOG AND YOUNG.

lem year consists of 354 days and 9 hours, hence is about 11 days shorter than the Gregorian year. This makes it difficult to reduce the Christian to the Mussulman year, but it may be roughly done by subtracting 40 from the former and adding 622 to the remainder. Since 1328 of the Hegira corresponds to the year 1910, it will be seen that  $1328 - 40 + 622 = 1910$ .

**HEIDELBERG** (hī'del-bĕrg), a city of Germany, in the grand duchy of Baden, on the Neckar River, ten miles southeast of Mannheim. It occupies a beautiful site in a valley between the river and the slope of the Königstuhl, an elevation 1,860 feet high, and has several beautiful streets. The noteworthy buildings include a castle of much beauty begun in the 13th century, the Church of the Holy Ghost, the Church of Saint Peter, the city hall, the public library, and the University of Heidelberg. Among the



manufactures are musical and scientific instruments, fabrics, clothing, and machinery. The celebrated Heidelberg tun is kept under the castle. It has a diameter of 26 feet, a length of 36 feet, and a capacity of 50,000 gallons of wine. Heidelberg has many beautiful parks, electric lights and street railways, pavements, and extensive railroad connections. The city dates from the latter part of the Middle Ages and suffered much during the Reformation. In 1803 it was annexed to Baden. Population, 1905, 49,527.

**HEIDELBERG**, University of, a famous institution of higher learning at Heidelberg, Germany, founded by Elector Rupert I. in 1386. Although a Roman Catholic center of learning at the beginning, it became a powerful influence of the Protestants in the 16th century. Here Melancthon preached the reformed faith. The 500th anniversary of the university was celebrated with imposing ceremonies in 1886. It has a library of 500,000 volumes, a faculty of 160 instructors, and an attendance of about 1,600 students.

**HEILBRONN** (hīl-brōn'), a city of Germany in Württemberg, 32 miles north of Stuttgart. It is located on the Neckar River, which is navigable at this place, and is at the junction of several railways. Among the chief buildings is the Church of Saint Kilian, a Gothic structure of the 11th century. It is the seat of a gymnasium, a school of agriculture, a large public library, and a meteorological observatory. The chief manufactures include sugar, jewelry, salt, cigars, chemicals, and machinery. It has a large trade in groceries, coal, merchandise, and farm produce. Near it are several mineral springs, which were visited by Schiller and a number of prominent sovereigns, including Gustavus Adolphus and Charles V. Heilbronn became a free city in 1360. It suffered greatly during the Thirty Years' War. Since 1802 it has belonged to Württemberg. Population, 1905, 40,004.

**HEIR**, in law, one who succeeds to his estate, not by the will of a decedent, but by the death of another. Such inheritance comes to the heir by operation of the law. This may be said to be a restrictive use of the word, since the term is used in some countries to describe the descent of property both by will and by the natural law of descent. An heir is said to be *direct* when the line of descent is direct, as from parents to children or grandchildren. All others, as brothers, sisters, cousins, uncles, etc., are termed *collateral heirs*. One who is certain to inherit property, provided he outlives another, is called an *heir apparent*.

**HELDER** (hēl'dēr), a city of the Nether-

lands, in the province of North Holland, at the entrance to the Zuyder Zee. It is strongly fortified and is protected from the sea by a dike built of Norwegian granite. This dike is five miles long and thirty feet wide at the top. It serves as a roadway from Helder to Nieuwediep, the harbor at the entrance to the North Holland Canal, by which Helder is connected with Amsterdam. The city has a large local and foreign trade. It is the seat of a naval hospital, shipyards, barracks, and magazines, and a military school. In 1673 it was the scene of a famous battle between the allied fleets of France and England, on one side, and the naval forces of Holland under Tromp and De Ruyter, in which the latter were successful. Population, 1906, 26,982.

**HELENA** (hēl'ē-nā), county seat of Philips County, Arkansas, on the Mississippi River, about eighty miles below Memphis, Tenn. It is on the Saint Louis, Iron Mountain and Southern, the Arkansas Midland, and other railroads. The chief buildings include the county courthouse, the high school, and the Southland College. It is surrounded by a fertile country and has a large trade in cotton and lumber. Among its manufactures are shingles, cotton-seed oil, machinery, lumber, and utensils. In 1863 it was the scene of a battle between the Confederates under General Holmes and the Federals under General Prentiss, in which the latter were defeated. Population, 1900, 5,550; in 1910, 8,772.

**HELENA**, the capital of Montana, county seat of Lewis and Clarke County, in the Prickly Pear valley, about fourteen miles west of the Missouri River. It is on the Northern Pacific and the Great Northern railroads and has intercommunication by electric lines. The site is a fine tract of land, sufficiently rolling to be well drained, and is surrounded on all sides by elevated ridges of the Rocky Mountains. The noteworthy buildings include the State capitol, the public library, the county courthouse, the Federal building, the high school, Saint John's Hospital, and several fine churches. It is the seat of the Montana Wesleyan University, a Methodist Episcopal institution. The surrounding country is agricultural, and contains valuable deposits of gold, silver, ruby, and sapphire. Among the manufactures are harness, vehicles, flour, machinery, implements, lumber, and quartz products. It has extensive machine shops and foundries. Helena was a mining camp in 1864, but was platted the same year and incorporated in 1881. Population, 1900, 10,770; 1910, 12,515.

**HELGOLAND** (hēl'gō-lānt), or **Heligoland**, an island in the North Sea belonging to Germany, situated 38 miles from the mouth of



the Elbe. It is a half a mile wide and two miles long. The area was formerly much larger, but it has been worn away by encroachments of the sea. The coast lines rise perpendicularly from the sea, but the soil is very fertile. It is cultivated largely in orchards and gardens. The fisheries are important, especially those yielding haddock and lobsters, and as a summer resort it is a favorite gathering place. Helgoland is important mainly as a strategic point and has been strongly fortified by the German government. In 1807 England forced Denmark to evacuate the island, when it was ceded to the British, and in 1890 it was formally ceded to Germany. Population, 1905, 2,385.

**HELICON** (hĕl'ī-kŏn), or **Sagara**, a mountain range in the southwestern part of Boeotia, Greece, and the fabled resort of the ancient Grecian muses. In these mountains were temples dedicated to the Muses and Apollo. They contained the fountains of Aganippe and Hippocrene, which gave inspiration to the poet Hesiod. Paleo-Vuno, the loftiest peak, is 5,730 feet high.

**HELIOPOLIS** (hĕ-lī-ŏp'ŏ-līs), meaning city of the sun, the city called On, Bethshemesh, or Rameses in ancient Egyptian writings, but now known as Matarich. It is situated on the Pelusiac branch of the Nile, near the canal which connects that river with the Red Sea, eight miles northeast of the present city of Cairo. Under the Pharaohs it was the most populous city of Egypt, being beautified by lakes and canals that connected it with the Nile, and in it were many temples and schools. These schools were visited by Eudoxus and Plato. Mention is made of the place by Herodotus and Strabo, but in the time of the latter it was little more than a deserted village. It is thought to have been the place where Joseph and Mary found refuge in their exile with the infant Christ. The pillar of On still stands near the present village. The obelisk now in Central Park, New York, was first brought to Alexandria from Heliopolis and thence to America.

**HELIOTROPE** (hĕ'lī-ŏ-trŏp), a genus of plants, including both annual and perennial species. They occur mostly in the warmer climates as herbs or undershrubs, but many are now cultivated extensively in all countries as ornamental plants and for the manufacture of perfumes. The leaves are oblong and small, the flowers are white or pale red and of beautiful fragrance, and the fruit is in the form of four drupes covered by a fleshy inclosure. A species known as Indian heliotrope is an Asiatic plant, but now grows wild in the Mississippi valley. It has hairy leaves. The **heliotrope** thrives best

in a light, rich soil and may be propagated by cuttings.

**HELIOTROPE**, or **Bloodstone**, a form of quartz allied to chalcedony or jasper. The color is usually deep green with red spots. It is highly prized for seals, signet rings, and various other purposes. Deposits occur in practically all countries, but the finest specimens come from Asia, particularly from Persia, Tartary, and Siberia.

**HELIUM** (hĕ'lī-ŭm). See **Chemistry**.

**HELL**, the place of punishment for the wicked after death. The term is used with



HELIOTROPE.

more or less distinctness in nearly all forms of religion, though the precise nature of the punishment varies widely. The three most common views are that it is a place where a future life is to be spent in eternal misery, with no idea of moral retribution, that the offenders punished there for deeds done in this life may escape after a period of torment, and that it enters as an important factor in the moral government of the universe, serving as a place or condition in which the wicked are punished rigorously. The terms used in the Hebrew from which translators have drawn in compiling different works are *sheol*, meaning a grave or pit, and *gehenna*, a term referring to the valley of Hinnom. The Greek *hades*, the unseen, is now used with its original meaning, and those said to enter there are thought to pass into an unseen or invisible state. In the New Testament *gehenna* is translated into the word hell, which is described as a place where the fire is not quenched. It is especially stated that hell was instituted as a place of punishment for the devil and his angels.

**HELLEBORE** (hĕ'lĕ-bŏr), the common name of several species of plants. The common



hellebore of Europe is a perennial herb with short root-stalks. It has leathery leaves and variously colored terminal flowers. The black hellebore has evergreen leaves, white flowers tinged with red, and is commonly called Christ-



HELLEBORE.

mas rose, since it has a rose-like flower and blooms early in the season. In this species both the leaves and flower stalks originate from the root-stalks. A species known as green hellebore has been naturalized in the eastern part of Canada and the United States, where it is cultivated and grows wild to a considerable extent. The white hellebore does not properly belong to this class of plants, but is a member of the lily family. Hellebore is a drug used in medicine for its cathartic properties. Formerly it was thought to be useful in cases of insanity and was used by the ancients for treating that malady.

**HELLESPONT.** See **Dardanelles.**

**HELL GATE,** the name of a formerly dangerous pass in the East River, between New York and Long Island. This pass is a portion of the strait which connects Long Island Sound with New York Bay. In 1885 the obstruction was removed by extensive submarine mining and the use of powerful explosives. As these obstructions no longer interfere with the passage of vessels, much value has been added to the East River for navigation purposes.

**HELMET,** a covering or protection for the head, formerly worn as a piece of armor. The helmet was made of iron or steel throughout the Middle Ages, when it had appendages to be drawn over the neck and face during an engagement. It was intended particularly to furnish protection from behind and from above, since the warrior was expected to defend the face chiefly by an adroit use of the sword or some other weapon. The helmet is of very ancient

origin, being mentioned by Homer in connection with the Trojan War.

**HELOTS** (hē'lōts), the name applied to the slaves in ancient Sparta, which had authority to assign them to citizens and alone had power to dispose of their life and freedom. They were employed largely by citizens in agricultural and mechanical pursuits, but during the time of war they were required to bear arms. They gave evidences of especial bravery during the Peloponnesian War, for which about 2,000 were granted liberty in 431 B. C. Since they were the most numerous element in Sparta, they were kept under close observation by the Ephors, who exercised a wide administrative authority in the government. See **Sparta.**

**HELSINGBORG** (hěl-sing-bör'y'), or **Hälsingborg**, a city of Sweden, located on the Sound, opposite Elsinore, Denmark. It is the converging center of several railroads and has a safe and commodious harbor. The manufactures include sugar, cured meats, canned fish, machinery, and sailing vessels. It has a large export trade in earthenware, iron ore, and fish. The imports consist chiefly of fertilizers and coal. The city is strongly fortified and has been the scene of several battles. Population, 1906, 31,404.

**HELSINGFORS** (hěl-sing-förs'), a city and seaport of Russia, capital of Finland, on the northern shore of the Gulf of Finland. As a naval station it is next in importance to Cronstadt. The prominent buildings include the governor's palace, the parliament house, the Lutheran Church of Saint Nicholas, the Russian church, and the commercial exchange. It is the seat of the University of Helsingfors, which has a library of more than 200,000 volumes. The city has many fine parks and charitable institutions. It is a flourishing trade and railroad center, has an excellent harbor, and engages largely in the manufacture of woolen and linen goods, sail cloth, machinery, and tobacco. The trade in fish, lumber, and corn is important. It was founded in the 16th century by Gustavus I. of Sweden. Since 1809 it has been a part of Russia. Population, 1905, 117,317.

**HELVETII** (hěl-vē'tī-i), the ancient people who inhabited the regions now occupied by Switzerland. They were of Gallic or Celtic origin. In 58 B. C. Julius Caesar, then governor of Gaul, came in contact with them. At that time they attempted to emigrate in large numbers from their possessions and occupy southern Gaul, but were defeated by Caesar at Bibracte, in Burgundy, and made subject to Roman authority. In the "Commentaries" written by Caesar an account is given of these people. Later they re-



fused to recognize Roman supremacy, which caused Vitellius to send General Caecina to subdue them. After that the Helvetii disappear from history and their territory was occupied by the Alemanni.

**HEMATITE** (hēm'ā-tīt), or **Specular Iron**, a common ore of iron, divided on account of the color into red and brown hematite. Both kinds occur in stratified and igneous rocks. The crystals are in the hexagonal system, and some of the varieties have a characteristic metallic luster. The red hematite is an important mineral, containing about seventy per cent. of iron, and is widely distributed. The most extensive deposits of North America are in the Lake Superior region, where the ranges of Gogebic, Vermilion, Menominee, Mesabi, and Marquette are located. Iron Mountain and Pilot Knob, Missouri, are the most noted regions producing this mineral in the Mississippi valley.

**HEMIPTERA** (hē-mīp'tē-rā), the name of an order of insects, so called because many of the species have wings formed partly of horny and partly of membraneous matter. All have the mouth formed like a beak or proboscis for piercing the plants or animals on which they feed. Metamorphosis is incomplete, though the young do not have a close resemblance to the adults. Some of the species are wingless. Among the insects belonging to this order are the cicada, louse, bedbug, water scorpion, chinch bug, and squash bug. See **Insects**.

**HEMISPHERE** (hēm'ī-sfēr), one of two equal parts into which a globe or sphere is divided by a plane passing through its center. Geographers use the term in describing the surface of the earth, which they divide into the land and the water hemispheres. Another division is to classify the surface as the Eastern Hemisphere and the Western Hemisphere, the former comprising Africa, Asia, Australia, and Europe, and the latter containing North America and South America. See **Earth**.

**HEMLOCK** (hēm'lök), a genus of poisonous plants of the parsley family. They have a tall, hollow stem and white flowers in compound umbels surrounded by an involucre of three or more leaflets. The best known species is the poisonous hemlock, or spotted hemlock, found extensively in waste places in Europe, but it is now naturalized in America. This plant grows from two to six feet tall, has a spotted stem, and closely resembles parsnip in its root growth. The poison contained in the different species is an alkali, which causes weakness and later death by paralysis. Extracts of the leaves and fruit have valuable medicinal properties and are used as powerful sedatives. The Grecians

administered capital punishment by giving a decoction of hemlock to criminals, and this is the form of death which Socrates died. In medical practice it is now used as a substitute for opium. It is valuable in treating chronic rheumatism, whooping cough, and cancerous and other sores. The *hemlock spruce*, a species of spruce, is a widely distributed and valuable evergreen tree of North America. It yields large quantities of lumber. See illustration below.

**HEMLOCK SPRUCE.** See **Spruce**.

**HEMP**, a class of plants with unisexual flowers, native to Asia, but now naturalized in all portions of the world. Hemp is cultivated extensively in the Philippines, the United States, Italy, Russia, and many other countries. It is an annual plant and varies in height from two to twenty feet, according to climatic conditions. The quantity of seed sown per acre is from one to two bushels. It is drilled in rows for the reason that the male plants mature earlier than the female, the latter



POISONOUS HEMLOCK.

growing larger and requiring a month longer to ripen the seed. A pithy matter fills the stem, the latter being constituted of woody fibers and covered with a fibrous bark. In India it is cultivated for the narcotic drug commonly called *hashish* (q. v.) and in other countries largely for the fibers, which are useful in the manufacture of sail cloth, ropes, cordage, and other coarse fabrics. The finer species are used extensively in manufacturing shirting, sheeting, and other fabrics suitable for wearing apparel and household purposes. These products are coarser than those made from flax fibers, but they may be bleached with equal success and are much more durable. The seeds produced by the female plant yield an oil highly valuable for mixing paints and varnish, and in the manufacture of soap and illuminating products. Cage birds are fed chiefly with hemp seed. Kentucky



is the principal hemp-producing State. Manila and sisal hemp are not classed with the true hemps.

**HENDERSON** (hĕn'dĕr-sŭn), a city in Kentucky, county seat of Henderson County, on the Ohio River, 148 miles west of Frankfort. It is on the Illinois Central, the Louisville and Nashville, and other railroads. The river is crossed here by a large bridge. The chief buildings include the courthouse, the high school, the public sanatorium, and several churches. Atkinson Park includes a tract of 100 acres. Electric lights and street railways, pavements, and waterworks are among the improvements. The chief manufactures are cotton and woolen goods, vehicles, ironware, machinery, and spirituous beverages. Henderson was one of the first settlements on the Ohio River. It was incorporated in 1797. Population, 1900, 10,272; 1910, 11,452.

**HEN HAWK.** See **Goshawk**; **Hawk**.

**HENLEY REGATTA** (rĕ-găt'ta), a famous rowing contest held annually at Henley-on-Thames, England. The regatta was organized in 1839, as a result of rowing contests held previously between the students of Oxford and Cambridge. Only two boats at a time are permitted in the races, since the river is narrow at this place, and both English and foreign amateurs are eligible. The course is about one and a third miles in length. The contests are held in the month of July and continue for three days. They are attended by vast assemblages of people from the United Kingdom and foreign countries.

**HEPATICA** (hĕ-păt'ĭ-kā), a plant common to the temperate parts of Europe and North America, where it blooms in the early part of spring. It belongs to the genus *Anemone*. The stalk is hairy, the leaves are three-lobed, and the flowers are somewhat similar to the buttercup. Owing to the bloom coming early, the hepatica is used in the study of nature in elementary schools. Some of the species are cultivated for their beautiful flowers, which are pink, white, or blue.

**HEPTARCHY** (hĕp'tark-ĭ), a frequent appellation of the seven principal kingdoms established in England by the Saxons. These established governments did not all exist simultaneously, nor were they entirely independent of each other. They included Essex, Sussex, Mercia, Wessex, Kent, North Umbria, and East Anglia. In 827 they were united by King Egbert of Wessex, who assumed the title of King of England.

**HERALD** (hĕr'ald), an officer employed in ancient and mediaeval times to carry messages of courtesy or defiance between sovereigns or

persons of knightly rank, to challenge to battle, and to proclaim war or peace. In more recent times the official duties of a herald included the granting of arms, marshaling processions and public ceremonies, treating and drawing up genealogies, recording the creation and succession of peers and others, and to determine and regulate all matters in connection with the use of armorial bearings. It is probable that the office originated as early as the origin of coats of arms. In England heralds are appointed by the earl marshal. Most European countries still continue the office of a herald, but the duties are modified from those pursued in former times.

**HERALDRY** (hĕr'ald-rĭ), the science that treats of blazoning or describing armorial bear-



HEPATICA.

ings or coats of arms, and of determining genealogies, precedent, and other matters in connection with titular rank. Historians trace the origin of heraldry to remote antiquity and find it practiced by the early Egyptians and the twelve tribes of Israel. It is exemplified by the Roman eagles. It is probable that signs and emblems were first used for clans and families to distinguish each other, each bearing different coats of arms. During the Crusades it was necessary to use heraldic arms extensively for the purpose of distinguishing the commanders of the different military organizations from each other, which led to an extensive adoption of heraldic practice in Western Europe. The coats of arms borne consisted of an escutcheon or shield, on which were displayed the emblems to distinguish the different commanders or bands of warriors. Besides indicating the rank



of the bearer, many designated the name and residence, and others the country or province in which the ruler held sway. The Herald's College was incorporated in England in 1484, and in it was vested the power to inquire concerning rights and titles in heraldry, to regulate the use of heraldic devices, and to inquire into claims and violations growing out of the system. The rules now recognized by the college are modified largely from those first enforced, but in many respects they are similar to those of other European courts.

**HERAT** (hĕr-ăt'), a city of the northwestern part of Afghanistan, on the Hari-Rud River, about 370 miles west of Cabul. It is surrounded by a rich agricultural and fruit-growing country, has an important market, and is famous as a strategic military and political stronghold. Its trade is controlled chiefly by the Hindus and consists largely of rice, wool, dyes, indigo, asafetida, and leather. The imports from Europe include principally ironware, machinery, textile fabrics, and sugar. Though not extensive, the local manufactories are noted for their production of cloaks, harness, carpets, shoes, sword blades, and sheepskin caps. It was the capital of Afghanistan for many years, but at present is the capital of the western division. Timour captured the city in 1381. It passed into the hands of the Persians in 1510, but has been a part of Afghanistan since 1863. Population, 45,500.

**HERB**, any plant whose stem does not become woody, but dies down to the ground after the growing season. Many herbaceous plants, such as annuals, die entirely and are propagated from the seed, while others die only to the ground and may be grown either from the seed or the root. To the former belong the pea, bean, tomato, melon, and sunflower, while the latter include the caraway, parsley, sage, and horseradish. Herbs are useful in medicines and for food. Many species of aromatic plants are employed in the preparation of viands, such as dill with cucumber pickles and sage in dressings with delicate meats.

**HERCULANEUM** (hĕr'cū-lā'nĕ-ŭm), an ancient city of Italy, situated about five miles southeast of Naples, near Mount Vesuvius. A vast eruption greatly damaged it in 63 A. D., and in the reign of Titus, in the year 79, it was totally buried by the lava flowing from the volcano. It was entirely forgotten until 1709, when its site was discovered by a well being dug at Pesina. The city lies under from 35 to 100 feet of ashes, but in 1713 some relics were found. In 1738 the first extensive excavations were commenced. Since then much work

has been done and many works of ancient art have been secured from the entombed city. Many of the remains, including numerous writings on papyrus, may be seen at Naples.

**HERCULES, Pillars of.** See **Gibraltar.**

**HERCULES BEETLE**, a giant beetle of Brazil, remarkable both for its great size and the peculiar head of the male. It is about six inches long. The male has two large horns, the larger of which is upon the head and the smaller upon the thorax. These projections have the appearance of a pair of pincers and are powerful weapons for offensive and defensive warfare.

**HEREDITY** (hĕ-rĕd'ĭ-tĭ), the tendency possessed by animals and plants to resemble the ancestral stock in many essential characteristics. There is in each animal or plant a tendency or peculiarity which causes it to resemble in certain respects the individuals from which it sprang. In animals the resemblance may be either in mental or physical characteristics, or in both, and the similarity may be noticeable in early infancy or may appear as the individual develops by growth and age. Among the more noticeable points of similarity may be mentioned the form and size of the body, the degree of intelligence, the color of the eyes and hair, and the tendency toward industry and activity. In some instances the marked hereditary tendencies may be traced to only one and in others to both parents, or they may originate from one or more generations which precede the immediate parent. Sometimes the hereditary tendencies alternate in the children. However, in all instances some minute differences are certain to arise. These dissimilarities in some cases tend to be reproduced in successive generations, but generally the movement is in a contrary direction, reproducing a reversion to ancestral types. Darwin, Herbert Spencer, Haeckel, and Wallace have written extensively on this subject and have introduced heredity as a doctrine into zoölogical study. See **Embryology, Evolution.**

**HEREFORD** (hĕr'ĕ-fōrd), a town of England, in a county of the same name, 51 miles south of Shrewsbury. It is on the Wye River and is surrounded by a productive farming and stock country. The chief building is a fine cathedral dating from 1079, having a frontage of 325 feet. It has manufactures of leather, gloves, and hardware. The celebrated Hereford cattle, noted for their meat and production of milk, are native to the vicinity of Hereford. The city has pavements, several fine schools, and railway connections. It was first chartered as a city by King John. Population, 1907, 22,070.



**HERESY** (hĕr'ĕ-sÿ), a word employed in the New Testament to denote a sect or a school of opinion among the Jews. Mention is made of the heresy of the Sadducees and the Pharisees. Saint Paul, when speaking to Agrippa, said: "After the strictest heresy of our religion I lived a Pharisee." Christianity was spoken of by certain Jews in the beginning of its history as the heresy of Nazarene. Later the term came to be applied to the belief of any person who differed from the standards of the church, though he professed Christianity. The Gnostics were among the first to be called heretics among the early Christians, and Gnosticism (q. v.) continued as a potent influence up to the 6th century. The church maintained a systematic policy of repressing heresy, as the beliefs differing from the dominant church came to be called, up to the time of the Protestant reformation, when the era of religious liberty had its beginning.

It was a common practice for the Roman Catholics to be enjoined in communicating in sacred matters with heretics, and many papal bulls were publicly read in Rome as a warning to the faithful against prevalent error. Pius IX., as late as 1864, issued his celebrated "Syllabus of Errors," in which he condemned as erroneous eighty current opinions. Huss, Wycliffe, and Luther are among the many reformers who were designated as heretics and their teachings in the main were stigmatized as heresies. A long line of persecution was practiced in France, Italy, and Spain from the latter part of the 12th to the 16th century, but greater moderation was shown to those who differed from the dominant church in the states of Germany. Many people were burned or tortured in England on the charge that they were heretics. At present the ecclesiastical authorities may pass upon points of doctrine and declare certain beliefs to be heresy, but no punishment aside from excommunication can be inflicted.

**HERKIMER** (hĕr'kĭ-mĕr), a village of New York, county seat of Herkimer County, eighty miles northwest of Albany. It is located on the Mohawk River and the Erie Canal and has transportation facilities by the New York Central Railway. The public library contains about 10,000 volumes. It is the seat of the Folts Mission Institute, has a free public library, and maintains a municipal system of waterworks. The manufactures include mattresses, clothing, and machinery. It is surrounded by a fertile farming and dairying region and has considerable trade in merchandise and farm produce. Population, 1910, 7,520.

**HERMIT** (hĕr'mĭt), a person who retires

from society to live in solitary contemplation and devotion. The word was probably derived from Paul the Thebaid, who lived for many years as a recluse in the deserts of Egypt, dying there at the age of 113 years. Saint Anthony and other historic characters were imitators of the first hermit and from them the name has gone into general use. The term gave rise to the word hermitage, which is generally applied to the home of some prominent person who lives in retirement and to many places of retreat, as the home of Andrew Jackson near Nashville, Tenn., and Rousseau's retreat in the valley of Montmorency, France.

**HERMIT CRAB**, the name applied to several species of crustaceans, found most commonly in the tropical seas. Each individual of the family consists of a fleshy mass, and for protection occupies the cast-off univalve shell of suitable size, which it carries until its size is too large, when it takes up its abode in one larger. See **Crab**.

**HERMON** (hĕr'mŭn), **Mount**, the most elevated mountain of Syria, rising 9,150 feet above the Mediterranean. It belongs to the Anti-Lebanon group. The modern name is Jebelsh-Sheikh. It is mentioned in the writings of Moses by the names Sion and Hermon.

**HERMOSILLO** (hâr-mŏ-sĕl'yŏ), a city of Mexico, capital of the state of Sonora, about ninety miles north of Guaymas. It is located in a fertile valley which produces large quantities of cereals and vegetables. The buildings are chiefly of stone and adobe. Among the improvements are a public library, a government mint, and several schools and churches. It is connected with Guaymas, its port on the Gulf of California, with a railway. Population, 1908, 18,250.

**HERNIA** (hĕr'nĭ-ä), the protrusion of some vital part from the cavity in which it normally belongs. It is due to an unnatural or accidental opening of the walls of the cavity that contains the organ affected. *Rupture* is the common term applied to abdominal hernia, in which the abdominal viscera may become partially or totally displaced. Other organs affected include the heart, the brain, and the lungs, and the protrusions give rise to hernial tumors. Formerly abdominal hernia was entirely neglected by the medical profession, but it is now the subject of careful attention of the most eminent physicians in all countries. The less severe cases can be cured by careful treatment, and temporary or permanent relief may be obtained by wearing a truss or support to retain the organ in its natural position.

**HERON** (hĕr'ŭn), a wading bird allied to



the flamingoes, storks, and spoonbills, belonging to the family *Ardeidae* and the genus *Ardea*. The species are numerous and widely distributed. The *green heron* and the *great heron*, sometimes called the *great blue heron*, are native to North America. In all species the bill is sharp, straight, and longer than the head. The common heron has a grayish color, black quill feathers, and a glossy plume, and measures about three feet from the bill to the end of the tail. It builds its nests in trees, but some nest on low bushes, laying three to four eggs. The different species inhabit the vicinity of ponds, marshes, fresh-water streams, and lakes, and abound on the seashore. They feed on insects, frogs, fish, rats, mice, the young of other birds and mollusks. Some species are

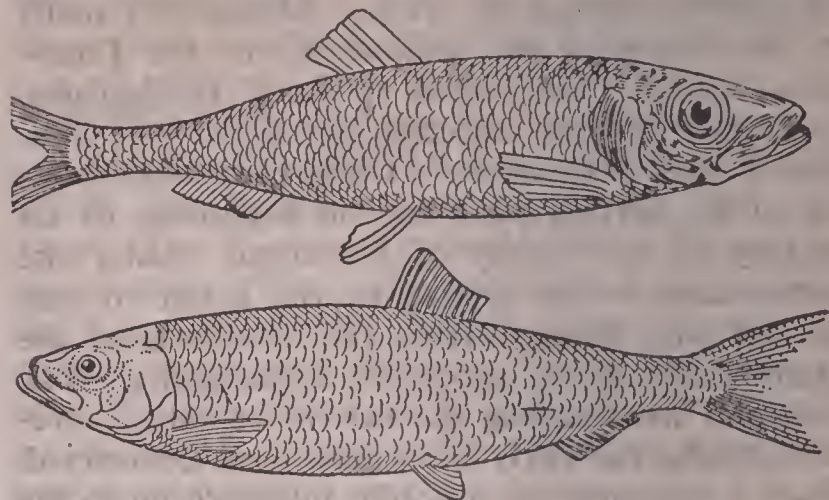


COMMON GRAY HERON.

esteemed for table use, but they are not generally eaten, except by natives.

**HERRING** (hĕr'ring), the name of a large family of soft-rayed fishes, of which the common herring of the North Atlantic is the most valuable. The head is one-fifth its total length. It has small teeth in both jaws. The upper side is blue-green in color and the length is from eight to twelve inches. The herrings are remarkable for rapid propagation. As many as 70,000 eggs have been found in a single female. They travel in schools, live on the small animals of the sea, and are widely distributed.

The herring fisheries of the North Sea and the North Atlantic are the most important. There



HERRING.

they accumulate in large groups to spawn in the summer months, when they are caught in countless numbers by fishers, and are preyed upon by sharks, seals, whales, and predatory birds. The small eggs are heavy, cling together, and settle on rocks, shells, and other solid surfaces at the bottom of the water. It is thought that the herring used for food subsist mainly on minute crustacea and small fishes. The artificial propagation of herring has attained to much success and is pursued extensively. As a food fish the herring is of much value and is utilized largely for curing as well as for fresh consumption. In Norway the annual catch aggregates 1,000,000 barrels. Other extensive herring fisheries are found off Nova Scotia, Holland, France, New England, and in the North Sea.

**HERZEGOVINA** (hĕr-tsā-gō-vĕ'nā), a province of Austria-Hungary. It is bounded on the north by Bosnia, east by Montenegro, and southwest by Dalmatia. The area is 3,530 square miles. It is mountainous, the highest peak ranging about 7,850 feet above the sea, and much of the surface is barren and rocky. The valley of the Narenta River, the largest stream, is fertile. Other tracts are fruitful, but the fertile lands are confined chiefly to the valleys. Fruits, grains, tobacco, and live stock are the principal products.

Herzegovina was formerly a part of Dalmatia, but became a dukedom in 1440. The Turks made it tributary in 1463, after which it was a battlefield for many years between the Christians and Mohammedans. It was transferred to Austria-Hungary by the Treaty of Berlin in 1878, in which condition it remained until 1908, when it was annexed as a crown land to the dual empire. Mostar is the capital and chief city. The inhabitants consist mostly of Slavs and Germans. Population, 1908, 203,080.

**HESSE** (hĕs), or **Hesse-Darmstadt**, a



grand duchy of Germany. It is eighth in size among the German states. The area is 2,965 square miles. Hesse-Nassau divides it into two separate portions, the most northern of which is entirely inclosed by that state. The Rhine, Main, and Neckar are the chief rivers. The soil is productive and yields large quantities of cereals, grasses, and fruits, particularly of the vine. Among the minerals are manganese, iron, and peat. The manufacturing industries produce furniture, shoes, chemicals, cotton and woolen goods, machinery, cigars, and leather. Hesse is a hereditary constitutional monarchy and the chief executive authority is vested in the grand duke, who is assisted by three ministers. About 850 miles of railways are in operation, most of which are owned and operated by the government. Darmstadt is the seat of government and Mentz is the largest city. Other cities include Bingen, Worms, and Giessen. In 1567 the landgraviate of Hesse was divided, from which the grand duchy of Hesse originated. It was formed into Hesse-Cassel and Hesse-Darmstadt in 1604. Napoleon enlarged the latter in 1806. In 1866 it was ceded to Prussia as one of the results of the Austro-Prussian War. About two-thirds of the inhabitants are Protestants. Population, 1905, 1,209,175.

**HESSE-CASSEL** (hēs'-kās'sel), a district of Cassel, in the province of Hesse-Nassau, now a part of Germany. The history begins with 1567, when it was organized as a landgraviate by William IV. Napoleon made it a part of the kingdom of Westphalia in 1806, but it was restored to an electorate in 1813. In the Seven Weeks' War it sided with Austria, which caused it to be occupied by a Prussian army, and in 1866 it was incorporated with Prussia.

**HESSE-NASSAU** (hēs-nās'sa), a part of the German Empire, being a province of Prussia, situated between the Rhine and the Weser. It is composed of portions of Hesse-Cassel, Nassau, and Hesse-Homburg. The area is 6,055 square miles. It is generally elevated, but has rich soil and is well fitted for agriculture and forestry. Iron, coal, zinc, lead, and copper are mined extensively. Cassel is the capital. Fulda, Frankfort, and Wiesbaden are flourishing cities and manufacturing centers. Population, 1905, 2,070,052.

**HESSIAN FLY** (hēsh'an), a small dipterous insect, the larvae of which are exceedingly destructive to rye, barley and wheat. It is about an eighth of an inch in length, the color is brown, the wings are dusky-gray and fringed at the outer sides, and the males are somewhat smaller than the females. The eggs are laid in

May and September on young plants, where they hatch after from ten to fourteen days, and the larvae develop into flies in about ten days. The damage to growing crops occurs during the larval state, when the young suck the juices of the joints and roots. In many sections of the country the erroneous view is held that the Hessian fly was brought to America by the Hessians employed by the British in the Revolution, hence the name. The first extensive ravages in America occurred in 1786 and 1789, but since then they have been quite destructive to small grain, except oats, at various times both in America and Europe.

**HIBBING** (hib'bing), a town of Minnesota, in Saint Louis County, eighty miles northwest of Duluth. It is on the Great Northern and the Duluth, Missabe and Northern railways. The surrounding country is rich in timber and deposits of iron ore. It has electric lights, a fine high school, and a number of well-built churches. Recently it has grown rapidly and it has a large trade in merchandise and manufactures. Population, 1905, 6,566; in 1910, 8,832.

**HIBERNATION** (hī-bēr-nā'shūn), the state of torpor in which many animals that inhabit cold or temperate climates pass the winter. On the other hand, in dry and hot countries various animals pass into a similar condition in the hottest season of the year, this state being known as *aestivation*. Many species of insects hibernate, some in the egg, others in the caterpillar, and still others in the chrysalis state. Hibernation is a physiological condition which is favored, but not produced, by cold. In severe winters many hibernating animals perish, since the temperature of their bodies is reduced to nearly the same degree as that of the surrounding atmosphere. Among the hibernating mammals are the porcupine, hedgehog, dormouse, badger, bear, and squirrel. Bats pass almost the entire winter in a state of sleep. Reptiles hibernate in both cold and temperate climates, which is likewise true of many amphibious animals. Among the hibernating reptiles are the tortoises, lizards, crocodiles, and serpents. During hibernation the digestion and respiration are either almost or entirely suspended.

**HIBERNIA** (hī-bēr'nī-à), or **I v e r n a**, the name given to Ireland by Julius Caesar and the classical writers. Though the island was never conquered by the Romans, it was well known to them. It is mentioned by Aristotle as one of the two islands situated in the ocean beyond the Pillars of Hercules. Ptolemy described a number of the rivers and harbors and speaks of the island as Juverna or Iverna.

**HIBISCUS** (hī-bis'kūs), the name of a large



genus of plants, including herbs, shrubs, and trees. They belong to the mallow family and are widely distributed in both hemispheres. Many of the species have very beautiful flowers, including several obtained from Syria, which are cultivated extensively as ornamental shrubs in Great Britain and the United States. Another species is a tree native to Florida and the West Indies. It yields material for matting and cordage and the wood is light and useful in manufacturing. The Deccan hemp of India belongs to this class of plants and is useful for its valuable fiber. Other species, mostly tropical, are cultivated for their fruit or seed, or are favorite garden plants because of the beauty of their flowers.

**HICCOUGH** (hĭk'kŭp), a spasm of the diaphragm and the glottis. The sharp sound which accompanies a hiccough is caused by the rush of air into the larynx. It is usually due to an unusual distension of the stomach, caused by eating rapidly or eating and drinking excessively. Hiccough is a symptom of some diseases, such as gangrene and peritonitis. A mild attack may be overcome by taking long inspirations of air or by drinking water.

**HICKORY** (hĭk'ŏ-rŷ), the name of several species of forest trees, formerly classed with the natural order *Walnut*. They grow to a great height, frequently 95 feet, and are stately and beautiful. Unless barked, the wood is rapidly damaged by worms, but when cared for is of much value in the manufacture of whip handles, axles, shafts, cogged wheels, and other purposes where a strong and durable wood is serviceable. Among the valuable hickory nuts are those borne by the shagbark, or shellbark, and the pecan, but the wood product of these species is also very valuable. They thrive in many parts of the Mississippi valley and regions farther east. The nutmeg hickory is a species common to South Carolina and elsewhere, but its fruit is of little value. Though an American tree, the hickory has been naturalized and is cultivated in Europe.

**HIDES**, the skins of animals, especially when considered material for leather or when made into leather. The trade in hides of cattle, horses, and other domestic animals has long been an important industry. At slaughterhouses the hides are removed from cattle, protected by a layer of salt, and transported to the tannery, where they are prepared for manufacture into boots, shoes, harness, belts, and many other articles for which leather is utilized. Formerly the chase supplied large quantities of hides, especially those taken from the buffaloes of North America and the wild horses of South

America, but at present the leather used in manufactures is derived almost exclusively from domestic animals.

**HIERARCHY** (hĭ'ēr-ärk-ŷ), a form of government administered in the church by bishops, archbishops, and patriarchs, and in a lesser degree by priests. Theological writers apply the name to the whole government and ministry body of the church, but in this sense it can be applied only to the Christian denominations that are ruled by bishops, such as the Anglican church and the Roman Catholic church. The term was applied especially to the papal hierarchy in the Middle Ages, when the Pope exercised both spiritual and civil authority, although he was limited more or less in the latter by councils and princes. In the latter part of the 14th century a powerful movement began against the exercise of hierarchical powers, and the Protestant revolution made possible the separation of the government of the state and the church.

**HIEROGLYPHICS** (hĭ'ēr-ŏ-glĭf'ĭks), a term originated by Greek and Latin scholars to describe the writings sculptured on buildings and monuments in Egypt and Babylonia. Subsequently it came to be applied to the writings of other peoples, including the picture writings of the Mexicans, Peruvians, and North American Indians. The name originated because it was thought the Egyptian writings related exclusively to sacred subjects and that they were legible only to priests. All attempts made by Western peoples to read the Egyptian hieroglyphics were abandoned in the 17th century and these writings were wholly unknown until 1777, when the French discovered a stone among the ruins of Fort Saint Julien, near the Rosetta branch of the Nile, which has since been called the Rosetta Stone, and is now in the British Museum. This stone contains an inscription of the coronation of Ptolemy V. and was probably sculptured in 95 B. C. It afforded a key by which the language and writings of the Egyptians became known to European scholars.

Four modes of more or less closely associated ancient writings of the Egyptians are generally recognized. They are known as the hieroglyphic, the hieratic, the demotic, and the Coptic. The *hieroglyphic* is the earliest and is formed by figures of objects with various symbols, most of which are arbitrary or mathematical. Later it assumed the form of a lapidary script and was traced in ink or painted on public monuments. *Hieratic* writing is known as the priestly and contains two symbols. The *demotic* form came into use in the



9th century B. C., and was used in commercial and social relations. *Coptic* writing is a form employed in the more recent period of ancient Egypt. On the Rosetta Stone the inscription is written in both the hieroglyphic and hieratic characters, hence it furnished a key to hieroglyphic writing which enabled scholars to translate extensively from Egyptian monuments.

The hieroglyphics found in Mexico and Peru are thought to have originated from the Aztec kings. Their earlier forms consisted of picture designs, but later they became modified into alphabetical characters. It was thought by Baron Houghton (1809-1885) and Stephan Ladislaus Endlicher (1804-1849) that the Assyrian and Chinese writings rose from the earlier hieroglyphics, and that the cursive forms which now constitute their alphabet were derived from the sculptured forms of objects formerly employed on monuments and in temples. See **Egypt**.

**HIGH PRIEST**, the principal religious dignitary in the hierarchy of the Jews. Aaron was the first high priest and from him the office succeeded to Eleazer, his eldest son, and thence to his successor. The Mosaic law provided that the office be held for life. It vested in the high priest the duties of overseeing the sanctuary. The high priest had charge of the service and the treasure and entered the Holy of Holies on the Day of Atonement. About the beginning of the Christian era conflicts began to arise between the civil and ecclesiastical authorities, hence the office ceased to be hereditary and the high priests were appointed or removed by the civil rulers. The pontificate in the time of the Maccabean princess reached its highest brilliancy, since they joined regal to priestly authority in the exercise of the office.

**HIGH SCHOOL**. See **Education**.

**HIGHWAY**, the road or way over which the public generally has a right to pass. In popular usage the term is restricted to ways or roads upon land, such as are used by pedestrians and vehicles, but in law it is applied to all ways that are open to public convenience, including paths, roads, streets, bridges, canals, ferries, public squares, and navigable streams. In English law it is usually called the king's highway, since by the theory of that law it was considered as having been originally given by him. Vehicles meeting in a highway in England are supposed to turn to the left, while in the United States the teams are expected to turn to the right. The law has recognized this rule to a certain extent, and proof of a violation in case of accident is quite essential where action is brought for damages.

A highway may be created by an act of government, as in the case where a new country is laid out for settlement, when the highway is located on the section line and is usually 66 feet wide. New highways may be established in a section of country already settled either by condemnation or by dedication. In the former case it is located by the civil authorities and the owner of the land is compensated according to its value, and in the latter instance the land is given free by the owner of the property, though it does not become a public highway until it is legally accepted by the proper officers. In case property is used as a highway for a considerable length of time to the knowledge of the owner, it becomes a highway through such use and cannot afterward be closed. Formerly extensive interstate or national roads were maintained, but the practice has been abolished very largely since the building of railways, and the authority over highways at present is vested in the smaller political divisions, such as the parish, town, or county. Though the public is permitted to use the whole or any part of a highway, the property right is usually vested in the owner of the abutting land and in case the highway is vacated it reverts to him. Those obstructing a highway are liable to a fine and imprisonment, or both, and in most instances legal restrictions limit the use to some extent, such as prohibiting stock to remain on the same without an attendant. It is unlawful to drive faster than a walk, or more than a certain number of head of stock at one time across the larger bridges.

**HILLSBORO** (hīlz'būr-ō), a city in Texas, county seat of Hill County, in the central part of the State. It is on the Saint Louis Southwestern and the Missouri, Kansas and Texas railroads. The chief buildings include the county courthouse, the high school, and an academy. Among the manufactures are flour, hosiery, candy, clothing, machinery, and cottonseed oil. It has electric lights, waterworks, and a considerable trade in live stock, cereals, and merchandise. Population, 1900, 5,346; 1910, 6,115.

**HILO** (hē'lō), a seaport and the largest city of the island of Hawaii, situated on Hilo Bay. It is the second city of the Hawaiian Islands, being exceeded in size only by Honolulu. The noteworthy buildings include the customhouse, the public library, the courthouse, and several fine schools. It has delightful drives and is ornamented by tropical plants and parkings. The city has a large trade in fruit, rice, fish, sugar, and coffee. Many of the inhabitants are Americans, but the natives and Chinese predominate. Population, 1910, 6,745.

**HIMALAYA** (hī-mā'lā-yā), meaning snow



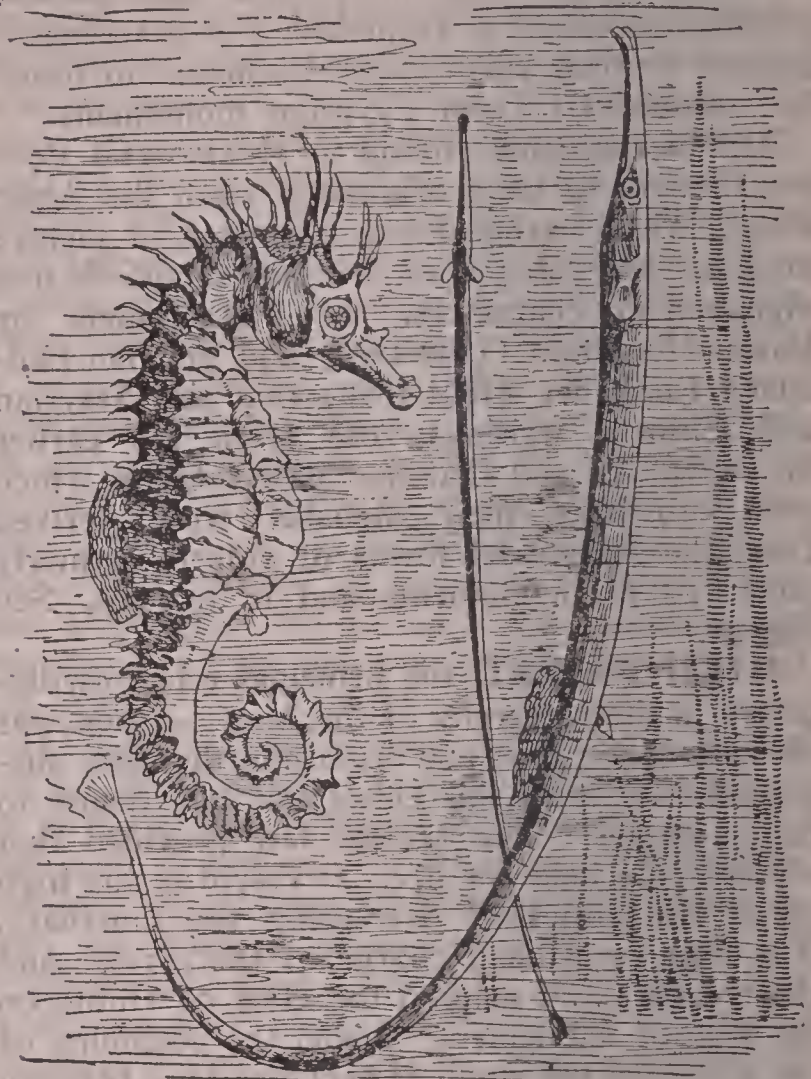
abode, the most elevated mountain system in the world, situated in the southern part of Asia. As a whole the system contains several parallel ranges, which have a length of about 1,500 miles and an average width of 180 miles. The Himalayas form a natural boundary between Tibet and India, contain numerous fertile valleys, and are the source of many important rivers, among them the Brahmaputra, Ganges, Indus, and Ghara, which belong to the watersheds tributary to the Bay of Bengal and the Arabian Sea. The general height of the Himalayas is approached only by the Andean system of South America. They contain the most magnificent snow-capped peaks in the world. The highest elevations are Mount Everest, 29,002 feet, the highest mountain in the world; Mount Godwin-Austen, 28,250 feet; Kunchinginga, 28,160 feet; Dhwalagiri, 26,825 feet; and Nanda-Devi, 25,675 feet. Other peaks are thought to be as high or even higher than Mount Everest, but their exact altitude has not been ascertained. The geological structure consists largely of granite, with important deposits of mica slates and gneiss. Metamorphic rocks and more recent alluvial deposits occur at the lower slopes, while the entire region is rich in zinc, coal, copper, iron, petroleum, gold, silver, and other mineral deposits. Vast forests of spruce, pine, deodar cedar, silver fir, and deciduous trees abound in the regions which have altitudes suitable to their growth. The Hindus regard the mountains sacred. Many pilgrims visit annually the sources of the Ganges and other localities especially interesting to them in religious rites and legends.

**HINDU-KUSH** (hīn'dōō-kōōsh), a system of mountains in Central Asia, lying west of the Himalayas, of which the Hindu-Kush form a continuation. The Indus River passes between them, and the Himalayas. Their breadth is about 200 miles and the length is 370 miles, separating Afghanistan from British India. Hindu-koh, north of Cabul, is covered perpetually with snow and is regarded the culminating peak. Its height is 20,225 feet. Several tributaries of the Oxus River rise in the northern slopes of the Hindu-Kush, and from the southern slope flow the Helmond and the Cabul.

**HINDUSTAN** (hīn-du-stān'), a name applied to the Punjab and Ganges valley. It is frequently, but less correctly, used to describe the whole of British India. See **India**.

**HIPPOCAMPUS** (hīp-pō-kām'pūs), or **Sea Horse**, a genus of fish allied to the pipefishes, of the suborder *Syngnathi*, found in the Mediterranean and the Atlantic. The head bears a curious resemblance to the head of a horse, and, when swimming, is held in a nearly vertical

position. Several species have been described, most of which have a length of from seven to twelve inches. The young are hatched and reared for a time in a marsupial sack under the



SYNGNATHI.

Hippocampus.

Pipefishes.

tail of the male. Several species are described in fables as monsters consisting of half horse and half fish.

**HIPPODROME** (hīp'pō-drōm), a word applied by the Greeks to the place where horse and chariot races were given for public exhibition. The hippodrome at Constantinople in the Byzantine period was especially noted and corresponded generally to the Roman circus. Olympia had a hippodrome which was 350 feet wide and nearly a mile long. In modern times the name is associated with the circus, but differs from it in that the exhibition consists mainly of horse and chariot racing and gorgeous displays by large vehicles.

**HIPPOPOTAMUS** (hīp-pō-pōt'ā-mūs), the river horse of Africa, a genus of a family of ungulates, which contains only two living species. One of these is large and occurs in the swamps, rivers, and lakes of Africa, while the smaller species is found principally in the vicinity of Lake Tchad and the rivers flowing into the Atlantic Ocean. The larger species is char-



acterized by a large head, small eyes and ears, a thick skin, few hairs, and a reddish fluid exuding from the skin. It delights to swim and dive in the waters of lakes and rivers and feeds on the plants growing in or near the water. In ancient times it was found in Lower Egypt, but its tendency to interfere with tilled fields has caused it to be driven from the cultivated por-

mentioned by Job to be the hippopotamus now found in Africa.

**HIROSHIMA** (hē-rō-shē'mā), a commercial city of Japan, in the province of Aki, at the southwestern extremity of the island of Honshū. It is about three miles from an inlet of the Seto Uchi, has railroad and electric railway facilities, and is the seat of several fine temples and schools. The manufactures include clothing, carpets, furniture, metal wares, and lacquered products. It has a large domestic and foreign trade. Population, 1903, 121,196.

**HISTOLOGY** (hīs-tōl'ō-jŷ), the branch of science which classifies and describes the microscopical structure of living organisms. It is subdivided into *vegetable histology*, which treats of the tissues of plants; *comparative histology*, which treats of the tissues of the lower animals; and *human histology*, which treats of the tissues of man. The history of this science dates back to an early period in the Christian era, but very little progress was made until the early part of the 19th century, when the compound microscope and the camera enabled scientists to make important investigations. These instruments were the means of discovering the nature of cell structure as well as that of the tissues, and the camera proved especially useful in preserving the result of



HIPPOPOTAMUS.

tions. The size of the body is large, being next to that of the elephant, but its legs are very short; hence, it appears much smaller. While the length is often seventeen feet, it stands only from four to six feet high. The feet are small, the hoofs are short, and each foot has four toes. The flesh is esteemed as food and is sought by the natives, who capture the animal by arranging pits from which escape is impossible. The feet and tongue enter into the manufacture of jelly, while the teeth furnish ivory, and the hide is serviceable for leather of a heavy kind. When not pursued, it is peaceable and apparently indifferent, but when attacked it becomes dangerous. Fossils of this animal do not occur in America, but there are remains of several extinct species both in Europe and Asia. Commentators on the Bible regard the behemoth

the investigations made by scientists. Since most of the diseases are due to some disorganization of the cells, it has been possible to determine the effect of many ailments by bringing the tissues and glands under the microscope at different stages, then preserving the records by means of the camera.

**HISTORY** (hīs'tō-rŷ), a systematic record or narration of events and circumstances relating to man, especially those having reference to his social and political conditions. In giving a record of the past it treats of facts concerning both nations and individuals, tracing to some extent the causes of the present condition of different peoples. As to accuracy, the facts related depend remotely upon contemporary witnesses and various circumstantial evidences. Although history as now understood is pre-



served in written form and is being added to constantly, it need not necessarily be committed to writing, as historic facts may be passed from generation to generation in the nature of story, when it is called *tradition*. This is substantially the form common among barbaric peoples, a circumstance due to their primitive mode of life and the absence of both desire and ability to preserve a written record of events. However, authentic history dates only from the invention of writing, whether uncial or cursive.

The ancients used hieroglyphic characters to inscribe important events on monuments, tombs, and temples. By them we have come into possession of valuable information touching their political and social life. However, ancient history as known to us is limited to a few nations and to a comparatively small area of the surface of the earth. The regions included comprise Northern Africa, Southern and Western Asia, and Southern Europe; the history connected with the other portions of these grand divisions is either mediaeval or modern. There are evidences that America and Australia, as well as all the continents, were inhabited in the remote past, but our knowledge of the peoples occupying these regions is limited to the information obtained from fossil remains and ruins of temples and dwellings. This is true particularly of portions of America and Europe. It is evidenced in many remains met with in Peru, Mexico, and the Mississippi valley in America, and in various cliffs and lakes of Europe. Modern history is not only more extensive than that coming to us from the preceding periods, but it is vastly more accurate. This is due at least partly to the circumstance that early peoples studied to make their records artistic rather than instructive.

Writers have divided history into various classes, these serving to detail information according to style in writing or as related to time. *Chronological history* is a record of successive times, *narrative history* is a story of events or a series of events, and *philosophical history* considers the causes of events and traces their results. History is sometimes classed as *sacred* and *profane*, the former being the history recorded in the Bible and the latter that of secular events. As to time, history is either ancient, mediaeval, or modern. *Ancient history* ends with the fall of the Western Roman Empire, in 476 A. D., including Jewish, Oriental, Greek, and Roman history. *Mediaeval history* closes with the revival of learning and the Protestant Reformation, in 1517. *Modern history* includes the period from 1517 to the present. *Biographical history* treats of the lives of individuals.

**HISTORY, Methods of Teaching**, the orderly process or procedure by which to give instruction in the facts and events of history. The purposes are to stimulate patriotism and to give information concerning the development and the underlying principles upon which nations are established. Other objects are to strengthen the character, train the judgment, and direct the reading of the students.

**INTEREST.** The first essential step in teaching history is to arouse interest. Students are interested in that of which they know something. One of the fundamental principles of pedagogy is to "proceed from the known to the unknown." It is a mistake to employ an overwhelming list of books to begin with. One book at a time and that the *right* one is a wholesome motto. In many instances it is well to vary from the chronological order, although the general method is to begin with the ancient history and drift down to modern times. While the usual plan is to teach modern history by reading backward from effect to cause, it may be said that to proceed from cause to effect appears to be fully as pedagogical. In general, the instructor should seize upon that which is already known as the starting point and thus proceed to the unknown, irrespective of whether the reasoning is onward from cause to effect or backward from effect to cause. However, with children it is more philosophical to begin with modern history, especially with that of our own country, rather than with that of Europe, mediaeval or ancient.

**PRIMARY WORK.** In the primary grades the teaching should be oral and the instructor should exercise skill and tact in presenting stories from history. When the learner enters school at about the age of six years, he may receive a bias from history which will avail much in his future life. He may be taught to tell the teacher in what town, in what county, and in what country he lives. Later may follow instruction as to who the chief executive officers are, where the capital is located, and what certain lines and illustrations on maps mean. These simple points, repeated until they are fixed in the memory, may seem of little consequence, but they invariably stimulate thought. They suggest local, state or provincial, and national government. Later may be added pleasing anecdotes from the lives of distinguished men, such as the exploits of Captain John Smith, the voyages of Columbus, and the adventures of La Salle and Daniel Boone. In this connection it is more essential to dwell upon the explorations, developments, and inventions than upon the achievements and contentions of war. Action



is the keynote of history and implies actors who do things. Brief sketches from the lives of Washington, Lincoln, and other distinguished Americans lend interest in studying the events which have an important influence in training for citizenship.

The work in the primary grades should lead up to the grammar school course. This implies that a line of supplementary reading may be placed in the hands of the students, making it possible to articulate the instruction in the lower grades. Suitable books for this purpose include Johonnot's "Stories of Our Country," Mowry's "American Inventions" and "American Pioneers," Coffin's "Boys of '76" and "Boys of '61," and Hale's "The Man Without a Country." Regular text books well suited for this work should be afterward introduced, including Mowry's "First Steps in the History of Our Country," Eggleston's "A First Book of American History," or Channing's "First Lessons in United States History."

**GRAMMAR GRADES.** The larger part of teaching history is done in the higher grades of the grammar school. Very properly, it consists almost everywhere in the study of the history of our own country. This requires both a good text book and a skillful teacher. In order to arouse real enthusiasm, it is well to have a half dozen or more different books, besides the use of supplementary work drawn from the reference department of the school library. Happily, the recent texts abridge the stories of wars and devote a larger amount of space to the triumphs of peace. However, care should be taken to discriminate between important paragraphs and those of less value. Facts are to be learned in their relations and care is to be taken that the words of the text are not memorized. Regular sequence of facts in chronological order is not enough. Relations of one fact to others and a strong grasping of cause and effect should be clearly pointed out. Maps and pictures are of much importance, especially as they fix localities and the early customs in the mind, but the intelligent use of reference books is relatively essential. As a whole the work in the grammar schools should lay a broad and liberal foundation for general work in history in the higher institutions of learning.

**ACADEMIC AND HIGHER WORK.** A general outline of ancient and mediaeval history should be pursued in the high schools and academies, especially in connection with the study of the ancient languages. While the higher institutions have agreed upon the general plan of studying history, many colleges and universities, as well as many individual professors, have specialized

methods for particular branches or divisions of the course. The purpose is not merely to become acquainted with the achievements of men in past times, or to study cause and effect, although these are important matters, but in addition to observe the various degrees of civilization and enlightenment through which the human race has passed in reaching the present stage. Here the study of the uplift of humanity becomes of vital importance. Indeed, whatever in history shows the progress of mankind, the steady advancement of the human race, is worth studying, and ordinarily only that.

**DATES AND OUTLINES.** The important dates should be memorized by the student, but too large a number sometimes confuses the learner. Such important dates as the discovery of America by Columbus, the English settlement at Jamestown, the landing of the *Mayflower* at Plymouth Rock, the expedition of Braddock, the capture of Quebec by the English, and the surrender of Burgoyne at Saratoga are among those that can profitably be memorized. In order to teach both dates and the general facts of history, the instructor should place outlines of the subjects upon the blackboard as the study proceeds from day to day. These outlines are to be constructed so as to embrace the important facts of the lesson in chronological order, giving the important names, dates, causes, effects, etc. Each lesson should include a brief review of one or more previous lessons and suggest facts for study in the lesson to be assigned for the succeeding day.

**MIGRATIONS.** In the study of general history it is well to emphasize the fact that migrations promote civilization. The four distinct movements in very ancient times of large bodies of people toward the west, from the banks of the Indus, in Asia, to Europe are notable examples. From these sprang the Celtic, Teutonic, Pelasgic, and Slavic peoples who produced the civilization of modern Europe. Then we may notice the great migration of from two to three centuries ago from Europe to North America, especially to the French and English colonies, which later gave rise to the United States and to the Dominion of Canada. Although the immigrants came from different countries and spoke a number of languages, they were brought together and eventually formed two of the largest and most enlightened countries in the world. At first these migrations peopled the Atlantic slope and the valley of the Saint Lawrence, but they moved westward across the plains and over the Rocky Mountains to the Pacific Coast. They were a hardy set, owing to the life of exposure which they had lived



in the eastern section of the country. To the early pioneers and their descendants were added many thousands who came directly from Great Britain, Ireland, Germany, France, Sweden, Norway, Denmark, and Austria. Later a large stream of immigrants came from countries of Southern Europe, including Italy and Portugal, and many immigrated from Russia, Japan, and other countries. Although at first heterogeneous in language and customs, these peoples are becoming welded together under the American system of education into a homogeneous whole.

**PEACE RATHER THAN WAR.** Although the essential campaigns and battles should be understood, it is of vitally more importance to study the causes leading to the wars and the results of these conflicts upon the nation. One campaign, as that of Burgoyne in the Revolutionary War, may be taken as a type and the others studied less exhaustively. Hitherto text books of history magnified the periods of war and neglected the triumphs of peace. The newer books have been improved by shortening the descriptions of campaigns and dwelling more upon the progress made in times of peace. They have added chapters or divisions on railroad and steamboat lines, canals and jetties, under land and water tunnels, wireless telegraphy, subways and elevated railroads, passenger and freight elevators, sewing machines, commerce and mining, and many other inventions and industries. It may be shown that we have attained a higher position in creative art and many of the sciences than any country of the world in the same period of time. This fact of history in our nation may well be emphasized in teaching youth in our schools. In connection with this it may be observed that the civilized world has made material progress in developing the spirit of universal, international peace, and that the different nations now regard each other as members of one vast family, rather than conflicting and antagonistic countries. All this has been stimulated by the modern development of commerce and the more liberal education of the masses.

**HITTITES** (hīt'tits), the name of a powerful tribe of Syria, which occupied the region between the Orontes and the Euphrates. The first mention of the Hittites in the Scriptures is in connection with Abraham at Hebron, who bought of them the field and cave of Machpelah. From them Esau obtained his first two wives. They occupied a part of Canaan at the time of the Jewish invasion under Joshua. Uriah, one of the chief officers under David, was a Hittite, and they appear to have remained with the Jews even up to the time of Ezra and Nehemiah.

They are referred to in the cuneiform inscriptions of Egypt, in which they are called Khita or Kheta. It is probable that they were a far greater people than the biblical mention of them indicates, since their outposts seemed to have extended as far west as the Aegean Sea about 1200 B. C.

**HIVES**, or **Nettle-Rash**, the common name of eruptions of the skin. They appear as white rounded elevations, but later turn red, causing an intense itching. Hives result from certain drugs, such as balsams and often from eating certain kinds of food, as crabs or lobsters.

**HOANG-HO** (hwäng'hō), or **Yellow River**, one of the important rivers of China, rises north of Tibet, flows toward the Khingán Mountains, thence south to the Pe-ling Mountains, and thence northeast into the Gulf of Pe-chi-li. Its banks are protected by levees, but it often overflows, the most noted of its inundations occurring in 1887. The entire length is 2,600 miles and the area of its basin is about 390,000 square miles, which constitutes one of the most productive and populous regions of China. The principal tributaries include the Tao-ho, the Wei-ho, and the Ta-tung-ho. It is designated Yellow River on account of the quantities of yellow earth held in solution by its waters and carried as silt into the Yellow Sea.

**HOBART** (hō'bērt), the capital of Tasmania, on the Derwent River, near its entrance into Storm Bay. It is located on the south coast of the island, has a railroad and electric railway facilities, and is the seat of considerable trade. The chief buildings include a college, an art gallery, a public library, a museum, and the Parliament buildings. The streets are regularly platted and well improved. Near the city is Mount Wellington, which is visited by many tourists. It has manufactures of clothing, soap, flour, earthenware, and machinery. Regular steamship communication is maintained with London and the important ports of New Zealand and Australia. The city was founded in 1804. Its prosperity is due largely to an extensive import and export trade. Population, 1906, 33,318.

**HOBOKEN** (hō'bō-ken), a city and port of entry in Hudson County, New Jersey, on the Hudson River, immediately above Jersey City and opposite New York City. It is on the Erie, the West Shore, the Delaware, Lackawanna and Western, and other railroads. A number of European steamship lines have their termini here. The city is at the base of the Palisades and the principal streets run north and south, parallel to the river. Among the noteworthy buildings are the Stevens Institute of Technology,



the Saint Mary's Hospital, the public library, and a number of fine schools. It has a firemen's monument, situated in Church Square Park, and maintains Hudson Park.

Hoboken is an important coal and produce depot and has a large trade in fruits, cereals and live stock. The manufactures include lead pencils, machinery, leather goods, coffins, paper, silk goods and tobacco products. Extensive electric street railway lines, sewerage, gas and electric lighting, and stone and macadam pavements are among the facilities. The site was a part of the patroonship granted to Michael Pauw in 1630 and was first called Hobocan Hacking. It was settled in 1640, but the city was really founded by John Stevens in 1804. It was incorporated as a town in 1849 and became a city in 1855. The city was visited by a destructive fire in 1900, but the damaged parts were rebuilt on an improved plan shortly after. Population, 1910, 70,324.

**HOBSON'S CHOICE**, a phrase originating from Tobias Hobson, the first keeper of a livery stable in England. The *Spectator*, a periodical published in London, related that Hobson had forty horses in his barn, and that he always kept near the door the one he wished to have used. Travelers coming to the barn were induced to allow him to choose the horse, when he always took the one nearest the door, hence "Hobson's Choice" came to signify an apparent rather than a real choice.

**HOCHKIRCH** (hōh'kīrch), a town in Saxony, Germany, famous on account of a battle fought there in the Seven Years' War, on Oct. 14, 1758. The Prussians under Frederick the Great were defeated by the Austrians under General Daun, but after retreating to the Heights of Drehsa the Austrians were routed completely.

**HOG.** See **Swine**.

**HOHENLINDEN** (hō-en-līn'den), a village in Bavaria, Germany, twenty miles east of Munich. It is celebrated for the victory of the French over the Austrians, in which the latter lost 8,000 killed and wounded, while the French lost 5,000 men. Marshal Moreau commanded the French and Archduke John had command of the Austrians. The battle occurred on Dec. 3, 1800, and shortly after the Peace of Lunéville was concluded.

**HOHENZOLLERN** (hō'en-tsōl-lērn), a province of southern Germany, forming an administrative district of Prussia. The area is 480 square miles. It is entirely surrounded by Württemberg. In 1905 it had a population of 66,780. The house of Hohenzollern, a princely family of Germany, derived its name from this region. It descended from Count Thassilo, a

Swabian noble of the time of Charles the Great, who founded a castle on the Zollern Heights in the 9th century. This dynasty has continued in an unbroken line until the present. Emperor William II. of Germany is a representative, though the most distinguished name associated with it is that of Frederick II. the Great.

**HOLIDAY** (hōl'ī-dā), a day set apart for the commemoration of some important event, as a religious or national festival. Besides the Sunday or Sabbath, the more important are New Year's Day, Washington's Birthday, Good Friday, Decoration Day, Fourth of July, Labor Day, Thanksgiving Day, and Christmas. This list of holidays is observed in nearly all parts of the United States, but in most states others are quite generally observed, particularly Lincoln's Birthday, Lee's Birthday, Arbor Day, and Election Day.

The statutory holidays of Canada are Sundays, New Year's Day, the Epiphany, Good Friday, the Ascension, Ash Wednesday, Conception Day, Easter Monday, All Saints' Day, Christmas Day, the birthday of the ruling sovereign, Victoria Day, Dominion Day, Labor Day (the first Monday in September), and any day appointed by proclamation for thanksgiving or a general fast. This list applies to the Dominion and in addition certain days are observed by some of the provinces, as Arbor Day and any day appointed by the Governor General.

**HOLLAND** (hōl'land), a city of Michigan, in Ottawa County, on the Black River, about three miles from Lake Michigan. It is on the Père Marquette Railroad and regular steamboat lines of the Great Lakes. It has a large trade in grain and lumber. The manufactures include leather, flour, ironware, machinery, and utensils. It has many churches, a fine public school system, and good municipal improvements, including electric lights, waterworks, and pavements. It is the seat of Hope College, an important educational institution of the Reformed Church, with an attendance of 300 students and a library of 18,000 volumes. Holland was founded in 1847 and incorporated in 1867. The city has a large number of citizens of Dutch extraction. Population, 1910, 10,490.

**HOLLAND.** See **Netherlands**.

**HOLLY** (hōl'ly), a genus of plants which includes many species of evergreen shrubs and trees, found mostly in temperate climates. The leaves are glossy, the flowers are whitish or white with yellow shading, and the fruit is mostly scarlet. The tree is from ten to forty feet high and of conical shape. Its ability to bear clipping makes it an excellent plant for



hedges and fences that are kept dwarfed. The wood is white and hard and is useful for knife handles, musical instruments, and turnery work.



AMERICAN HOLLY.

EUROPEAN HOLLY.

The leaves and twigs are used extensively for decorating houses and public buildings, especially at Christmas. From the bark a mucilaginous substance is secured, which serves in preparing birdlime. The holly tree is widely distributed in North America, Europe, and Africa. Several species are cultivated as ornamental plants. The *maté*, or *Paraguay tea*, of South America, is the leaf of a species of holly.

**HOLLYHOCK** (hōl'li-hōk), a plant native to China, but now cultivated for its ornamental flowers in gardens and parks. Though perennial in warm countries, it is classed with the biennials in temperate climates. It has a tall, branchless stem. The flowers are either single or double on the upper part and are greatly variegated in color. As cultivated in gardens, it reaches a height of from five to twelve feet, and is popular on account of its blooming until late in autumn. The leaves are rough and heart-shaped, the sessile flowers are large, and the corolla has five petals. In some countries the flowers are used in medicine. Some of the double flowering species are grown extensively.

**HOLSTON** (hōl'stūn), a river of Tennessee, rises on the eastern slope of the Clinch Mountains, and at Kingston joins the Clinch River to form the Tennessee. Its length is about 200 miles, most of which is navigable for light-draft river boats.

**HOLY ALLIANCE**, a league formed by Alexander I. of Russia, Frederick William III. of Prussia, and Francis of Austria on Sept. 26, 1815. It was concluded at Paris and signed by the sovereigns in their own hand. The purport of the league was to make the precepts of Jesus Christ the basis of administration, but the real purpose consisted of maintaining the power

of the existing dynasties. The Holy Alliance came to an end by the events of 1848.

**HOLY FAMILY**, in art, the name applied to representations of the Virgin, the infant Savior, and their attendants. Many paintings known by this title are extant, the first of which date from the 6th century. Among these is the famous production in which the Virgin is represented sitting on a seat, now in the Catacomb of Saint Calixtus in Rome, and later painters substituted a throne for the seat. Subsequently the Prophet Isaiah and angels were introduced as prominent attendants. Other figures frequently seen in these paintings include the mother of the Virgin, the infant John the Baptist, Saint Catherine, Saint Anna, and Saint Joseph. The Madonna and Child later became prominent subjects of paintings, although they were comparatively unknown in art before the 13th century. Among the leading painters who produced works in which the Holy Family is a prominent figure include Raphael, Leonardo, Perugino, Giovanni Bellini, and Andrea del Sarto.

**HOLY GHOST**, or **Holy Spirit**. See **God**.

**HOLYOKE** (hōl'yōk), a city of Massachusetts, in Hampden County, on the Connecticut



DWARF DOUBLE HOLLYHOCK.

River, eighty miles west of Boston. It is on the Boston and Maine and the New York, New Haven and Hartford railroads. Extensive water power is obtained from the river, which has a



fall of sixty feet at this place. The municipal facilities include electric lights, waterworks, a public library, and an extensive street railway system, by which it is connected with Springfield and other cities. The public schools rank among the best in the State, and the public buildings include many valuable and massive structures. They include the Federal building, the city hall, the public library, and many schools and churches. Among the manufactures are machinery, cutlery, cotton and woolen goods, screws, rubber, sealskin, blank books, and wire. Holyoke was long called Ireland Parish as it was originally settled by the Irish. From 1786 until 1850 it was a part of West Springfield. It was chartered as a city in 1873. Population, 1905, 49,124; in 1910, 57,730.

**HOLYOKE, Mount**, a ridge situated in Hampshire County, Massachusetts. It is about seven miles long. The highest point is 1,122 feet above sea level. It separates Hadley and Amherst townships from Granby and South Hadley. Mount Holyoke College is situated in Hadley township, on the northern side of the ridge, and is the oldest college for women in the United States. It was established in 1837, has 85 instructors, 700 students, and contains a library of 25,000 volumes. The college property has a value of \$1,580,000.

**HOLY ROMAN EMPIRE**, a vast dominion established in the western part of Europe. It dates from the year 800, when Charlemagne was crowned at Rome as successor of the Roman emperors, but the name *Roman Empire* was not used until 962, when Otho the Great was crowned by Pope John XII. and inaugurated the Roman Empire of the German nation. The empire included all of the territory in which the people recognized the German monarch and Italy, and at different times it included Denmark, Hungary, Poland, Cyprus, and Jerusalem. Frederick Barbarossa, in 1152, prefixed the word *Holy*, after which the dominion became known as the Holy Roman Empire. The Hohenstaufen (q. v.) dynasty represented the stronger monarchs of this imperial realm, and after their time the title was rather honorary than imperial. Switzerland became independent from the empire in the 15th century, the Netherlands obtained their independence by the Peace of Westphalia in 1648, and other territory was gradually lost or became semi-dependent. All but two of the emperors after 1438 belonged to the house of Hapsburg. In 1806 the title Holy Roman Emperor became extinct, as Francis II., two years previous to that, had been crowned as Emperor of Austria.

**HOLY SEPULCHER** (sĕp'ŭl-kĕr), the

tomb in which Jesus lay. It was located near the place of crucifixion, having been hewn out of a rock near the walls of Jerusalem. The place called *Golgotha*, meaning a skull, which has been anglicized as *Calvary*, is the place of the crucifixion. Not far from it, near a road and within a garden, was the tomb, which is said to have belonged to a rich man by the name of Joseph. Within the modern city of Jerusalem, about 450 yards west of the northern part of the Haram esh-Sherif, or temple area, is the Church of the Holy Sepulcher, which covers the traditional site of both Golgotha and the tomb of Jesus. See **Jerusalem**.

**HOLY WATER**, a consecrated mixture of salt and water used in the ritual of the Roman Catholic Church. The use in churches is very ancient and many believe it to have been derived from a similar custom practiced by the ancient Hebrews. The water, after being blessed by a priest, is sprinkled on the worshipers and some of the objects in the church, such as the images, vestments, and bells. It is used at various domestic occasions, especially at marriages and funerals.

**HOLY WEEK**, the last seven days of Lent, the week before Easter, and frequently spoken of as Passion Week. It is kept as a penitential season to commemorate the passion and death of Christ. The special days included are Palm Sunday, Spy Wednesday, Holy Thursday, Good Friday, and Holy Saturday. The Roman Catholic church commands abstinence from wine and flesh for all the days, but absolute fast is enjoined for the Friday and Saturday.

**HOMEOPATHY** (hō-mĕ-ōp'ā-thÿ), or **Homoeopathy**, the name of a system of medical practice introduced by Samuel Hahnemann. The distinguishing characteristic of the system is based upon the principle that "like cures like." He set forth the essence of the system in the following words: "Every powerful medicinal substance produces in the human body a peculiar kind of disease; the more powerful the medicine, the more peculiar, marked, and violent the disease. \* \* \* We should imitate nature, which sometimes cures a chronic disease by superadding another, and employ, in the disease we wish to cure, that medicine which is able to produce another very similar artificial disease, and the former will be cured." See **Allopathy**.

**HOME RULE**, a term applied in British politics to the movement made by the Irish home rule party with the view of establishing a Parliament in Ireland for the purpose of legislating in relation to local affairs, but subject to the imperial Parliament of the empire.



It designed to make the local government similar to that now common to Canada and Australia. The movement originated at Dublin in 1870, and four years later 60 members of Parliament were elected who favored the home rule policy. In 1885 there were 86 members under the leadership of Parnell. The project received a new impetus by the support of Gladstone. A large party of Irishmen favor absolute independence, but the adoption of local self-government is held by many to be both feasible and of mutual interest to all concerned. John Redmond and Justin McCarthy are among the influential leaders within the last decade.

**HOMESTEAD** (hōm'stēd), a borough of Pennsylvania, on the Monongahela River, eight miles above Pittsburg. It is on the Pennsylvania and the Pittsburg and Lake Erie railroads. The surrounding country produces large quantities of coal, which caused large steel, iron, and glass industries to be built up at Homestead. It is the seat of the steel works established by Andrew Carnegie, in which extensive labor disturbances occurred in 1892. The place has good municipal facilities, electric street railways, and a number of fine schools and churches. It is noted especially for its extensive production of steel plate. Population, 1900, 12,554; in 1910, 18,713.

**HOMESTEAD ACT**, a law enacted in 1862 by the Congress of the United States, under which it became possible for the head of a family, or any person at least 21 years of age, to acquire by settlement and improvement title to 160 acres of public land. The only condition provided is the payment of a registration fee, improvement as a residence, and occupation for five years. This law carries with it the commutation privilege, by which title can be acquired to not more than 160 acres after fourteen months' occupation and the payment of \$1.25 per acre, but \$2.50 if situated within United States railroad grants. So-called homestead exemptions are recognized in all the states. These provide that a specified amount is exempt from execution for debt to the head of a family, but the amount in different states varies greatly.

In Canada a homestead entry may be made on 160 acres by any male over eighteen years of age, but it must be applied for personally at the district land office. The entry fee is \$10. Residence upon the land is required at least six months in each of three years. The homesteader must cultivate a portion of the land each year and not less than fifteen acres must be under cultivation at the end of that time. A patent is issued at the end of three years upon

proof of residence and improvement as required by law.

**HOMICIDE** (hōm'ī-sīd), the act of killing a human being. It may be either criminal or justifiable, depending upon the circumstances under which the act is committed. Justifiable homicide includes the taking of a human life in self-defense, by accident, or under an order issued by a court to an officer. It is especially declared in the law of most countries that whoever kills a human being with malice aforethought, either expressed or implied, is guilty of murder. This constitutes criminal homicide, which is usually divided into three classes, those of murder in the first degree, murder in the second degree, and manslaughter.

**HONDURAS** (hōn-dōō'rās), a republic of Central America, bounded on the north and east by the Gulf of Honduras and the Caribbean Sea, south by Nicaragua and San Salvador, and east by Guatemala. It has an area of 43,300 square miles. The climate is similar to that of Guatemala, being hot in the low regions and quite equable and pleasant where the country is elevated considerably. Among the minerals are coal, gold, silver, cobalt, iron, zinc, and lead, but iron is the most important. Much of the soil is fertile. In the southwestern portion trend lofty mountain ranges, but the northern and eastern parts consist of valuable coast and valley lands. The streams flow almost exclusively into the Gulf of Honduras and the Caribbean Sea, and include the Guangues, Cutchabutan, Roman, Tinto, Barba, Catago, and Cape rivers.

Agriculture is the principal industry. The various products include sugar, coffee, tobacco, wheat, indigo, maize, rice, and a large variety of tropical fruits. The forests yield valuable dyewoods, tamarinds, cabinet woods, rubber, and vegetable ivory. Cattle raising and dairying are important industries. The country has considerable trade with the United States, Germany, and Great Britain, in the order named. Several short lines of railway have been constructed, by which the Gulf of Honduras is connected with Puerto Cortez and other interior points, and several lines penetrate the coast and valley regions. In 1909 the railroads included a total of 112 miles. A large part of the interior is reached only by mules and ox-carts. Tegucigalpa is the capital. Other important cities are Juticalpa, Nacaome, La Esperanza, Santa Rosa, and Choluteca.

At present the country comprises fifteen departments. A national constitution proclaimed in 1894 vests the chief executive authority in a president, who is elected by popular vote for a



term of four years. The president is assisted by ministers of the interior, finance, war, public instruction and justice, and public works. Legislative authority is vested in a national congress, which is constituted of deputies elected by popular suffrage. It has a standing army of 500 men and a national militia of about 20,000. The inhabitants are largely of Spanish descent and the dominant faith is Roman Catholic, but religious liberty is extended to all. Education is gratuitous and nominally compulsory. Spanish is the spoken and official language. Besides the system of common schools, there are twelve colleges or institutes.

Columbus discovered the coast of Honduras in 1502. Settlements were made by the Spaniards in 1524, when the town of Triunfo de la Cruz was founded. The region was made a royal province of Spain two years later and afterward it became a captain generalcy of Guatemala. It revolted from Spain in 1821 and was annexed to Mexico. In 1823 it joined the states of Central America, but since 1838 it has been an independent republic. At several times it has been disturbed by revolutions and wars with neighboring countries. Population, 1905, 500,136.

**HONDURAS**, Bay of, an important inlet of Central America, extending from the Caribbean Sea. It is bounded largely by Honduras, Guatemala, British Honduras, and Yucatan. The bay contains several important islands, including Turneffe and the Bay Islands, and on its shore are several growing seaport cities.

**HONE**, or **Whetstone**, a kind of stone used to sharpen edged tools, such as knives, scythes, and razors. Hones are of finer grain than either ordinary whetstones or grindstones. The finest kinds are very hard and compact and are commonly called oilstones. They are made of several species of slate and are used in sharpening the finer class of instruments. The best hones for scythes obtained in America are made of sandstone found in Arkansas. The finer classes of slate or oilstones come from Bohemia and Siberia.

**HONEY** (hŭn'y), a vegetable food product deposited by bees in the cells of their honeycomb. It is a sweet, thick liquid, quite clear and transparent, and when kept for some time solidifies into a granular white mass. The neuter bees collect the sweet juices of flowers by means of their proboscides, thence it is transferred to the honey-bag, and by certain chemical changes honey is produced, which is deposited in store for food during winter. When elaborated by young bees, it is whiter than in other cases and is called *virgin honey*. The

product of older bees is more or less of a yellowish hue. The flavor of honey is dependent largely upon the plants from which it is collected. In many countries the culture of bees is an important industry, the milder climates being best adapted to the enterprise. Besides being a valuable food, it is used in medicine as a promoter of expectoration, with vinegar as a gargle, in pastry and cooking, and for the manufacture of mead. Both extracted and comb honey are sold in the market, while an artificial product is made of glucose placed in cells of wax. Where apiaries are kept, it is customary to prepare bee food by cultivating clover and other plants. Clover is a favorite food plant because honey made from its flowers is almost white and of excellent flavor.

**HONEY LOCUST**, a leguminous forest tree widely distributed in North America, but found most extensively in the southern part of the Mississippi valley and the Atlantic coast plain. The flowers are greenish, usually in spikes, and generally unisexual. They are followed by pods, which are more or less twisted and from a few inches to two feet long. Within the pods are the seeds, enveloped in a pulp, and they become quite sweet when ripe. The leaves are pinnate and the foliage is elegant in appearance. Long thorns develop on the limbs, which make the plant a favorite for ornamental hedges and for fencing. The wood is of an inferior quality and decays rapidly. Several species of locusts grow to a height of 80 to 100 feet, having fine spreading branches.

**HONEYSUCKLE**, a genus of shrubs and twining plants found in the Northern Hemisphere. About 100 species have been described, of which the common honeysuckle is the best known. It is found largely in Europe and North America, where it blooms from June to September. The flowers are tubular in form and red without and yellow within. The fruit consists of scarlet berries. This species is cultivated extensively for its flowers. In North America there are nine different species of honeysuckle. The Australian honeysuckle is so called because of the sweet liquid found in the flowers. The trumpet honeysuckle is cultivated largely in the United States as a twining plant in gardens and at porches.

**HONG-KONG** (hŏng'kŏng'), or **Hiang-Kiang**, meaning sweet water, an island near the mouth of the Canton River, off the southeastern coast of China, forming a possession of Great Britain. It is separated from the mainland by a narrow channel called Ly-e-Mun. The area is 32 square miles. Much of the surface is rocky and barren and the shores are steep.



The general elevation above the sea is from 1,000 to 2,000 feet. Population, 1906, 328,638.

Hong-Kong, in a larger sense, is a crown colony of Great Britain. It consists of the island of Hong-Kong and the leased district of Kowloon. The latter is in the southeastern part of China and was leased to Great Britain in 1898 for 99 years. This portion of the colony has an area of 376 square miles and a population of 89,012. Victoria is the capital. It extends several miles along the bay. Its harbor is one of the finest in the world, being strongly fortified, and it is the center of a vast trade. The local products consist of various manufactures, such as clothing, cigars, textiles, utensils, and machinery. Among its buildings are a government house, the courthouse, a cathedral, the university, and a number of other public buildings. The island was ceded by China to the British in 1842 after the close of the opium war. Since then it has developed an enormous trade, the value of its annual imports amounting to about \$20,000,000 and the exports to \$12,000,000. The trade is chiefly with Great Britain, Japan, the United States, Germany, and France.

**HONOLULU** (hō-nō-loō'loō), the largest city and the capital of the Hawaiian Islands, on the southern coast of the Island of Oahu. The site is beautiful and is surrounded by groves of fruit and ornamental trees. It has a pleasant and healthful climate. Among the noteworthy buildings are the public treasury, the post office, the customhouse, the capitol, the public library, a museum, and a cathedral and several churches. It has many hospitals and fine schools. The harbor is well protected, giving the city considerable advantage in foreign trade. It has manufactures of clothing, earthenware, canned fruits and fish, and utensils. The general facilities include sewerage, electric lights, waterworks, pavements, public parks, rapid transit, and railroad connections. It has had a rapid growth in wealth and population. In 1815 it was little more than a fishing village. It became the capital of the archipelago in 1820. Population, 1910, 52,183.

**HOOD, Mount**, an elevated mountain of Oregon, in the Cascade Range. It is located in the western part of Wasco County, about fifty miles southeast of Portland. It has an altitude of 11,935 feet. The summit affords a fine and extensive view of the surrounding country.

**HOODED SEAL.** See Seal.

**HOOKE, Mount**, a lofty peak of Canada, one of the highest summits of the Rocky Mountains. It is situated on the border between Alberta and British Columbia and has an altitude of about 15,710 feet.

**HOOPOE** (hōōp'ō), a genus of birds native to the warmer parts of the Old World. These birds are classed according to some with the honey eaters and by others with the horn-billed birds. The bill is long and slightly curved, the tail is broad, and the eyes are large. Two nearly parallel rows of long feathers form a crest on the head. In most species the color is buff, but variegated with black and white. The male is about twelve inches long, somewhat larger



HOOPOE.

than the female, and is more vivid in color. The nest is built in the holes of trees, in which five or six eggs of lavender-gray are laid. They feed largely on insects, worms, and filthy accumulations. The double whoop uttered has originated its name.

**HOOSAC TUNNEL** (hōō'sak), an important railroad tunnel on the line from Boston to Troy, in the western part of Massachusetts. It is built through the Hoosac Mountain, a range extending into Massachusetts from the Green Mountains of Vermont. It was completed in 1875 at a cost of about \$18,000,000, is nearly five miles long, and contains a double railway track.

**HOOSICK FALLS** (hōō'sik), a village of Rensselaer County, New York, on the Hoosick River, 27 miles northeast of Troy. It is on the Boston and Maine Railroad. The chief buildings include the high school, a parochial school, and several churches. The manufactures consist principally of clothing, farming machinery, utensils, knitted goods, and ironware. It was settled in 1688 and was first incorporated in 1827. Population, 1905, 5,251; in 1910, 5,532.



**HOOSICK RIVER**, a stream in eastern New York, flows toward the west, and joins the Hudson about fourteen miles above Troy. It is noted for its vast water power, which is utilized extensively for manufacturing purposes in towns along its banks. The valley is highly fertile.

**HOP**, a perennial plant of the nettle family. A single species is found native in North America and Europe, but under cultivation it has



HOP-VINE AND FLOWER.

been greatly variegated. The perennial root annually sends forth long, weak, rough, twining stems. The flowers are male and female. The latter, occurring in cones, are greenish in color and constitute the hops sold in the market.

These cones are gathered when ripe, and, after being carefully dried, are used to communicate an aromatic bitter flavor to beer. Hop culture is an important industry and is pursued extensively in all civilized countries. About 80,000,000 pounds of hops are grown annually in the United States, the supply coming chiefly from New York, Oregon, Washington, and California. Large quantities are grown in Ontario and British Columbia. The County of Kent, in England, is noted for its production of hops. Besides being used in the manufacture of beer, hops enter into the preparation of medicine on account of their tonic and narcotic properties. They are placed in pillows to induce sleep. In some countries the young shoots are bleached and eaten like asparagus, while the fibers of older stems enter into the manufacture of cordage. Hops are an important ingredient in the manufacture of yeast for baking and general leavening purposes.

**HOPKINSVILLE** (hōp'kīns-vīl), a city in Kentucky, county seat of Christian County, seventy miles northwest of Nashville, Tenn. It is on the Illinois Central, the Louisville and Nashville, and other railroads. The surrounding country produces large quantities of wheat and tobacco and has extensive deposits of coal and iron. Among the manufactures are carriages, farming machinery, earthenware, flour, and tobacco products. The chief buildings include the county courthouse, the high school, and several churches. It is the seat of the South Kentucky College, a State insane asylum, and

two seminaries. It was settled in 1797 and incorporated the following year. Population, 1900, 7,280; in 1910, 9,419.

**HOREB** (hō'rēb), Mount. See Sinai.

**HOREHOUND** (hōr'hound), a labiate plant found in Europe and Asia. Most of the species are herbaceous. The common horehound of Europe has downy leaves and stems, dense whorls of flowers, a bitter flavor, and an aromatic smell. It yields a volatile oil and a bitter fluid, which are used in the preparation of a tonic given as lozenges for coughs and colds. Many species have been naturalized in the United States.

**HORN**, the name applied to a modification of the epidermis in animals, as the hoofs and horns of ruminants, the spines of porcupines, and the claws of birds. These parts are constituted of substances similar to those forming the anatomical structure of animals, but differ from them in the proportion of their parts. There are three classes of horns borne for defense on the heads of animals—those composed of bone, as the antlers of the deer; those consisting of epidermis or skin formations, as the horns of the rhinoceros and the buffalo; and those partly bone and partly epidermis, as in the case of the cow. Horns are either solid or hollow, and differ from each other in that some are single, while others contain a number of branches or prongs. Generally the single horn is hollow, and those containing prongs are of solid or bone formation throughout.

In commerce the term horn is often applied to the hoofs, claws, nails, bills, and quills of animals, and to the shell of the tortoise, but in a narrower sense it refers only to the appendages on the heads of animals. Horn formations contain both animal and mineral matter. They are tough, may be softened by heat, and are usually semitransparent. The horn growth differs widely in various animals, as, for instance, in the stag only the males have horns. Both sexes of most cattle have horns, but some species are hornless. In deer the horns are shed annually, while a horn once destroyed in cattle, goats, and sheep does not grow again.

The various kinds of horns are employed to manufacture many articles of commerce. They are used in making handles for knives and forks, canes, umbrellas, and walking sticks. Some enter into the manufacture of buttons, combs, snuffboxes, pipe tips, and ornaments. Besides, they serve a useful purpose in preparing a convenient vessel for powder and in making hat racks and decorative articles. Horn can be softened by heat and pressed into molds or split into sheets. When cooled, it resumes



its former toughness and flexibility. Many dyes and other coloring matters can be employed to give it a lasting tint in color.

**HORN**, the name applied to a large number of different kinds of wind instruments. They were made formerly of the horns of animals, but these have fallen more or less into disuse. The musical instrument now designated particularly by that name is manufactured largely in France. It consists of a metal wind instrument furnished with a *mouthpiece* and a *bell*. The Saxe horn and other military horns, as well as those used in bands, are usually some form of the *French horn*. Instruments which belong to the class known as *horns* are seldom played singly in the orchestra. A pair and more frequently two pairs are employed.

**HORNBEAM** (hörn'bēm), the name of a small tree, so called because the wood has been



HORNBEAM.

A, Flowers; B, C, Fruit.

used extensively for making yokes for cattle. The common hornbeam, or yoke elm, is native to Western Asia and the temperate parts of Europe. The trunk is frequently flattened and twisted and covered with a smooth and light gray bark. The roots descend deep into the

ground. In moist and shady places this species frequently attains a height of sixty to ninety feet. The wood is white and quite hard and is used by carpenters and wheelwrights. The hornbeam of North America is a smaller tree, usually from twenty to forty feet in height, and is found from Quebec to the Gulf of Mexico. Locally it is called ironwood, blue beech, or water beech. A similar tree known as hop hornbeam, locally known as leverwood, is of slow growth and has very hard and heavy wood.

**HORNBILL**, the name of a family of large birds native to Africa and the East Indies. They are related to the kingfishers and toucans, and, like the latter, have very large bills. The bill is broad at the base and compressed toward the tip, and in most species a large bony protuberance surmounts the upper part. The rhinoceros hornbill is the largest species. It has an expanse of wings of about three feet, is four feet long, and the upper mandible has a peculiarly large protuberance. It is stupid and cowardly, showing little boldness except when in search of food, and the flight is rather slow. The female, after laying four or five eggs, sits on the nest until the young are fully fledged, usually eight or ten weeks. In the meantime the male plasters the opening of the nest over with clay, leaving only a slit three or four inches long and sufficiently wide to permit the entrance of its head, and through this the female and young are fed. During this time the male becomes lean, but the female gets very fat and is considered a dainty by the natives.

**HORNBLENDE** (hörn'blënd), a subvariety of aluminous amphibole. It is one of the five most abundant simple minerals of which rock is composed. The others are mica, quartz, feldspar, and carbonate of lime. It occurs in various forms, differing in the composition of its crystalline particles. In color it is greatly diversified. It is found as a constituent of trap rock and with such igneous forms as granite and gneiss. Some species of hornblende are transparent and others are opaque. The colors predominating are white, brown, and black.

**HORNED TOAD**, or Horned Frog, a genus of horny lizards of North America, which somewhat resemble a toad or frog. They are found chiefly in the western part of North America, especially in the arid plains and mountains, extending from Alberta to the central part of Mexico. They lie close to the ground, usually among weeds and cacti, and the color somewhat resembles that of the surrounding objects. Several species have been described, but all have a more or less circular or oval body, which is flattened and covered with scales surmounted



by horny spines. They are sluggish in their movements and pass the winter in holes dug by various rodents. The food consists of ants, flies, and other insects.

**HORNELLSVILLE** (hörn-ělz'vīl), a city of New York, in Steuben County, on the Canisteo River, 57 miles south of Rochester. It is on the Erie and other railroads. The chief buildings include the high school, an academy, and a public library of 15,000 volumes. It has a growing trade in merchandise. Among its industries are railroad shops, tanneries, glove factories, iron foundries, potteries, and brick-yards. The public utilities include sewerage, pavements, waterworks, and electric street rail-ways. It was settled in 1790 and was called Upper Canisteo until 1820, when it was incorporated under its present name. Population, 1905, 13,259; in 1910, 13,617.

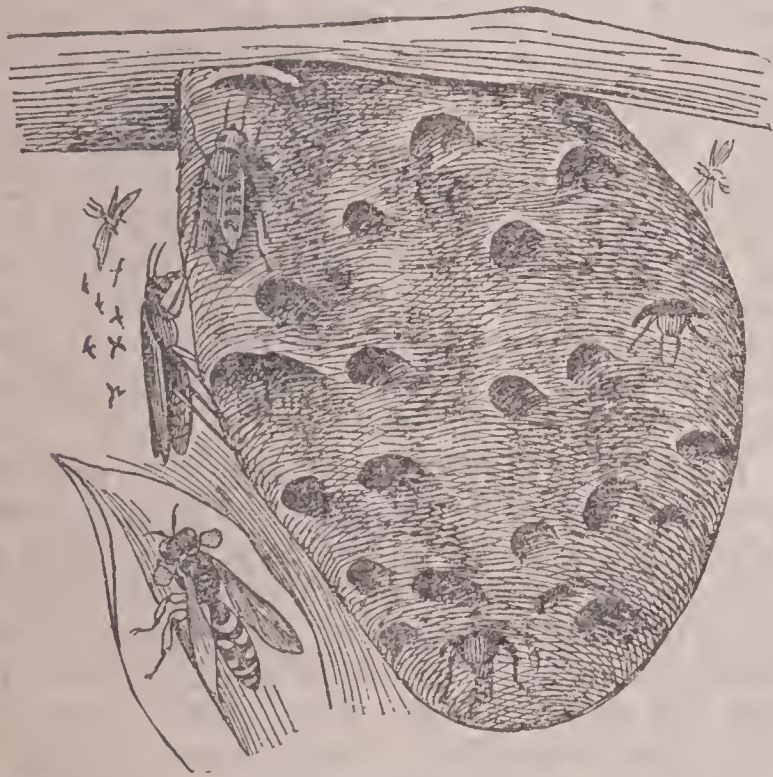
**HORNET** (hôr'nět), a stinging insect of the family *Vespidæ* and the genus *Vespa*. It is larger than the common wasp, being about an inch long, and has a more venomous sting. The hornets are widely distributed in North America and other grand divisions. They are usually black or dark brown and are ornamented with white and yellow. Several species of

painful, that of some species causing fevers in men and cattle.

**HORSE**, a genus of quadrupeds classed with the zebra and the ass. It is distinguished by an undivided hoof, a mane on the neck, a simple stomach, and lips and teeth adapted for cropping short herbage. Careful breeding has developed many kinds of horses, all of which are distributed more or less widely. They serve more important purposes than any other animal as beasts of burden and draft. It is thought that Central Asia is the nativity of the horse, but some contend that it was first domesticated in Egypt. Writers generally agree in expressing the view that the horse was brought to Western Europe at an early date, a fact evidenced by remains found in caves in Switzerland and figures of horses cut on rocks.

The Scriptures mention the horse in connection with warfare and with the arts of peace among the ancient Egyptians. Prior to the discovery of America, horses were unknown in the Western Hemisphere. Those met with in a wild state in South America descended from animals introduced by Spanish settlers. Fossil remains found in America indicate that an animal similar to the horse existed in remote ages, but it was much inferior to the species common to the Old World, even to those known in Egypt during the time of the Pharaohs. Forty or more species have been discovered in the Tertiary deposits of North America, but all were comparatively small and none was represented by living forms at the time of the discovery by Columbus. It is assumed that the horse developed from a small and inferior class of animals, about three feet tall, and that this early class is now extinct, the wild horses of Tartary and other regions being descendants of animals that escaped from domestication and gradually developed into the present wild and inferior form.

The horses of Arabia are classed as the most beautiful breed and excel in swiftness, endurance, and perseverance. The European breeds came largely from importation of the Arabian, and have been more or less intermingled with the different classes which were previously common to the West. In America horse breeding has attained a high state of development and constitutes one of the important industries. Among the classes used for draft and agriculture are the Clydesdale, Percheron, and Belgian; those used for speed embrace the Hambletonian, Morgan, and French coach; and the ponies include the Shetland, Galloway, and Indian. These races of horses are interbred more or less with each other and with other grades, and represent classes possessing qualities of su-



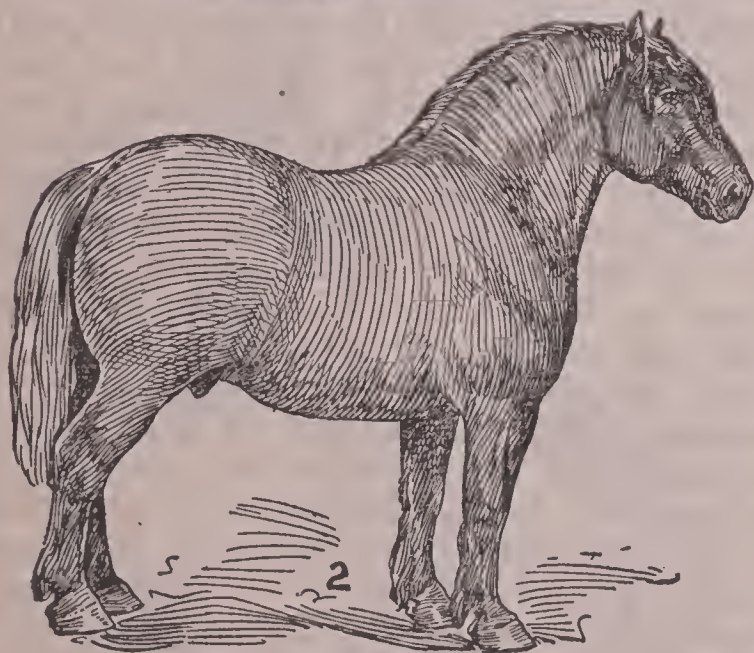
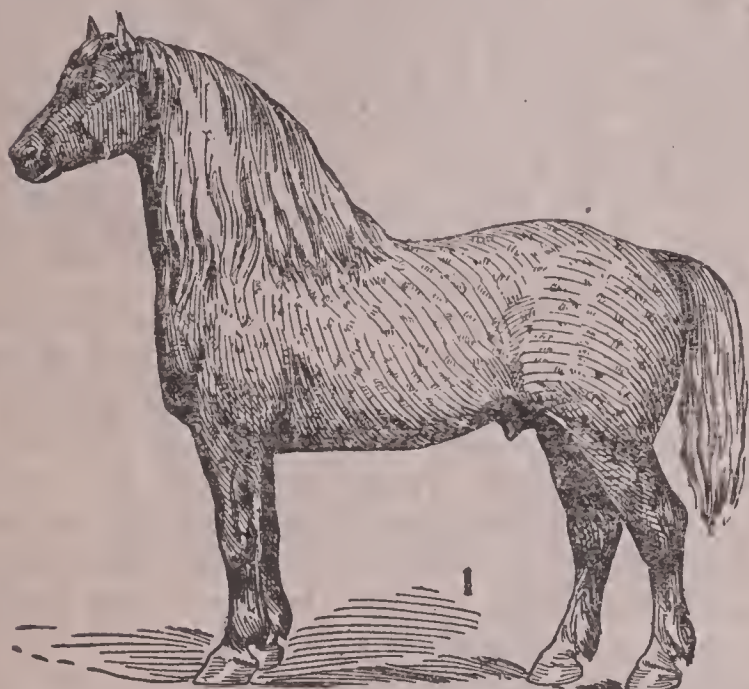
HORNET AND NEST.

Asiatic hornets attain to a length of fully two inches and are peculiar for their bright colorings. Their nests are built in the large trunks of trees and in old walls, and some species construct a kind of paper work, which is hung in the branches of trees. They live in communities, which consist of about 200 insects. Hornets feed on the sap of trees and on fruit and honey. Some prey on other insects. The sting is very



periority for various purposes, including several species which may be considered strictly American, such as the Kentuckian.

The horse is characterized by its acuteness of the senses, ability to observe danger, and strength of memory. By suitable food and careful treatment it can be made to serve man in all the arts of war and peace. The period of gestation is a trifle over eleven months and the age of puberty is reached at two years. At the



1, PERCHERON; 2, BELGIAN.

age of from three to four years the horse begins to come into its higher state of usefulness, but lives to an age of from twenty to thirty years, serving with more or less profit during the entire time after being broken for work. In docility it surpasses all the domestic animals, except the dog and possibly the elephant.

Corn, hay, oats, barley, and beans constitute the principal food for horses, but they thrive well when given a variety of these and small quantities of linseed, bran, carrots, and straw.

For driving and running purposes it is best to feed oats largely, while for heavy work corn is the staple food. Until about nine years old the age can be estimated by the marks on its teeth, but after that it is difficult to determine. Horse flesh is used for food in some countries. The hide is an important material for the manufacture of leather and in making robes and rugs, and the tail and mane are utilized for hair cloth and upholsterers' products. The introduction of electric street cars, bicycles, and automobiles has lessened the use of horses to some extent, but, on the other hand, the development of natural resources in new countries has widened it correspondingly. The running record of American race horses is among the best in the world. "Black Beauty," written by Anna Sewell, is one of the most beautiful works on the horse. Literature abounds with valuable and interesting productions relating to the horse and its uses.

**HORSE CHESTNUT**, a genus of trees widely distributed in North America and other continents. The leaves are opposite and quite large, and the seeds are unpleasantly bitter. The seeds contain considerable starch, which is prepared for the market by freeing it from bitterness through repeated washing with an alkaline solution. The species native to North America do not have wood of material value and the seed is quite small, but the true chestnut has nuts that are quite valuable as food for swine, sheep, oxen, and horses. The latter is native to Tibet and has been naturalized in many parts of Europe, where it is cultivated for its wood and for the nuts. The chestnut of North America ranges from Canada to Mexico and is especially abundant in various parts of the Mississippi Valley.

**HORSE POWER**, the unit of force employed in measuring the power of engines, water-wheels, and other prime movers. The term was obtained by Boulton and Watt from observing the dray horses employed in London. They found that a horse is able to go at a rate of two and one-half miles per hour, and at the same time raise a weight of 150 pounds by means of a rope placed over a pulley, hence they estimated the horse power, the horse working eight hours per day, at 33,000 foot pounds per minute. From this circumstances it is estimated that a horse power is equal to a force which will raise a weight of 33,000 pounds one foot in one minute. An engine of ten horse power has the power to raise the same weight ten times that distance in one minute. In practice it is necessary to deduct one-tenth for friction, hence the estimate given is theoretical.



**HORSE-RADISH**, a perennial plant with long stalks, cylindrical roots, and whitish flowers. It is cultivated in many portions of America, but grows vigorously in all kinds of soil after once getting a foothold. The roots possess medicinal qualities. They are used extensively as a condiment for table purposes. Their medicinal qualities are diuretic, stomachic, and diaphoretic. Several preparations are employed as external applications.

**HORSESHOE**, a plate of iron bent into the form of the hoof of a horse, and fastened to the bottom of the same by nails driven through the outer layer and clinched upon the outside. Shoes intended for use upon icy roads are provided with steel points called *corks*, one at the toe and one at each heel of the shoe. Those used for horses employed for draft purposes on soft roads have corks of iron, and those for shoeing driving horses are quite smooth or have blunt corks. Iron shoes are used to some extent for oxen, but they are of two parts on account of the clefts in the foot, and are made to fit the bottom of the hoof. The practice of providing a protection to the feet of horses and mules is quite ancient, and originated from the utility of furnishing security against these animals becoming foot-sore in the time of war. Xenophon and other writers mention certain methods of rendering the hoofs harder as a protection against rough and stony roads. Leather coverings are used to some extent to protect the feet of camels on long journeys. The lower part of these is made from oxhide much like heavy soles in the shoes of modern times. Horseshoes made of iron were introduced into Europe about the 9th century and the custom was taken to England by the Normans. At present this class of horseshoes is used in practically all countries, especially for draft and driving horses, but those used in farming are generally unshod.

**HORSESHOE CRAB**. See **King Crab**.

**HORSETAIL RUSH**, or **Scouring Rush**, the common name of the *Equisetum*, a genus of small plants belonging to the fernwort family. About 25 species are represented in the living flora, and they are classed with an extensive race of plants that predominated in the Mesozoic and Carboniferous times. Formerly they were of great size, in fact enormous trees, but the living species are quite small. They are characterized by having spore-bearing leaves. The plants are unisexual; that is, different plants produce the male and female organs.

**HORTICULTURE** (hôr'ti-kŭl-tŭr), the art or science relating to the cultivation of garden plants for decorative and useful purposes. The main divisions of horticulture are *pomology*, or

fruit growing; *floriculture*, or flower growing; and *olericulture*, or vegetable growing. It is properly a branch of agriculture and like the latter has made rapid progress in America. Many species of shrubs, flowers, and fruit-bearing trees have been naturalized in the different soils and climates, thereby rendering the garden and orchard more productive and profitable. In planting gardens and orchards it is essential to take into account the character of the soil, the drainage, and the slope of the surface. Fruit trees usually thrive best in a rich, dark loam, while early crops and vegetables yield the best returns in a sandy loam. Systematic drainage is essential for the reason that cultivation is most effective in well-drained surfaces, and freezing is thereby rendered less injurious to the growing trees. A slope facing the sun is preferable for orchards in some climates, but in northern latitudes, where frosts appear late in the spring, it is much better to select a slope toward the north for the reason that the early sap flow occasioned by the warm sun in the early part of the year will, when followed by frost, cause a rupture of the cells and consequently result in damage to the tree.

Next of importance to selecting choice species of plants and a suitable location is the careful fertilization and cultivation of the soil. Thorough tilling permits the essential elements of the air to penetrate to the roots, while the destruction of weeds and insects is essential in preserving both the tree and the vigor of its fruit. To succeed in the culture of flowers and ornamental plants it is quite necessary to construct plant houses, pits, greenhouses, and other structures with the view of securing early development. The art of grafting and propagating plants has led to wholesome results and greater profit. Suitable instruments, tools, and various forms of machinery patented within recent years have facilitated the culture to a great extent. Besides, the operation of railroad lines in various directions has opened a wider market in city and country districts for fruit and ornamental products, making it possible for the inhabitants of the colder regions to enjoy largely the more delicate products grown in the warmer climates.

The United States is the leading fruit-growing country of North America. Apples, which can be grown in all the states, comprise the leading crop and yield about 30,000,000 barrels per year. California has first place in the yield of citrus fruits and ships about 32,500 car loads annually. Florida holds second rank in the production of citrus fruits. Peaches, pears, tomatoes, grapes, bananas, strawberries, and many other fruits are grown more or less extensively. Canada



and the southwestern part of the United States have made remarkable progress in the number of species and the quantity of fruits produced. Both countries make large shipments to foreign ports.

**HOSPITAL** (hōs'pīt-al), an institution for the reception, care, and medical treatment of the sick and wounded. The term was applied formerly to a place of hospitality for those in need of shelter and maintenance. This application is still made to institutions built for the care of children, and in some cases to retreats or almshouses for the poor. Hospitals of a general character established in modern times are designed for those who are more or less dependent upon the public, or who are afflicted so as to make it a matter of public policy to extend aid. However, many institutions of this kind are built with the view of supplying the demand of those who prefer to be treated when sick in a hospital rather than in the home. Frequently private families and societies have special departments in readiness for use when needed in such institutions. In many instances the hospitals are maintained by appropriations or donations made by private individuals, but more largely by the city, county, or state under a system of general taxation. In these institutions departments or wards are provided, each being in charge of a separate force of attendants, and the whole is supervised by a matron, house surgeon, and apothecary. Patients afflicted with contagious diseases are kept and treated separately. Special departments are provided for those having ailments likely to prove fatal.

During the time of military operations field and naval hospitals are maintained for the care of sick and wounded soldiers and seamen. The hospitals are either temporary or permanent, the former serving immediate wants, while in the latter prolonged cases are treated. Sick or wounded seamen are usually taken on board of hospital ships, where they are given treatment for a brief period. Later they are transferred to the nearest permanent hospitals, or conveyed to their homes. The care and treatment of sick and wounded military men have made material progress within recent years. They have attracted the attention of philanthropists and of various societies, such as the famous Red Cross.

General hospitals were first established in the 4th century of the Christian era, and since then have spread to all the civilized nations. The United States, Canada, and the countries of Europe have excellent facilities for the care of unfortunates in hospitals. Some of the finest institutions provided by the government are main-

tained for that purpose. The hospitals of New York, Philadelphia, Chicago, Saint Louis, San Francisco, Montreal, and Toronto are especially noteworthy. The most important of Europe are in London, Berlin, Vienna, Paris, and Saint Petersburg. In Europe the institutions of this character date largely from the early part of the 16th century.

**HOTEL** (hō-těl'), a large inn or house for the reception and entertainment of strangers or travelers. The larger hotel buildings of the larger cities are among the finest and best equipped institutions of modern times. They are usually built fireproof throughout, or have fireproof construction in one or more of the lower floors, and are equipped with electric lighting, steam heating, hot and cold water service, baths, telephones, and elevators. The basement usually contains the heating and electric lighting plants, the laundry, the sample rooms, and a general lavatory. The first floor of a modern hotel has the office, the lobby, the news and cigar stands, one or more reception rooms, and rooms for the café, a drug store, a barber shop, a gents' furnishing store, and several small offices. In most instances the parlor and one or more writing rooms are on the second floor, which likewise has the best rooms for guests. All of the floors are reached by elevators and are furnished with fire escapes.

Two general plans of service are in vogue, known as the European and the American. The *European* plan is to place a price upon each particular kind of food enumerated on a bill of fare and extend to the guest the privilege of ordering what he pleases. In fact, the matter of board is entirely separate from lodging, since the guest registers only to take a room at a specified rate per day, and he may secure his meals wherever he chooses. This practice has been adopted with more or less favor in many of the American cities. The *American* plan is to serve a general meal without special orders. Under this plan the guest pays for his lodging and board at a specified price per day or per week.

**HOT SPRINGS**, a city in Arkansas, county seat of Garland County, fifty miles southwest of Little Rock, on the Chicago, Rock Island and Pacific and the Saint Louis, Iron Mountain and Southern railroads. The noteworthy buildings include the Federal Army and Navy Hospital, the high school, the public library, and the Park, Eastman, Arlington, and Majestic hotels. Building stone is quarried in the vicinity. It has a large trade in cotton, fruit, and merchandise. Hot Springs is celebrated for its thermal springs, about 75 in number, some of which have a temperature of 130° Fahr. Electric lights, water-



works, rapid transit, and sewerage are among the improvements. The place was settled in 1804 and was incorporated as a city in 1879. Population, 1900, 9,973; in 1910, 14,434.

**HOTTENTOT** (höt't'n-töt), the descendants of the aborigines of the southern part of Africa. When South Africa was first visited by Europeans, this peculiar race occupied a territory including about 100,000 square miles, from the Cape of Good Hope to the Orange River, but subsequently the number has been reduced greatly. A late census of Cape Colony places the Hottentot population at 90,000, but these are mixed more or less with other races, the total number of purely Hottentot inhabitants being about 20,000. The name was first applied to them by the Dutch; they call themselves Quaqu. The complexion is light brown, the hair is wooly, the nose is flat, the nostrils are wide, the beard is scant, and the cheek bones are high. Though symmetrical in form, their faces are quite ugly, and the general appearance is not pleasant. Formerly the dialect consisted of three classes, but at present they have a language mixed largely with the Dutch and English. They wear European dress.

**HOUGHTON** (hō'tŭn), a village of Michigan, county seat of Houghton County, 95 miles northwest of Marquette, on the Copper Range and the Duluth, South Shore and Atlantic railroads. It is located on Portage Lake, near Lake Superior, and has transportation facilities by a canal. The surrounding country is a rich mineral district, chiefly of copper. The principal buildings include the high school, the county courthouse, and a number of fine ward schools and churches. It is the seat of the Michigan College of Mines. Electric lights, waterworks, and a library are among the public utilities. Population, 1904, 4,345; in 1910, 5,113.

**HOUND**, a class of dogs useful in hunting, noted for their ability to locate game by the scent. The best known species include the bloodhound, staghound, foxhound, beagle, harrier, and greyhound. In the last named the scent is less acute. Hounds are noted for their docility and attachment to man and, when properly trained, are of much service. See **Dog**.

**HOURLASS**, an invention made at Alexandria, Egypt, in the 3d century, and used for measuring time. It consists of two hollow glass bulbs connected by a narrow neck, through which dry sand or some other substance passes. The instrument is not absolutely accurate, as the sand is impeded or affected by the fluctuations of temperature and the humidity contained in the air. Hourglasses are divided into hourglasses proper, and those having a shorter period, as

half-hour and three-minute glasses. In the 16th and 17th centuries hourglasses were used as regular pulpit furniture to indicate the length of the sermon, being placed where the congregation could see the grains of sand falling from the upper to the lower bulb.

**HOUSATONIC** (hōo-sə-tōn'ik), a river of western Massachusetts and Connecticut. It rises in the former State, flows through Connecticut, and after a course of 150 miles discharges into Long Island Sound. It passes through a rich country, affords an abundance of water power for manufacturing, and is affected by tide water for fourteen miles.

**HOUSE BOAT**, a raft with a flat bottom, designed as the support of a house with several rooms. The first structures of this kind were made by fishermen, who designed them as habitations during the fishing season, and later they came into use for the homes of people who were unable to own land. More recently structures of this kind have been built for the use of families or parties who wish to spend the summer season in fishing, or as a season of recreation. House boats are very common on the Thames River during the summer. They have come into use on the Saint Lawrence River and other streams of North America, especially on the lakes. The smaller house boats are propelled by means of poles or oars and the larger ones by gasoline engines. Some of these structures have houses with three or four well-furnished rooms, and offer good accommodations to those who wish to spend a short season in rest or recreation.

**HOUSEFLY**. See **Fly**.

**HOUSELEEK**, or **Live-Forever**, a genus of plants with thick, succulent stems and leaves. They are cultivated for their ornamental flowers. Several species are native to the region extending from Siberia to Italy, but the cultivated plants have been improved and are popular in gardens and parks. The common houseleek has flowering stems from six to twelve inches in height, and is the cyphel that grows on the rocky soil of the Alps in Europe. The flower stems and the blossoms have a beautiful roseate hue. It is hardy under cultivation and the flowers vary in color, though they are usually red or yellow. The juices of the leaves are considered cooling when applied to ulcers, burns, and inflammations.

**HOUSTON** (hūs'tŭn), a city in Texas, county seat of Harris County, fifty miles northwest of Galveston. It is on the Missouri, Kansas and Texas, the International and Great Northern, the Southern Pacific, the Gulf, Colorado and Santa Fé, and other railroads. The chief buildings include the Carnegie Public Li-



brary, the high school, the Federal building, the county courthouse, the Masonic Temple, the Rice Polytechnic Institute, and the cotton exchange. It has a fine union railroad depot. Among the manufactures are furniture, spirituous beverages, oil, cotton and woolen goods, railroad cars, farming machinery, and packed beef. The cottonseed oil factories are among the largest in the United States. The surrounding country is agricultural and fruit producing and contains deposits of cement-producing minerals. Among the facilities are electric street railways, street lighting, sewerage, pavements, and an extensive sewer system. The place was settled in 1836 and was named in honor of Samuel Houston. Population, 1900, 44,633; in 1910, 78,800.

**HOWITZER** (hou'its-ēr). See **Gun**.

**HOWLER** (houl'ēr), or **Stentor**, a kind of monkey native to South America, so named from the hideous howls it utters. The hyoid bone is expanded into a hollow drum, which communicates with the larynx and acts as a resonator. In the males it is much larger than in the females. The hair is long, the tail is prehensile, and the thumbs are large. In size this monkey is the largest of America. Ten or twelve species of howling monkeys have been listed. The *ursine howler* is black or dark brown with yellow markings, and the *golden howler* has a chestnut-red color diversified with yellow on the back. The latter furnishes the principal food for the natives in many parts of the Andes. Some of the species are peculiar in that they hang from the limbs of trees, suspended by their tails, and utter sounds that can be heard more than a mile at night.

**HOWRAH** (hou'rā), a city of India, on the Hugli River, opposite Calcutta, with which it is connected by a floating bridge. The chief buildings include many churches, temples, schools, hospitals, and government structures. It has good railroad and electric railway connections. The manufactures include fabrics, furniture, machinery, utensils, and toys. Howrah is a modern city and has many municipal utilities. In 1785 it was little more than a small village of huts. It is now a suburban section of Calcutta. Population, 1907, 161,535.

**HUCKLEBERRY** (hük'k'l-bēr-rÿ), or **Whortleberry**, a small shrub native to the temperate part of the Northern Hemisphere. It belongs to the genus *Vaccium*. Many species are included in the genus, some of which are common throughout North America. They have bell-shaped flowers and berries with many seeds. They thrive best in the dry soil of woods and mountain sides and yield dark purple berries, which are used in preserves. Species called *bil-*

*berry* grow in moist and marshy places, but their fruit is less serviceable, owing to greater tartness. Most species attain a height of from one to two feet.

**HUDDERSFIELD** (hüd'dērz-fēld), a city in the West Riding of Yorkshire, England, on the Colne River, sixteen miles southwest of Leeds. The chief buildings include the townhall, the public library, the Market hall, and the technical school. The place is noted for its manufactures of steam engines and machinery. It produces cotton, woolen and silk goods, and utensils. The city has extensive railroad connections and several lines of electric railways. The public utilities include sewerage, pavements, several parks, and a system of waterworks. It is the seat of Huddersfield College, which is affiliated with the University of London. Population, 1907, 94,814.

**HUDSON** (hüd's'n), a town of Massachusetts, in Middlesex County, 27 miles west of Boston, on the Boston and Maine Railroad. It is situated on the Assabet River and is surrounded by a productive farming country. The manufactures include clothing, boots and shoes, leather, machinery, and cigars. It has a public library, electric lights, waterworks, and well-improved streets. Several school buildings and churches, a townhall, and a number of substantial business blocks are among the chief buildings. Population, 1905, 6,217; in 1910, 6,743.

**HUDSON**, county seat of Columbia County, New York, on the Hudson River, 28 miles below Albany. It is on the Boston and Albany, the New York Central, and other railroads. The site is on the slope of Prospect Hill. Among the chief buildings are the county courthouse, the State Armory, the State House of Refuge for Women, the city hospital, and the Hudson Orphanage Asylum. The Public Square and the Franklin Square Park are points of interest. The manufactures include steam engines, car wheels, pianos, carriages, cotton and woolen goods, and farming implements. It has electric street railways, electric lights, pavements, waterworks, and a sewer system. The place was settled by New Englanders in 1783, when it was known as Claverack Landing, but the present name was adopted in 1784 and it was chartered the following year. Population, 1910, 11,417.

**HUDSON BAY**, a large bay, or inland sea, situated in the northeastern part of North America. Its length is about 1,000 miles; breadth, 600 miles; and area, 400,000 square miles. It is inclosed wholly by British territory, communicates with the sea through Fox Channel and Hudson Strait, and receives the drainage of a large portion of Canada. Numerous reefs and islands abound along the western shore. In



the southern portion is James Bay. The streams flowing into it include the Great Whale, Churchill, East Main, Albany, Nelson, Fish, Seal, and Severn rivers. It is open to navigation about five months in the summer, and the remainder of the year its surface is covered with ice or largely obstructed by drift ice. Several harbors are situated in the southern part, where the adjoining regions are adapted to stock raising and farming. The fur trade and white whale fisheries are especially profitable, but considerable quantities of fish are also secured in the summer season.

**HUDSON RIVER**, an important river of New York, rises by two small streams in the Adirondack Mountains, at a height of 4,325 feet above sea level. Its course is almost due south and about 340 miles long. It flows into the Bay of New York. The Hudson is navigable a distance of 145 miles, to Albany, for the largest vessels. Beautiful falls of 50 feet are at Glens Falls, 56 miles north of Troy, where great water power has been developed by means of a dam. Its course is through regions both historical and beautiful. It was named from its discoverer, Henry Hudson. Upon it sailed the first steamboat made by Fulton. A tunnel under it connects Jersey City and New York, and it is spanned by many valuable bridges. Near its mouth are the Palisades, which rise from 300 to 500 feet above the surface of the water. Tappan Sea, about three miles wide, and Haverstraw Bay are features between the Palisades and the Highlands. About 50 miles north of New York is the West Point Military Academy, near which the historic treason of Arnold took place. The upper Hudson is noted for its precipitous banks and picturesque scenery. Albany, Yonkers, Troy, Peekskill, and Poughkeepsie are among the cities on its banks.

**HUDSON'S BAY COMPANY**, a corporation chartered by Charles II. of England in 1670, in which Prince Rupert and other noblemen were interested. The company secured sole control of the large region known as Rupert's Land, consisting of all that portion of Canada which drains into Hudson Bay. The object was to control the fur and skin trade. Later the company secured control for a like purpose of possessions extending to the Pacific, but in 1869 its rights were transferred largely to the crown in consideration of \$1,500,000. However, the company reserved rights to certain ports, about 50,000 acres of land, and exclusive control of the chase in certain regions. It has still a large trade in furs and in the sale of its lands to speculators and settlers.

**HUÉ** (hōō-ā'), a city on the Hué River, in

Anam, ten miles from the China Sea. It is the capital of Anam and is noted for its importance as a military and trade center. The French fortified it in 1801, to whom it is subject. It contains a garrison of troops and several public buildings, but the houses of the natives are inferior. The inhabitants are mostly Annamites, but include 850 Chinese and 380 Europeans. Population, 1906, 53,041.

**HUE AND CRY**, a phrase that originated with the Anglo-Saxons from the manner in which criminals were apprehended. If the offender could not be found, the hue and cry was raised, and all the people joined in the search until the offender was seized. For many years all persons informed of a criminal offense were by law required to raise the hue and cry, but it was abolished many years ago.

**HUGLI** (hōō'glē), or **Hoogly**, an important river of British India, the principal channel of the delta of the Ganges. It is formed by the confluence of three branches of the Ganges, known as the Churni, Bhagirathi, and Jalangi, and has a length of 160 miles. At the mouth it is about fifteen miles wide and at the time of the southwest monsoon it is traversed by a bore seven feet high. Shoals obstruct the entrance of the river in many places, but ships drawing 25 feet of water may ascend as far as Calcutta. The city of Hugli, population 30,500, is located about 27 miles north of Calcutta, on the west bank of this river.

**HUGUENOTS** (hū'gê-nōts), a term which probably originated from Hugues, an obscure religious advocate, and applied to the Protestants of France during the Reformation and in the religious struggles of the 16th and 17th centuries. Among the early Protestants of France were Farel and Margaret of Valois, sister of Francis I. and Queen of Navarre. The movement was opposed by Francis I., but, when Henry II. of Germany joined the Protestant party and gave it encouragement in 1547-59, the Reformation made powerful advances in both France and Germany. In the reign of Francis II. it was headed by the Bourbon family and supported with vigor by the Queen of Navarre and the Prince of Condé. The Guises led the Catholic party. Under their leadership a fanatical persecution of the Protestants was pursued, when many were executed or banished and their property was confiscated. The events rapidly formed under which the Protestants took up arms. They named Louis I., the Prince of Bourbon-Condé, as their leader, and at a meeting in Nantes, on Feb. 1, 1560, resolved to petition the king for the removal of the Guises and the freedom of religion. It was also agreed that, if the peti-



tion be ignored, the king should be seized and Condé proclaimed regent of the realm. Shortly after the king was informed of the intention and fled to Amboise, and 1,200 Protestants were made prisoners and executed.

After the death of Francis, in 1560, it became necessary for Charles IX. and his mother, Catherine de' Medici, to curb the power of the Guises by encouraging the Protestants. Accordingly, the Guises were removed, an edict freeing the Huguenots from penalty of death was issued, and in 1562 they received the freedom of religious worship on their own estates. An attack made by adherents of the Duke of Guise on a Protestant meeting, in 1562, brought about a prolonged series of religious wars, by which France suffered great losses in life and property for many years. The Protestants were defeated at Dreux by the Duke of Guise, but he was assassinated on Feb. 18, 1563, while marching upon Condé at Orleans. The Peace of Amboise, concluded by Catherine, granted freedom of religion in many portions of France, but an alliance with Spain caused a renewal of hostilities and the execution of about 3,000 Huguenots. Condé was killed in battle at Jarnac on March 3, 1569, and shortly after Catherine began to plan the suppression of the Protestants by a general massacre. This scheme was inaugurated in 1572 by the Massacre of Saint Bartholomew, and within a few months about 30,000 Protestants were slain in France. The Protestants fled for protection to their fortified towns and carried on a defensive war with varying success until 1580, when peace was concluded.

In 1584 Henry of Navarre became heir to the throne on account of the death of the Duke of Anjou, but the Duke of Guise laid claim to the throne of France. He revived the Holy League, formed an alliance with the Pope and Spain to exterminate heresy, and inaugurated the so-called "War of the Three Henries." The Protestants secured troops from Germany and some from England, and under the leadership of Henry of Navarre presented a formidable opposition. In this conflict the Duke of Guise, Cardinal Lorraine, and the King of France were assassinated, and Henry of Navarre ascended the throne. On April 13, 1598, the famous Edict of Nantes was issued, by which the Protestants were given freedom of worship. Previous to this, in 1593, Henry of Navarre went over to the Catholic party for the purpose of maintaining himself on the throne.

In the meantime the Protestant influence continued to develop, and successive hostilities occurred in 1615, 1622, and from 1624 to 1629, when a war was waged against the Protestants

by Richelieu, which ended in the latter year by the capture of the Huguenot stronghold, La Rochelle. However, the Protestants still continued to enjoy freedom of conscience under the ministry of Richelieu and Mazarin, but they were required to surrender their strongholds. Later Louis XIV. and Madame de Maintenon inaugurated a new series of persecutions, which caused many thousands to seek refuge in Germany, Switzerland, Holland, and England. Those remaining were guarded by dragoons or compelled to abjure their faith. Louis revoked the Edict of Nantes on Oct. 23, 1685, which was followed by horrible persecutions and the industry of thousands of Huguenots was carried to foreign countries. These persecutions included the annulling of marriages, the ruthless murder of women and children, the execution of preachers, and the closing of convents. Louis XV. issued an edict of suppression, though this was revoked because of general opposition. The Protestants attained equality only with the Revolution of 1789, when they secured a recognition of their political and civil rights.

The first Huguenots came to the American colonies in 1630, when they were induced to settle in the Carolinas under the charter granted to Sir Robert Heath. About the same time large numbers settled in Virginia. When the Edict of Nantes was revoked, their immigration reached its height, and large parties came to Virginia and other American colonies in 1700. They founded a settlement at Charleston, S. C., and made settlements in the middle states, particularly in New York. The industry of the Huguenots added greatly to the early development of the colonies, since they possessed superior skill, thrift, and energy. Besides engaging in agriculture, they introduced dyeing, the manufacture of woolen goods, and glass making.

**HULL**, a city of Quebec, capital of Ottawa County, on the Ottawa River, opposite the city of Ottawa. It is on the Canadian Pacific and the Pontiac Pacific railways and a number of electric railway lines. The Ottawa River is crossed by two extensive bridges, the Chaudière bridge over the Chaudière Falls and the Interprovincial, or Alexandria bridge, a short distance farther down stream at Nepean Point. Among the noteworthy buildings are the Church of the Holy Redeemer, the Notre Dame de Grâce, the Church of Saint James, the courthouse and jail, the city hall, the Notre Dame College, the Notre Dame Hall, the Scott block, the Graham block, and many public schools. It has manufactures of cement, matches, clothing, cured and packed meat, lumber products, hardware, and machinery. The municipal-



ity maintains a modern fire department, waterworks, an electric lighting plant, sewerage, and street pavements. Hull was first settled in 1800 and was incorporated in 1870. It suffered greatly by a fire in 1900, but has been rebuilt on a more substantial plan. The prosperity of the city is due to its extensive trade. Population, 1908, 14,765.

**HULL**, or **Kingston-upon-Hull**, a river port of England, in the East Riding of York, on the north bank of the estuary of the Humber, where it is joined by the Hull. The Trinity Church, the townhall, the corn exchange, and several hospitals are among the noted buildings. It is noted for its spacious docks and an extensive trade. The city has many modern improvements, such as gas and electric lights, street railways, stone and asphalt pavements, and systems of sewerage and waterworks. The manufactures include ships, steamboats, flax and cotton goods, oil, cordage, machinery, and utensils. It is noted as a commercial and educational center, has a fine public school system, and is the seat of several large churches, a public library, and Hull College. The city was chartered by Edward I. in 1299. In the Civil War it was held by the Parliamentary forces, and successfully repulsed the Royalists at two different sieges. Population, 1907, 266,792.

**HULL HOUSE**, a social settlement in Chicago, situated at 335 South Halsted street. It was founded by Jane Addams and Ellen Starr in 1889, and was so named from Charles J. Hull, who occupied the site as a tenement residence and junk shop. The portion of the city surrounding the site is occupied largely by foreigners, including chiefly Jews, Italians, and French. Under wise management, the institution has been made highly beneficial, and its property includes a gymnasium, a library, a coffeehouse, and numerous buildings used in educational and industrial work. The Hull House takes rank as a leader in the social settlement movement of North America, and many of its former residents have held responsible positions in city and state offices and as inspectors and superintendents of industrial enterprises.

**HUMBOLDT** (hŭm'bōlt), an inland river of Nevada, rises by two forks in Elko County, and after a course of 390 miles flows into Humboldt Lake, an inland body of water in the western part of that State, about 4,000 feet above sea level. The Humboldt River is remarkable because its water contains a large per cent. of soda. It flows through an arid valley which has large tracts of sagebrush. The dry air causes the water to evaporate and become less in volume toward the mouth. The river is followed

from its source to its mouth by the Central Pacific Railroad.

**HUMIDITY** (hŭ-mīd'ī-tŷ). See **Rain**.

**HUMMING BIRD**, the name applied to a family of small birds, so named from the sound made by their wings in flight. They are native only to America and the West Indies, and are more abundant in the tropical than in the temperate regions. Most species are very small, some not larger than a bumblebee, but all are noted for their beauty of color and plumage, their quickness in darting through the air, and the peculiar manner in which they gather the food from flowers and foliage. In taking food they never alight, but feed while hovering on the wing before a flower, supporting themselves by vibratory movement of the wings, thus producing a peculiar humming sound. Most species have a long, slender beak, either curved or straight, and a tongue which they are capable of



HUMMING BIRDS.

protruding some distance in securing food. Their food consists partly of the nectar found in flowers, but they also feed on insects, and carry away flies caught in the webs of spiders. The female lays two eggs in a nest built of vegetable fibers or cotton. Both sexes display much boldness in defending their young, and with much vigor strike their enemies, usually aiming to inflict a wound in the eyes. No less than 400 species of humming birds have been described, some of which are migratory and are seen far in the north of the Temperate Zone. The *tufted-necked* humming bird of northern Brazil is the most remarkable species of these birds, and is noted for its variety of color and beautiful plumage. The only sound given out by humming birds is a chirp, with a vigor equal to that of a cricket. Their flight is so rapid as to elude the eye. The larger species are about the size of a wren.



**HUNDRED** (hūn'drēd), an ancient territorial division of England, which occupied an intermediate place between the parish or township and the shire or county. The name probably originated from a convenient grouping of one hundred families for local government. It is thought to have been a Danish institution, adopted by King Alfred about 897. The name *wapentake*, which has reference to the military side of the organization, is generally connected with the Danish occupation. The hundreds were represented in the shire mote, which, under the presidency of its bishop, sheriff, or earl, regulated the affairs of the county. In the time of Edgar the hundred became responsible for the administration of justice, and a fine or some other punishment was imposed upon it if criminals were not brought to the law.

**HUNDRED DAYS**, a term applied to the second reign of Napoleon I. as Emperor of France. It began on March 20, 1815, when he entered Paris after the return from Elba, and ended on June 28 of the same year, when Louis XVIII. was restored to power. Napoleon, on hearing that the restoration of the Bourbon monarchy was unpopular in France, left Elba and landed near Cannes with 900 men. Immediately the soldiers rallied to the support of their old leader, but 800,000 men were sent against him by the allies, who had pledged themselves to forever prevent Napoleon from disturbing the peace of Europe. He swore to support a liberal constitution and succeeded in raising an army of 287,000 men, but was defeated at Waterloo. He abdicated in favor of his son and gave himself up, after attempting to flee to America.

**HUNDRED YEARS' WAR**, the name of a long struggle between England and France, in which the English kings sought to obtain the territory and crown of the French kings. It began in 1337 and continued with several intermissions until 1453. Edward III. of England, who was a son of a sister of Charles IV. of France, claimed the crown of that country. War was declared in 1337, but the early contests were those of diplomacy rather than of arms, and in 1346 the English gained a substantial victory at Crecy, after which Calais became an English possession. The French were again defeated at Poitiers in 1356, where the leadership of the Black Prince was a potent factor in obtaining victory for the English. In 1360 a short intermission was secured by the Peace of Bretigny, but when Charles V. ascended the throne of France he had the help of Du Guesclin in regaining the lands lost by his predecessor. He was succeeded by Charles VI. in 1380, when few possessions were left to the English

in France, and a truce for 28 years was signed in 1396. War broke out again in 1415, owing largely to the Civil War in France, hence the English under Henry V. found comparatively little resistance. The latter compelled Charles VI., in the Treaty of Troyes, to recognize him as his heir and the regent of France. At that time the English were in possession of nearly the whole of France, but in 1429, through the achievements of Joan of Arc, the French were victorious on every hand. When the war closed, in 1453, the English held no territory except the city of Calais and a small district adjoining, and this was regained by the French in 1558.

**HUNGARY** (hūn'gà-rī), a political division of Europe, forming the eastern part of the monarchy of Austria-Hungary. It has an area of 125,430 square miles, and comprises, besides Hungary proper, Croatia, Slavonia, and Transylvania. In 1900 it had a population of 19,254,559. The surface is well adapted to agriculture, which is the principal industry. It may be regarded a natural basin around which extend mountain chains, except on the south, where the valley of the Danube stretches into Servia. The Theiss, Danube, and Drave, with their tributaries, form the drainage, practically all of which is by the Danube into the Black Sea. Two lakes, the Balaton Lake and the Neusiedler Sea, are situated between the Drave and Danube, and form the principal lake basins. They have a depth of about forty feet and include extensive marshes, but the water evaporates from the latter in dry seasons.

The productions, climate, and general industries of Hungary are practically the same as those of Austria. Hungary is exceedingly rich in minerals, forests, soil products, and internal improvements. The canals and navigable rivers have a length of 3,150 miles, while railroad lines penetrate all portions of the country, the different lines including about 12,500 miles. Among the minerals are iron, lead, copper, cobalt, salt, gold, silver, coal, petroleum, zinc, antimony, and peat. The soil products consist of wheat, cotton, tobacco, hay, barley, rye, a large variety of fruits, and many valuable forest products. Stock raising, dairying, and manufacturing are of growing importance. About 35 per cent. of the adult inhabitants are illiterate, but schools and colleges are maintained under government grants, and school attendance is compulsory. The religious affiliations are diversified greatly, as also are the races represented in the various portions. Among the numerically strongest sects are the Roman Catholics, Lutherans, Calvinists, Greek Catholics, Arminians, Unitarians, and Israelites. All forms of worship are free and



marked liberalism is shown in the treatment of all classes. The races most numerous are Hungarians, Germans, Servians, Croatians, Bohemians, Moravians, Slovaks, and Jews. However, the Hungarians constitute about one-half of the inhabitants.

**HISTORY.** The Hungarians, or Magyars, are an Asiatic people of the Turanian race and are allied to the Finns and Turks. Formerly they occupied a large district in southern Russia adjacent to the Caspian Sea, but under their leader, Arpad, they crossed the Carpathians in 889 and established a foothold in the plain of the Danube. Subsequently they conquered the regions now occupied by Transylvania and Hungary and made incursions into Germany and France. Otho I. of Germany defeated them with great slaughter, after which they became less warlike and developed agriculture and civilized arts. They established a kingdom in the latter part of the 10th century. In 997 Steven I. became their king, ruling until 1030. During his time the Hungarians embraced Christianity, established churches, founded cities, developed the arts of peace and laid the foundation for their present power. Steven was made a saint by Pope Sylvester II. and was given the title of Apostolic King. During the reign of succeeding kings the boundary line was extended. Croatia and Slavonia were added in 1089 by King Ladislaus and Dalmatia was annexed in 1102 by King Coloman.

In 1222 the nobles secured from Andrew II. the Golden Bull, the so-called Magna Charta of Hungary, by which the civil rights were defined. Andrew III. was the last of the house of Arpad, died in 1301, and was succeeded by Charles Robert of Anjou in 1309. During his reign Hungary became one of the greatest military powers of Central Europe. In 1342 Louis I. became king. In his reign of forty years he annexed Red Russia, Moldavia, Poland, and a part of Servia. Sigismund, who ascended the throne in 1387, was elected Emperor of Germany. His reign became famous for the wars with the Turks and the Hussites. He established an academy at Buda and secured various reforms. Matthias Corvinus became king in 1458, founded a university at Pressburg, defended the country against the Turks, and added territory to his dominion. The next sovereign of note was Ladislaus II., who reigned from 1490 to 1516, and was succeeded by Louis II., reigning until 1526. While the last two sovereigns occupied the throne the country was disturbed by domestic troubles and incursions of the Turks. At Mohács the Hungarian army was defeated by Soliman the Great and 30,000

people were carried into slavery. A large portion of the Hungarian provinces remained under Turkish dominion for 160 years. Ferdinand of Austria, a brother-in-law of Louis II., subsequent to the death of the latter entered upon a conquest of Hungary. After a dispute between him and John Zápolya, of Transylvania, the Protestants sided with Ferdinand and the house of Hapsburg obtained control of Hungary. In 1687 Leopold I. forced the Hungarians to declare the crown of Hungary forever hereditary in the house of Hapsburg.

Francis Rákóczy induced the Hungarians to rebel against Austria in 1703, but the effort proved futile. Charles VI. succeeded in gaining the approval of the Hungarians by granting reforms and adopting the Pragmatic Sanction, under which Maria Theresa eventually became ruler. Both Germany and France disputed her claim, but the invaders were repelled by the Hungarians. The queen showed her gratitude by granting religious freedom, building schools, and encouraging agriculture. Joseph II., son of Maria Theresa, governed Hungary without regard for its constitution, but, when Francis I. succeeded him, the Hungarians gave the latter valuable support in money and troops to defend the Hungarian constitution against the claims of Napoleon. Later he imposed exorbitant taxes, but in 1825 a diet was summoned to devise reforms, which discontinued the Latin language in public debates and adopted the Magyar. The diets of 1830 and 1832 again raised questions regarding absolute religious views, popular suffrage, and the rights of the common people, in which such men as Francis Deak and Louis Kossuth were prominent factors. These patriots were first imprisoned, but, when the French Revolution of 1848 gained strength, it gave an impulse to the demands for greater rights and equality to the people of Hungary, and soon after many concessions were granted by the court of Vienna.

Kossuth published the first Hungarian daily newspaper and spread the doctrine of human rights broadcast in the land, advocating equal taxes for all, freedom of speech and the press, and equality in citizenship. The government began to operate secretly against these demands, but the Austrians, who were also clamoring for reforms, encouraged a revolt of the Croats and Wallachians, inducing them to invade Hungary. An Austrian army sought to suppress the revolution, but after a number of battles the successes were on the side of the Hungarians, and Austria was obliged to enlist aid from the Russians. After struggling for some time, the Hungarians were obliged to surrender, and



many of the rebellious statesmen and soldiers were executed. The Battle of Sadowa, in 1866, brought about a separation between Austria and Germany, and the demands of Hungary were now heeded by the granting of a constitution. In 1867 Francis Joseph was crowned King of Hungary with a splendid public ceremony. Since then the government has been a constitutional monarchy. Hungary has its own parliament for local government and sends its share of delegates to the national assembly, a form of home rule long contended for by Ireland. Budapest is the capital. It is a beautiful city of thrift and enterprise. Other important cities include Szegedin, Maria Theresiopel, Pressburg, Debreczin, and Temesvár. See **Austria-Hungary**.

**HUNS**, a Turanian race of nomadic and warlike people, who, prior to the Christian era, were confined to Asia. They had a yellow complexion, a low and strong structure, a flat nose, and eyes deeply sunken in the head. To prevent the growth of the beard they scarred their faces with lashes and consequently possessed a peculiar ugliness. In habits they were roving, built no houses or cities, clad themselves in skins, and were noted for excellent horsemanship. Their families and all their possessions were carried in huge wagons, and their means of subsistence was secured largely from the chase and rude agriculture.

The Huns organized a powerful state in Mongolia. In the year 200 B. C. they overran the Chinese Empire, and after consecutive defeats compelled the Chinese Emperor, Kao-ti, to make a treaty. In the reign of Vou-ti, about the year 80 B. C., they were defeated by the Chinese, and subsequently large waves of emigrants began to move westward in search of possessions in the vicinity of the Caspian Sea. They settled between the Ural and Volga rivers. About 372 A. D. many Huns crossed the Volga, conquered the Alani and the Ostrogoths, and caused the Visigoths to emigrate and settle west and south of the Danube. Successive waves of immigrants followed each other until the former possessions of the Goths became a stronghold of the Huns, and their powerful chief, Rugias, in 432, secured from Theodosius II., Emperor of Byzantium, valuable tributes and territorial possessions.

Their greatest warrior was Attila, who called himself the scourge of God. He gathered a half million savages, with whom he moved westward from his wooden palace in Hungary, and vowed that he would not stop until he reached the sea. The army of Theodosius was beaten in three battles and Macedonia, Thrace,

and Greece were completely overrun by the Huns. Subsequently Attila conducted a campaign against the Germans on the Rhine and proceeded into France. On the field of Chalons, in 451, the Huns were defeated by Aëtius, the Roman general in Gaul, and Theodoric, King of the Goths, and Europe was saved to Christianity and Aryan civilization. Attila next crossed the Alps and descended into Italy, where city after city was taken. While marching upon the city of Rome, he was met by Pope Leo I., and by his majestic mien and exemplary character inspired Attila to spare the city. The death of Attila and the defeat at Chalons were heavy blows against the Huns. Later they were defeated in successive battles by the Goths and other Germanic tribes. This not only scattered their forces, but required them to remain principally on the east side of the Danube.

**HUNTING.** See **Game**.

**HUNTINGDON** (hūn'ting-dŭn), a borough and the county seat of Huntingdon County, Pennsylvania, on the Juniata River, 98 miles west of Harrisburg. It is on the Pennsylvania Railroad. Among the chief buildings are the county courthouse, the high school, and several fine churches. It is the seat of Juniata College and of the State Industrial Reformatory. The surrounding country has extensive deposits of iron, lead, coal, and building stone. Among the manufactures are railroad cars, flour, ironware, cigars, and machinery. It was settled in 1760 and incorporated in 1796. Population, 1900, 6,053; in 1910, 6,861.

**HUNTINGTON**, a city in Indiana, county seat of Huntington County, on the Little River, 24 miles southwest of Fort Wayne. It is on the Erie and the Wabash railroads. The noteworthy buildings include the high school, the public library of 12,500 volumes, and a United Brethren College. The surrounding country is agricultural and produces the famous Huntington white lime. The general facilities include waterworks, electric railways and lights, and good public schools. Among the manufactures are woolen goods, cigars, flour, shoes, bicycles, stoves, and ironware. It is the seat of important railroad shops. The place was settled in 1834 and incorporated in 1848. Population, 1900, 9,491; in 1910, 10,272.

**HUNTINGTON**, a town of New York, in Suffolk County, thirty miles northeast of New York City. It is located on Long Island Sound and on the Long Island Sound Railroad, has electric railroad facilities, and is surrounded by a fertile farming district. The manufactures include pottery, machinery, brick, clothing, and cigars. It is popular as a residential center



and as a summer resort. The public library has about 5,000 volumes. In the town is a monument to commemorate the spot where Nathan Hale was captured by the British. Population, 1905, 10,236; in 1910, 12,004.

**HUNTINGTON**, a city of West Virginia, county seat of Cabell County, on the Ohio River, 52 miles west of Charleston. It is on the Chesapeake and Ohio, the Baltimore and Ohio, and other railroads. The surrounding country is fertile and produces large quantities of iron, coal, salt, fruits, and lumber products. Among the chief buildings are the county courthouse, the high school, the Carnegie Library, Marshall College, and the West Virginia Asylum for the Insane. The enterprises include woolen and flouring mills, car and broom factories, iron works, tobacco factories, and railroad machine shops. Electric street railways, pavements, public lighting, and waterworks are among the municipal facilities. Huntington was settled and incorporated in 1871. Population, 1900, 11,923; in 1910, 31,161.

**HUNTSVILLE**, a city in Alabama, county seat of Madison County, called "Queen City of the Mountains." It is on the Nashville, Chattanooga and Saint Louis and the Southern railroads, and is beautifully situated on a spur of the Cumberland Mountains. The surrounding country is agricultural, dairying, and fruit raising. It is the seat of the Central Alabama Academy, the Huntsville Female College, a State normal and industrial school, and the Huntsville Female Seminary. Other noteworthy buildings are the high school and the county courthouse. The manufactures include railroad machinery, farming implements, ironware, cotton, cotton-seed oil, ice, and lumber products. Gas and electric lights, waterworks, and a public library are among the facilities. It was settled in 1775 and incorporated in 1800. Population, 1900, 8,068; in 1910, 7,611.

**HURON** (hūr'ŕn), **Lake**, one of the five Great Lakes of North America, located between the State of Michigan on the west and the Province of Ontario on the east and south. It joins lakes Superior and Michigan on the north and Lake Erie on the south. The length is 256 miles; the width, 190 miles; and the area, 22,322 square miles. It is from 200 to 700 feet deep and its surface is 582 feet above the sea. Within the lake are about 3,000 islands, of which Grand Manitoulin is the largest. The bays are Saginaw and Thunder on the west and Georgian on the east, though there are numerous others of less importance. The water is pure and clear. Many valuable species of fish abound. Good harbors are plentiful, including those at

Bay City, Port Huron, and Cheboygan, Mich.; and Collingwood, Kincardine and Goderich, Ontario. The most important streams flowing into it include the Saginaw and Au Sable rivers. Lake Huron receives the discharge from Lake Superior through the Saint Mary's River, and is connected with Lake Michigan by the Strait of Mackinaw. It discharges into Lake Erie through the Saint Clair River, Lake Saint Clair, and the Detroit River.

**HURON INDIANS**, a tribe of North American Indians, which formerly occupied the lake region of Ontario. They were classed with the Huron-Iroquois family. Among the Indians they were generally spoken of as the Wyandottes and they have been known by that name since 1751, but they were designated as 'Hurons throughout the early colonial times. They were frequently at war with the more powerful Iroquois, for which purpose they became allied with the Algonquins at different periods, but by the middle of the 17th century were driven westward to the vicinity of Lake Superior. In 1632 the Jesuits started missions among them, and by 1670 they had caused most of the tribe to settle in the vicinity of Mackinaw. The operation of these missionaries induced many to embrace the Catholic religion and to learn the French language. Subsequently some of them drifted into territory which is now occupied by the United States. In 1812 they aided the British and in 1832 a reservation was formed on the present site of Kansas City, Kan., which was known as the Wyandotte. Subsequently the larger part of the tribe was settled on the Quapaw reservation, where it numbers about 300. The Hurons remaining in Ontario, Canada, occupy a region near Quebec, where they have been intermixed largely with the French. Many have adopted civilized arts and are advanced in education.

**HURRICANE** (hūr'ŕi-kān). See **Storms**.

**HUSBAND AND WIFE**, the two parties to a marriage contract, after the same has been suitably ratified through solemnization by a minister or a civil officer empowered to perform that act. The laws which govern the marital relation are among the most important of those which prevail in any community. Though they have been looked upon in this respect from remote antiquity, many marked changes have taken place within the last two centuries in the legal relations existing between husband and wife. The common law of England formerly regarded the person of the wife as merged in that of the husband, and all of her property rights were transferred to him at the time of marriage. This law did not give to woman



that place and those rights which place her on an equality with the husband, and since then many changes have taken place in the equity of England as well as in the statute law of America. At present the marriage relations between husband and wife may be said to be those of practical equity, and they are governed by the laws enacted in the State or Province. Since equity and statute law differ somewhat in the various states and as there is no national law governing marriage relations, it is impossible to give more than a general outline of the more important common law rules in the scope of this article.

Since the residence of the husband is that of the wife, it being her duty to reside with him, the husband has the right to determine the residence of the family. He is required to support the wife according to his ability and income, and she is obligated to furnish reasonable and necessary domestic service. In some states the husband is liable for debts contracted by the wife before marriage, but generally neither husband nor wife is liable for the debts or liabilities of the other incurred before marriage. At common law, when a man married a woman, he became liable for all the debts she owed when married, but she was not competent in law to contract a debt in her own name after marriage. At present she may purchase necessaries for the home, such as clothing, articles of food, and essentials in furthering the reasonable educational advancement of the family, but in general the wife does not possess the power to make contracts, this right being vested in the husband.

Previous to a marriage the parties may make agreements between themselves about their separate properties, and, if these are not unreasonable or against the policy of the law, they will be enforced after marriage. In the absence of such a contract, neither the husband nor wife can dispose of real property without the consent of the other, since the right of dower is attained at the time of marriage in the absence of a contract. Under the common law neither the husband nor wife could sue the other, except for separation or divorce, but now the law of most countries permits either party to sue for the recovery of property or in equity for other rights. However, neither is a competent witness against the other, except in actions at law where one of the parties sues for protection against the other. The presumption of the husband's influence over the wife still exists to the extent that, if she commits a crime in his presence, she is punishable for it if it is shown that she did it of her own free will. While married women have been emancipated from

many of the disabilities imposed upon them by the common law, the statutes and courts still recognize the husband as the head of the family.

**HUSSITES** (hūs'its), a powerful organization that honored John Huss and Jerome of Prague as martyrs, and after the death of the former took up arms in defense of their religious principles. Under the leadership of Johann Ziska they captured Prague and successfully opposed Emperor Sigismund, whom they charged with breaking his pledge in furnishing safe conduct to Huss. There were two parties among the Hussites, known as the Calixtines and Taborites. The former comprised the so-called moderate Hussites, who, later, by the compact of Prague, in 1433, united with the Catholics. During the union of both branches the priests and monks were punished excessively, but when they became separated a weakness appeared and the Taborites were defeated in a battle at Bömischbrod on May 31, 1434. Subsequently their political influence declined and for religious purposes they became united with the Bohemian Brethren.

**HUTCHINSON** (hūch'in-sūn), a city in Kansas, county seat of Reno County, on the Arkansas River, 225 miles southwest of Kansas City, on the Missouri Pacific, the Chicago, Rock Island and Pacific and the Atchison, Topeka and Santa Fé railroads. In its vicinity are vast beds of pure rock salt, which are worked extensively. The chief buildings include the county courthouse, the high school, and the public library. It is the seat of the State reformatory, has many beautiful residences, and is a center of trade in merchandise. The municipal facilities embrace electric lights, waterworks, a sewerage system, and a street railway. It has manufactures of matches, creamery butter, ironware, flour, salt, cigars, and machinery. It was settled in 1872 and incorporated in 1874. Population, 1910, 16,364.

**HYACINTH** (hī'ā-sīnth), a genus of flowering plants which belong to the order of *Liliaceae*. It includes many species, several of which are highly popular as garden flowers, especially the bluebell hyacinth. Dutch traders first brought the hyacinth to Europe from its nativity in the Levant in the early part of the 16th century. Since then it has been greatly improved by cultivation and bears many kinds of beautiful flowers of various colors. The bulb is stout and onionlike, the leaves are fleshy and linear, the stamens are six in number, the style is single, and the seeds are numerous. At Haarlem, Holland, are the most extensive bulb gardens in the world, where the finest double-flowering species have been originated. In early times it



was cultivated in Asia Minor and as far east as Persia, where it is still a favorite flower. Many beautiful romances and literary productions



BLUEBELL HYACINTH.

mention the Oriental hyacinth, but it has entered modern literature of all countries with even greater latitude.

**HYBRID** (hī'brīd), an animal or plant which is produced by the union of two distinct but closely allied species or genera. Extensive experiments

have been made in relation to the crossing of species, and, while material knowledge and productive results have been obtained, there is yet a wide field for experimental investigation. It is quite certain that successful crossing extends largely to different genera, but reproduction will not take place from the union of different orders. Plant hybrids are produced artificially by applying the pollen of one species to the stigma of a plant closely allied. The theory that hybrids are uniformly sterile and that this sterility is provided in nature to prevent the confusion of species was long held by scientists. Darwin pointed out in his "Origin of Species" that this view is generally erroneous, and that two fundamentally different facts have been confounded by many writers, namely, the sterility of species when first crossed, and the impotence of the hybrids produced from them. His views imply that the sterility of various hybrids has arisen from divers causes and not from natural selection. He asserts that crosses between the progeny resulting from two breeds, called *mongrels*, are not uniformly sterile. From this fact he elaborates the view that there is nothing in the phenomena of hybridization from which to conclude that species had not existed at first as varieties.

Hybrids are secured between the toad and the frog and between the swan and the goose. In fishes they result from artificial impregnation, as between different species of the carp. Among mammals they are produced from the copulation between the tiger and the lion, the fox and the wolf, the ibex and the goat, the horse and the ass, the he goat and the female sheep, and the horse and the zebra. In many cases the hybrids are sterile, even though the crossing

may be brought about without difficulty, while in other cases the act of conjunction may be more difficult but the hybrids produced are fertile. Generally it is impossible to secure offspring from crossing different species, but where it is possible it takes place between animals or plants having a fair degree of likeness. Some hybrids are sterile among themselves, but fertile with their parents. Usually the degree of fertility depends upon various physical peculiarities differing in degree among various species.

**HYDE PARK**, a popular pleasure resort at London, England, occupying an inclosure of 400 acres. Formerly it was a park of the manor of Hyde, belonging to Westminster Abbey, but in the reign of Henry VIII. the grounds came into possession of the crown.

**HYDE PARK**, a town of Norfolk County, Mass., on the Neponset River, about eight miles south of Boston. It is on the New York, New Haven and Hartford Railroad, has electric railways and is a favorite residence place for Boston business men. The chief buildings include the public library and a number of schools and churches. It has systems of waterworks, pavements, and drainage. The manufactures include machinery, cotton and woolen goods, and curled hair. Population, 1905, 14,492; in 1910, 15,507.

**HYDERABAD** (hī-dēr-ä-bäd'), or **Haidarabad**, capital of the state of Hyderabad, situated on the Musi River, in the southeastern part of India. It is elevated 1,800 feet above the sea and is important as a trade and railway center. The principal buildings include the Nizam's palace, the British government buildings, and a number of important Mohammedan institutions, among them a college founded in 1590. The Jama Musjid, a celebrated mosque, is built on the pattern of the great mosque at Mecca. It has many fine schools, churches, hospitals, and municipal improvements. The city has beautiful streets, several parks, and extensive gardens. It is noted for its manufacture of silks, turbans, woolen and cotton goods, and machinery. In recent years it has grown rapidly and is the fourth city of India. Population, 1906, 452,646.

**HYDRA** (hī'drā), in Greek mythology, a monster serpent with nine heads. It was the offspring of Typhon and Echidna and infested the vicinity of Lake Lerna, where it committed great depredations among the herds. To slay this monster was one of the twelve labors of Hercules. Accordingly he proceeded in the task, being assisted by his servant Iolaus, but as the heads were stricken off by his club two new ones grew forth. Hercules next burned away the heads of the hydra, but the center



head, being immortal, he buried under an immense rock. Into the poisonous blood of the monster he dipped his arrows, which ever afterward rendered wounds inflicted by them incurable.

**HYDRA**, an island of Greece, off the east coast of Morea, near the Bay of Hydra. It is about eleven miles long and three miles wide, and has an area of 22 square miles. The surface is broken and barren and the shores are steep and rocky. The inhabitants are classed among the best sailors of Greece and during the war of independence performed important services. Hydra, the capital of the island, is located on a barren height near the northwestern shore. It has manufactures of soap, leather, and silk and cotton textiles, and carries on considerable trade with foreign countries. In 1825 the population was about six times larger than at present, but the decline of its trade has caused a decrease, being due to the improvement of other harbors. At present the inhabitants are centered almost entirely in the town of Hydra. Population, 1906, 7,086.

**HYDRA**, or **Hydroid**, a fresh-water polyp found in ponds, so named because its buds resemble the Hydra of mythology. It is usually found attached by a basal sucker to sticks, stones, and other objects in the water. The body is extensible and the terminal mouth is surrounded by a varying number of tentacles. It is one of the simplest forms of many-celled animals, the body being a simple tube. Young hydras bud out from the side of the older ones, and after a short time become detached and take on the form of their parents. If the body be divided into pieces, each piece will grow into a complete hydra. The food consists of small insects which are paralyzed by the barbed cells of the tentacles, and by them are carried to the mouth of the hydra, through which it enters into an internal digestive cavity, where the nutritive parts are absorbed, after which the indigestible portions are expelled through the mouth.

**HYDRANGEA** (hî-drăn'jê-à), a genus of plants which belong to the saxifrage family, including about fifty species. They are favorite plants on account of the size and beauty of their flowers. The stalk is shrubby, the leaves are oval, and the flowers are showy and greatly variegated in color. They are employed in Japan to make a kind of tea and elsewhere in the preparation of medicine. The cultivated species include the snowy-leaved and oak-leaved hydrangeas.

**HYDRAULIC ENGINE** (hî-dră'lik), a machine which is propelled by the pressure of

a column of water. It differs from the steam engine in that the piston of the cylinder is driven by water power instead of by steam. In construction machines of this kind are similar to steam engines, but, as the pressure under which they work is greater, they are usually smaller than the engines employing steam. The



SNOWY-LEAVED HYDRANGEA.

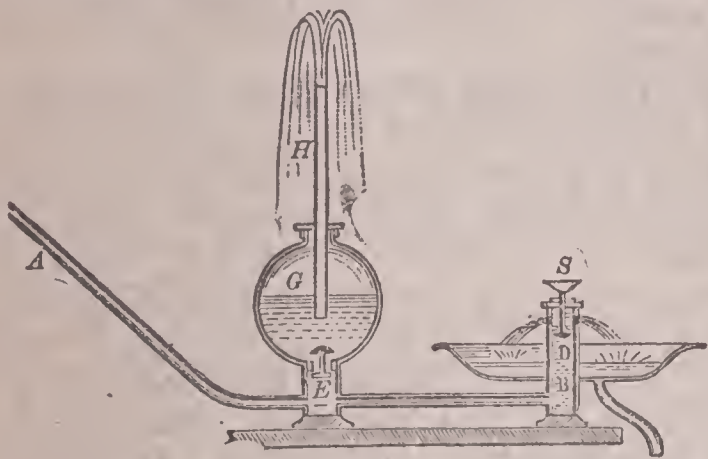
plungers in the cylinders are forced outward by the water being admitted through valves, and, when the outward stroke is completed, the water escapes from the cylinder, the plungers slide inward, and are again forced outward by a new supply of water. Some hydraulic engines are known as single-acting, while others of a different construction are double-acting. Generally the entire water pressure is cut off at the end of the outstroke, and the water exhausts by a valve after serving its purpose. The speed is usually slow, as power is increased by a corresponding decrease of speed, but the pressure is magnified so intensely that engines of this class are exceedingly powerful.

**HYDRAULIC RAM**, a machine for raising flowing water to a greater height than that of its source. It is utilized only where there is an abundant supply of water, for the reason that a portion of the water is wasted in the operation. In the hydraulic ram the momentum imparted to water in falling is utilized, this being sufficient to carry it to a height greater than that of the source, where it is held in place by the uplifting valve *E*. Valve *D* is located in a supply pipe *AB* beyond the uplifting valve *E*, which is closed periodically by the velocity of



water running down the supply pipe. Successive reaction causes alternate jets of water to pass the uplifting valve *E*, into the chamber *G* above, in which the air becomes compressed. The valve *D* at the end of the supply pipe opens as soon as the pressure into the air chamber ceases, when the uplifting valve *E* closes, and the water passes through the supply pipe *AB*. The end valve *D* is closed again as soon as sufficient velocity is gathered, and water is forced into the air chamber *G*. A continued series of operations forces the water to the proper height to be utilized for the purpose intended, flowing out of pipe *H* in successive jets. The first self-acting hydraulic ram was invented in 1796 by Joseph M. Montgolfier (1740-1810), who secured a gold medal at the exposition of 1802 held in France.

**HYDRAULICS**, the branch of science which treats of liquids in motion. It describes the flow and elevation of liquids, and the machines for moving liquids or intended to be moved by them. Water is taken as the type, and in theory its principles are those of falling bodies, but they cannot be relied upon in practice except when verified by experiment. The discrepancy arises from various conditions, such as the shape of the orifice; the changes of temperature, which vary the fluidity of the liquid;



HYDRAULIC RAM.

and friction. *Hydraulic engineering* treats of the control and management of water by the practical application of the mechanics of fluids, particularly such as are concerned in water power, artesian wells, canals, hydraulic machines, waterworks, pumps, dams, and water motors. The energy or capacity for work found in pressure transmitted by water is termed *hydraulic power*, and is exemplified in engineering by the water pressure in pipes, cylinders, and channels.

When a fluid is confined in a vessel and a certain amount of pressure is exerted on a given area, an equal amount is transmitted in all directions to every equal area on the walls

of the vessel. If the area of the external pressure surface is decreased, the whole pressure may be increased proportionately. It is on this principle that such mechanical structures as jacks, hydrostatic presses, rail benders, elevators, punches, and lifts are operated successfully. Hydraulic engineering likewise is concerned with the velocity of rivers, water motors, undershot wheels, overshot wheels, turbines, and breast wheels. In the construction of machinery to employ hydraulic power the principle is utilized that pressure is equal in all directions, area for area, as well as in all parts, which makes it possible to obtain increased pressure by giving a larger surface to the working area against which the pressure is exerted. In this way a magnified pressure is obtained at one end from only a small pressure at the other.

The first *hydrostatic press* for utilizing this principle dates from 1796, but at that time only the simplest form of the apparatus was known. Since then vast strides of progress have been made in the application of hydraulic power. It may be said that improvements in this line have kept pace with the use of compressed-air apparatus and electric motors. Where great power is required for short intervals, hydraulic power is preferable, since it is not expensive when idle. It is utilized extensively in sheet-punching machines and in riveting. The hydrostatic press is to some extent taking the place of the steel hammer for forming wrought iron and steel. Some of these have a capacity of 4,000 tons. Notable examples of vast machinery of this class may be found in some of the larger manufactories of Pennsylvania, in which from six to twenty tons of pressure is secured to the square inch. Another use to which this power is now applied extensively is in tunneling operations. The machinery thus employed is adequate to penetrate through various formations with success, and serves to push aside small boulders with little difficulty. Wherever the nature of the ground permits it, tunneling is carried on most extensively by hydraulic shields. Notable incidents of successful operations of this character within recent years are those at the Saint Clair River and the tunneling under the Thames, in London, in 1897.

**HYDROCARBON** (hī-drō-cār'bōn), a compound containing only hydrogen and carbon, such as benzine and methane. This compound occurs in many plants as wax or essential oil, in natural gas, gutta-percha, petroleum, caoutchouc, etc. The hydrocarbons are of considerable commercial importance. They are insoluble or slightly soluble in water. The natural decomposition of organic substances is the chief source



of hydrocarbon, but they may be produced by artificial means, such as making gas by the destructive distillation of coal.

**HYDROCHLORIC ACID** (hī-drō-klō'rik), or **Muriatic Acid**, a corrosive gas consisting of equal volumes of hydrogen and chlorine. It is colorless, has a suffocating odor, and has a marked affinity for water. Great quantities are obtained in making soda, by the acting of sulphuric acid on common salt. During volcanic eruption this gaseous compound is set free, hence is found in the water of lakes and rivers that have their source in volcanic formations. In medicine it is used in a greatly diluted form as a tonic and an astringent. Its chief commercial use is in manufacturing bleaching powder and in preparing phosphorous, glue, artificial waters, and carbonic acid.

**HYDROFLUORIC ACID** (hī-drō-flū-ōr'ik), a volatile liquid obtained by the action of sulphuric acid on fluorite. It is colorless and very corrosive and has a pungent, suffocating odor. Since it attacks all silicates, such as glass or porcelain, it is employed chiefly for etching upon glass and to decompose and dissolve silicates in mineral analysis. To preserve it for use, it is necessary to have it in a vessel made of lead, caoutchouc, platinum, or gutta-percha.

**HYDROGEN** (hī'drō-jěn), an element which is very abundant in nature, occurring as a constituent of water and of all organic compounds. It may be obtained by pouring hydrochloric acid over granulated zinc. If this mixture be confined in a tall jar, an effervescence arises and gas forms at the mouth of the jar, which may be lighted by applying a match, when a large stream of very pale flame shoots into the air. Water may be decomposed into its elements, hydrogen and oxygen, by the action of an electric current. It may be obtained by bringing the vapor of water in contact with red-hot iron filings. Hydrogen is the lightest substance known, being  $14\frac{1}{2}$  times lighter than air and 11,160 times lighter than water; hence, it is taken as a standard in comparing atomic weights and volumes. If it be breathed in a pure state, death results, not by poisoning, but from the absence of oxygen. Six volumes of air with two of hydrogen form an explosive. In blast furnaces requiring unusual heat it is burned in oxygen gas, these two elements being necessary to produce the most intense heat.

Pure hydrogen is a gaseous element, is odorless, tasteless, colorless, and slightly luminous when lighted, but intensely hot. It is a powerful refractor of light and is the only gas that conducts heat. It combines with many of the other elements, but under ordinary circumstances

its affinities are not very pronounced. Heat is required to bring about the union of hydrogen and oxygen, and chloride combines with it under the influence of light. Compounds of much utility and importance are formed with or of it, such as ammonia, when combined with nitrogen; hydrochloric acid, when united with chlorine; and hydrofluoric acid, when combined with fluorine. It does not occur extensively in a free state, but escapes as a gas in many of the petroleum regions, such as are met with in Pennsylvania and Ohio. Hydrogen forms, in combination with oxygen, one-ninth part by weight of water.

**HYDROGRAPHY** (hī-drōg'ra-fy), the art of surveying bodies of water, such as lakes, rivers, and the ocean. It relates to the determination of the contour, depth, character of the bottom, and other phenomena of bodies of water. As a branch of geography, it relates to the water surfaces of the earth, including the general characteristics of currents, icebergs, winds, and other phenomena that affect the sea. It treats of the systems of rivers, of lakes, and other bodies of water that are associated with the land. Hydrographic departments are maintained by all the leading governments. The purpose of these is to make coast surveys, direct soundings, and conduct other work of research which tends to promote navigation and other industrial enterprises.

**HYDROGEN DIOXIDE** (dī-ōks'id), a colorless liquid obtained by the action of acid on barium peroxide. *Oxygenated water* and *peroxide of hydrogen* are other names for this compound. It resembles water, but has a bitter, sour taste. It is found in nature in small quantities, especially in some plants and in rainwater. Large quantities are manufactured for an oxidizing and bleaching agent, such as are used for bleaching hair and textiles. In medicine it is used as a tonic to overcome indigestion and in the treatment of diphtheria.

**HYDROMETER** (hī-drōm'ē-tēr), an instrument used to determine the specific gravity of a liquid. It consists of a small glass tube to which two larger bulbs are sealed, one above the other. In order to keep the stems of the instrument vertical, a weight, either mercury or small shot, is put into the lower bulb. The upper end of the stem is graduated decimally, and the instrument sinks to the point marked zero when immersed in water. A liquid that is heavier than water will not permit it to sink to the zero point, while one lighter than water will permit it to sink below the point marked zero. Special forms of hydrometers are used for particular liquids. A *lactometer* is used for testing the purity of



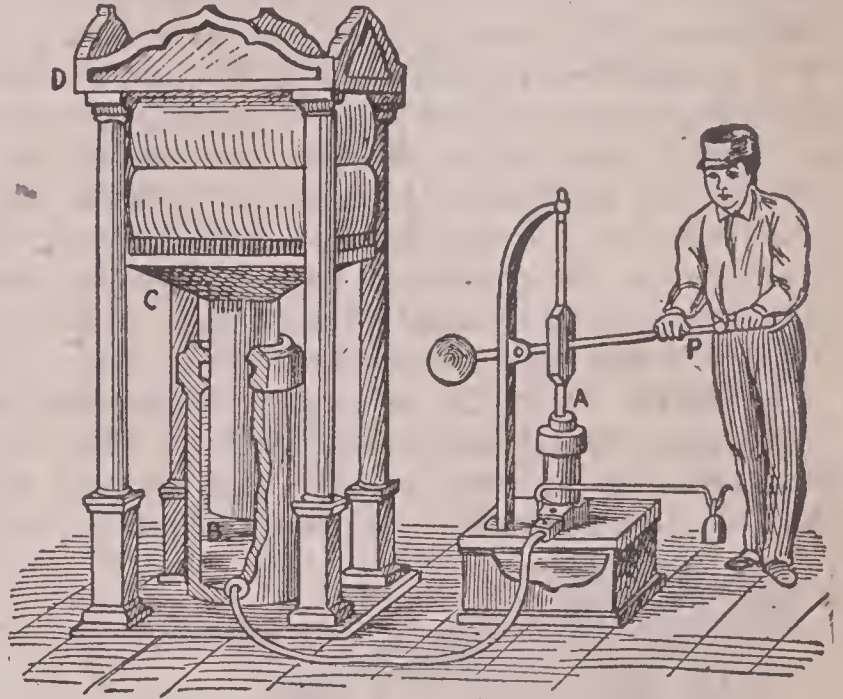
milk, and an *alcoholmeter* for determining the per cent. of absolute alcohol in spirits.

**HYDROPHOBIA** (hī-drō-fō'bi-à), or **Rabies**, a disease which is communicated by the bite of a rabid animal, due to a specific virus in the saliva. Dogs are the most liable to be afflicted with madness, but there are other animals subject to the disease, particularly cats, wolves, raccoons, and foxes. In hydrophobia the patient experiences great nervous disturbance, difficulty of swallowing, convulsive dread of water, and spasmodic muscular contractions. The symptoms of the disease appear from six weeks to eighteen months after the bite is inflicted and death results about three days after the specific symptoms begin. To prevent affection it is advisable to impede the circulation from the wound by bandages, stopping the flow of blood, and cauterizing with an iron at a white heat, or with nitrate of silver, but any burning or cauterizing agency may be used. In 1884 M. Louis Pasteur announced that protection against hydrophobia can be secured by inoculation with a prepared virus. Inoculations are effected by marrow taken from a rabid animal and are made consecutively, first with weak virus and then with stronger, and they are increased gradually in strength until the strongest obtainable is injected into the system. In this way the parasitic cause of the disease may be destroyed. Institutes have been established in New York, Paris, and other cities where this method has been thoroughly tested and the patients treated are cured almost universally. Out of 21,631 cases treated at the Pasteur Institute in Paris, France, in a period of fourteen years, all the patients except 99 were cured.

**HYDROSTATICS** (hī-drō-stāt'iks), the branch of science which treats of the pressure and equilibrium of liquids. Its principles apply to all liquids, but water, on account of its abundance, is taken as the type. A liquid placed in several vessels communicating freely with each other comes to rest in all at the same level, or height. Two or more liquids placed in the same kind of vessels arrange themselves according to their relative densities, after which the equilibrium continues firm and distinct. The law relating to hydrostatics as announced by Pascal is considered fundamental. From it we learn that pressure exerted anywhere upon a mass of liquid is transmitted in an undiminished degree in all directions, and acts with the same force in all directions, and in a direction at right angles to the surfaces upon which it is exerted. It may seem impossible at first thought that a pressure of one pound is sufficient to produce a pressure of 100 pounds, but this is only an ex-

emplification of the general law of mechanics that applies to both liquids and solids. If a force of one pound on one square inch causes motion by pressing through the medium of 100 square inches, the velocity of the body moved is only one-hundredth of that of the body applying the pressure.

In the hydrostatic press this principle is taken advantage of by filling two connected cylinders



HYDROSTATIC PRESS.

with water, as shown in the illustration. If the smaller cylinder, *A*, has an area of one square inch, and the larger cylinder, *B*, 100 square inches, then a downward pressure of one pound on each square inch, by means of the lever, *P*, acting on a piston in the small cylinder, lifts a weight of 100 pounds. *C* is a platform and *D* a strong frame, between which the compression takes place. If the pressure downward be 100 pounds, it balances 10,000 pounds, and in like proportion the pressure of the hydrostatic press may be increased to 200 or 300 tons. This class of machinery is utilized extensively in raising heavy weights, for testing anchors, and for other purposes where immense pressure is necessary. Other matters investigated in the study of hydrostatics are the equilibrium of floating bodies, the buoyancy of liquids, the specific gravity of liquids, and the four laws of equilibrium. These laws embrace: 1. At any point within a liquid at rest the pressure is the same in all directions. 2. The pressure increases with the depth. 3. The pressure does not depend on the shape or size of the vessel, but on the area and depth. 4. Water seeks its level.

**HYDROTHERAPY** (hī-drō-thēr'á-pÿ), or **Water Cure**, a method of treating diseases by the frequent and copious use of water, both internally and externally. It has long been recognized that water is an efficient agent in the



cure of numerous forms of diseases. Hippocrates employed it to a considerable extent, and it has continued to be advocated as a remedial agent, especially in the treatment of acute and some forms of chronic disorders. Many institutions of Canada and the United States use the hydropathic treatment, either as supplementary or exclusive, though it is generally recognized by physicians that this method is not efficient in all maladies. However, it is looked upon as a potent stimulating remedy, and is efficient in that it cleanses the body and tends to produce greater uniformity and vigor in the various organs. Fevers are reduced by bathing, sore throat and tonsillitis are relieved by hot and cold water compresses, the circulation is stimulated by local bathing, and various other forms of treatment are universally recognized as efficient.

**HYENA** (hī-ē'nā), a genus of flesh-eating quadrupeds found in Asia and Africa. They are characterized by strong teeth well adapted to breaking the bones of their prey, extended claws,



SPOTTED HYENA.

a rough tongue, prominent eyes, long and acute ears, and fore legs longer than the hind limbs. Their gait is shambling, but they are able to move with considerable speed. Long, coarse hairs cover the body and form a mane and enlargement on the back. They feed on carrion, but also on fresh flesh, and devour carcasses in an advanced state of decay. Their claws are well adapted for digging, on account of which they are reputed to dig into newly made graves. At night they come out of their places of seclusion and gather in packs like coyotes, often attacking domestic animals and even children. At least four species are recognized, of which the

*striped hyena* of Western Asia and Northern Africa has been known the longest. The ancients knew of these animals and attributed many peculiar habits to them. A closely related species called the *spotted hyena* is found in South Africa. It has a yellowish color with numerous spots, and is more ferocious and somewhat smaller than the striped hyena. The *strand wolf* is a species allied to the spotted hyena, has a grizzled-brown color, and is found in the vicinity of the Orange River. The *brown hyena* is native to Natal and the southeastern part of Africa. Remains of extinct species occur in Germany, France, and England. They are known as the cave hyena, from their remains occurring in caves formed during the glacial epoch.

**HYGIENE** (hī'jī-ēn), the branch of medical science which relates to the preservation and improvement of health, both in individuals and communities. This branch of study has been receiving increased attention within recent years, and by means of modern agencies it has been possible to both improve the general health and prolong materially human life. The period in which delicacy was considered an element of beauty has passed away, and it is now sought to so develop the body in its powers and usefulness that it may be a fit dwelling for the mind and soul. Strength and vigor physically are looked upon as personal and national blessings, while weakness and timidity are deplored. Not only is it sought to provide the most highly sanitary conditions for the preservation of health in individuals, but a public policy is pursued by the authorities, and institutions are maintained under which the most favorable conditions of healthy living may be vouchsafed to all classes of people in rural and urban districts. The establishment of sewer systems in the cities, the provision of a water supply, the removal of waste materials, and the regulation of lighting and ventilation of public buildings are the outgrowth of economic study. They exhibit the public concern that civilized nations have for the best interest of each individual community.

Though public hygiene has been made a subject of investigation by the leading nations for many centuries, definite aims regarding the promotion of public health and the prolongation of human life did not take form until the beginning of the 18th century. Besides, it cannot concern itself specially with the diet of persons, since each individual may choose for himself in relation to the diet of his household and the use of medicines so long as they do not interfere



with the rights and welfare of others. However, conditions have been provided generally, whereby individuals may take advantage of public conveniences, that both the comforts and sanitary conditions may be rendered of the highest character for all.

Legislation has been directed with the view of supervising the sale of drugs, liquors, and articles of food. The aim is principally to protect purchasers against adulterations and to counteract the tendency of unscrupulous manufacturers to take advantage of the public by placing on sale articles of great inferiority, with the view of inducing their purchase by consumers under the apprehension that they are pure and genuine. Instances of this are seen in the laws regulating the sale of oleomargarine, those preventing the sale of diseased meats, and those forbidding the exposure of persons affected with contagious diseases. Pure air is an important essential in promoting public hygiene, since we consume it infinitely beyond our consumption of food. This has been recognized by the government and city authorities, which is evidenced in the regulations requiring cleanliness in cities, providing for the grading of sites, and stimulating numerous other sanitary measures. Material advancement in our knowledge of the sciences and the regulation by law of the practice of medicine, especially such as requires rigid examinations for admission to practice the profession, have likewise been material agencies in public hygiene. Such discoveries as those of Jenner in relation to vaccination against smallpox, those of Koch in the treatment of consumption, the discoveries of antitoxin as a remedy in diphtheria, and many others equally important have had a marked influence in preserving human life as well as preventing a weakening of the general system by diseases long affecting the individual. A proper knowledge and observance of hygienic laws are thus lessening greatly the number of persons afflicted with such diseases as consumption, rheumatism, dyspepsia, gout, cholera, hydrophobia, smallpox, and others.

It is found that one-half the children in some parts of England die before they reach the age of five years, and it is estimated that 100,000 persons die annually in that country from causes easily preventable. What is true of England is true of other countries to a varying extent. The movement now in progress looking toward better observance of individual and public rules of health will lessen fatalities at immature ages very materially. Besides, the advancement of education and public intelligence is having a wholesome effect. One of the most prolific reforms ever instituted is that in the case of

scurvy, a disease formerly prevalent among sailors, but now entirely avoided by the use of vegetables or lime juice. Much progress has been made in the construction of jails and prisons, which formerly contained few provisions calculated to maintain the health of those confined, while now the most wholesome sanitary rules are enforced with much care.

Another prolific movement in stimulating the public health is found in the construction of school buildings. We have learned from past experience that the early years of life need especial consideration, since during the formative period it is very important that the different organs of the body be provided with conditions favorable to growth and that overstrain of immature organs be avoided. To effect this the clothing, food, and cleanliness of children need careful attention, while schoolhouses must be well ventilated, lighted, warmed, and provided with adequate sanitary drainage. Child study has become a branch of intense interest. Teachers everywhere are concerning themselves with the study of the individual capacity of each child, its powers, inclinations, and weaknesses, thereby becoming better fitted to provide especially for the nature and need of each child life. It is not now a question whether children should begin study at four or eight years, but rather when each individual child possesses maturity and strength sufficient to begin the work of the schoolroom. Thus, the prevention of disease by culture, disinfection, sanitary regulations, pure food and water, and other measures for individual and public health have been and are among the immediate duties. To cure a disease is wholesome, but to prevent it is far better, such prevention being the object of intelligent application of effort in medicine, instruction, and all lines of progressive institutional development.

**HYGROMETER** (hĭ-grŏm'ĕ-tĕr), an instrument for measuring the degree of moisture contained in the atmosphere. Various forms of this instrument are in use. It is an essential supply in the weather bureau of the government. The Daniell hygrometer consists of a bent glass tube terminating in two bulbs, one of which is covered with muslin, and the other is of black glass or is coated with metal. The latter contains some ether and a thermometer. When ether is poured on the muslin, the black ball, cooled by the evaporation of the ether within, is soon covered with dew. At this time the inclosed thermometer indicates the dew-point, and this, compared with the reading of a thermometer in the air, determines the humidity.

**HYMNOLOGY** (hĭm-nŏl'ŏ-jĭ), the science



of sacred miracle poetry, or the hymns used at a particular time or place. Formerly the term was restricted to hymns which were written to praise God in the form of songs, but it is now defined as a lyric expression of religious feeling. The Greeks dedicated many hymns to their gods and heroes and these were usually sung at festivals. The older Greek hymns, as those written by Homer, are chiefly descriptive and are classed with the epics, while those of Pindar and the later poets are largely lyric. Many hymns are contained in the sacred books of the Orient, especially the Vedas, and these have been translated extensively into the languages of Europe. However, the Jewish psalms are the most familiar of all the sacred poems of antiquity and they have become familiar to all the Christian churches. Ambrose and a number of other Latin hymn writers have enriched literature with many lyric poems that have become well known in the civilized nations. These include "Stabat Mater" (The Mother Stood), "Dies Irae" (q. v.), and "Veni, Sancte Spiritus" (Come, Holy Spirit).

The Reformation gave birth to much interest in sacred songs, which were made an instrument by the Protestants in spreading the new faith among the nations. It is especially noteworthy that Luther was a potent factor in forming and directing the writing of hymns, chiefly because he wrote in the common language of the people. His "Ein' feste Burg ist unser Gott" (A Mighty Fortress is Our God) is still in wide use. To the same period belongs Martin Rinkart, the composer of "Nun danket alle Gott" (Now Thank We all Our God). Paul Gerhardt (q. v.) wrote a large number of sacred hymns and many of these were translated into English by John Wesley, including "O Sacred Head Once Wounded." Isaac Watts (1674-1748) is one of the most prolific English writers of hymns and is frequently referred to as the "father of English hymnody." His collection published under the title "Divine and Moral Songs for Children" was long a standard and popular work. Charles Wesley (1707-1788) is the author of about six thousand hymns, several hundred of which are still in popular use, and at least twenty may be classed among the favorite sacred songs in the English language. Other English writers of hymns include John Keble, William Cowper, Frances Ridley Havergal, and John Henry Newman, the last mentioned being the author of "Lead, Kindly Light."

The evangelistic movement of the 19th century was the means of producing and making popular a favorite class of church hymns. Some of these were not of a high order, but many were

exceptionally appropriate and are at present in great favor among the Christian churches. These include "Nearer, My God, To Thee," by Sarah Flower Adams; "Just as I am Without One Plea," by Charlotte Elliot; "My Faith Looks Up to Thee," by Ray Palmer; "Battle Hymn of the Republic," by Julia Ward Howe; "One Sweetly Solemn Thought," by Phoebe Cary; "Pass Me Not, O Gentle Saviour," by Frances Jane Crosby; "My Country, 'tis of Thee," by Samuel Francis Smith; and "Onward, Christian Soldier," by Arthur S. Sullivan.

The music in use for hymns among the early Christians was heavy and somber, and many melodies were in the form of chants. These were rarely sung in the common language, but were more generally chanted in the Latin. Luther translated many of the popular tunes into German, thereby seizing the opportunity for reforming the church music as well as making it an instrument of education and public worship. Johann Sebastian Bach (q. v.) developed the structural side of music and emphasized the rhythmic element. The movement of reform in music spread to France and England in the 18th century. The popular epoch was reached in the latter country through the hymns of Isaac Watts and Charles Wesley. In the earlier period of this movement the music was rather somber and solemn, but later it became livelier in character. To the latter class belong the hymns used extensively by Moody and Sankey in America.

**HYMNS** (hĭmz), **National**. See **National Hymns**.

**HYPNOTISM** (hĭp'nō-tĭz'm), a method of artificially inducing sleep, formerly called animal magnetism and mesmerism, but the results differ from sleep by several striking peculiarities. See **Mesmerism**.

**HYPOTHERMIC INJECTION** (hĭp-ō-dĕr'mĭk), a method of treating disease by introducing medicine beneath the skin, where it is taken up directly by the blood. It was first used by Alexander Wood of Edinburgh, Scotland, who injected remedies by means of a fine hollow needle connected with a small syringe. Medicine injected in this way is absorbed speedily. The pain is felt less acutely if the point of the needle is lubricated with carbolic oil or some similar preparation. This method is particularly valuable in cases where the stomach or other organs make it inadvisable to administer by the mouth, and it requires less bulk and is more rapid in its effects. Morphine and other vegetable alkaloids are often administered in this way, but all the drugs and instruments used should be carefully sterilized.



**HYPOTHESIS** (hĭ-pŏth'ĕ-sĭs), a supposition made without evidence, or with insufficient evidence of its own, in order to deduce conclusions in agreement with real facts. In this sense it may be said to be a defective kind of proof, there being some missing link, and the question is raised upon the proposition that this be made good in other ways. In the geological investigation concerning the transportation of boulders, we have various suppositions regarding icebergs, glaciers, and water currents, and by verifying observations and making deductions we are able to arrive at a strictly scientific theory, which accounts for the existence of boulders at certain localities. Newton's supposition was that celestial attraction is the same force as terrestrial gravity. He thus proceeded upon a known cause, the hypothetical element being the extension of gravity to the sun and planets. The great amount of coincidence in this case has justified the assumption that the two attractions are the same, hence the hypothesis has been proven by its consequences. As no rival supposition has ever stood the same test, the theory of Newton is considered as beyond the reach of challenge.

**HYRAX** (hĭ'răks), a genus of small mammals native to Asia and Africa, somewhat similar in size and appearance to the rabbit. The body is covered with fur, the tail is short, and the snout or muffle is split like that in the rodents. A species called *klipdas* is native to South Africa, where it is also known as the Cape hyrax. These animals have the pads of the feet so arranged as to give a slight suction, hence they are able to climb about smooth rock

and the lower limbs of trees with much agility. A species native to Syria is called *cony* in the Bible and is known locally as the *daman*. The flesh is eaten by the Arabs and others, but it is not considered very palatable by Europeans. The skin is used in making cloaks and other wearing apparel.

**HYSSOP** (hĭs'sŭp), a genus of labiate plants native to Southern Europe and Asia, but now cultivated extensively in gardens. They are perennial, shrubby plants, grow to a height of two feet, flower from June to September, and have an agreeable aromatic odor. They yield a kind of camphor, but are cultivated more largely for their beautiful blue flowers. Many species are grown in flower gardens, some of which are mentioned in both the Old and New Testaments. They are spoken of as the symbol of spiritual purification from sin.

**HYSTERIA** (hĭs-tĕ'rĭ-ă), an affection of the nervous system, in which the excitability is exaggerated and the will power is reduced correspondingly. While it affects both sexes, it occurs almost exclusively in women. The chief symptoms are a choking sensation, uncontrollable laughing and crying, and convulsive and irregular movements of the head and limbs. Hysteria is often due to worry, overwork, irregular habits, and great mental excitement. Though formerly regarded as of little consequence, it often takes the form of a dangerous disease. It is generally curable by mental treatment alone, but requires a removal of the causes that produce the disease, and the patient should have wholesome nourishment and healthful exercise.





## I

**I**, the third vowel and ninth letter of the English alphabet. In the early Phoenician and Greek alphabets, from which it was derived, it was formed somewhat like the letter z. Up to a comparatively late date *I* and *J* were regarded as one character, and in dictionaries the words beginning with these letters were classed together. It has two principal sounds, the long and short. The *long sound* is represented in such words as *find*, *bind*, *wind* and the *short sound*, in *bill*, *pin*, *fill*. In addition to these, it has three minor sounds, as in *dirk*, *intrigue*, and the consonantal sound of *y*, when followed by a vowel, as in *billion* and *Christian*. *I* is the pronoun by which a speaker or writer denotes himself, being the nominative case of the first personal pronoun of the singular number.

**IBADAN** (ĕ-bă'dân), an important town of Western Africa, in the Yoruba country, 75 miles north of the Bight of Benin. The town is surrounded by walls and is connected with Lagos by a railway. It contains 25 mosques, a system of Mohammedan schools, and numerous temples. The trade is important, especially in cotton, live stock, clothing, and fruits. Population, 1908, 198,408.

**IBAGUÉ** (ĕ-và-gă'), a city of Colombia, capital of the department of Tolima, sixty miles west of Bogotá. It is situated on a fertile plain and has a healthful climate. The surrounding country is rich in silver and sulphur mines. Ibaqué was founded in 1550. Population, 1906, 16,475.

**IBÁJAY** (ĕ-vă'hī), a town of the Philippines, on the island of Panay, about sixty miles northwest of Cápiz. It has considerable trade in amber, rice, tobacco, and fruit. Population, 1906, 11,375.

**IBARRA** (ĕ-băr'rá), a city of Ecuador, capital of the department of Inbabura, sixty miles northeast of Quito. The surrounding region is volcanic and the city has suffered from earth-

## IBICUI

quakes at different times, hence it has declined somewhat in importance. The chief industries are cotton and woolen mills, machine shops, and brickyards. Population, 1905, 13,506.

**IBERIA** (ĭ-bĕ'rĭ-ă), the name by which Spain was known to the Greeks and other ancient peoples. It was probably derived from the Iberus or Ebro River, and the inhabitants were called Iberians. These people are represented in the modern Basques (q. v.), who speak a language derived from that of the ancient Iberians. They were of low stature and are sometimes identified with the Picts and other groups. English writers generally apply the term Iberian to the Mediterranean race. In this larger sense the Iberians form the basis of the inhabitants in Spain, Portugal, France, and Italy.

**IBEX** (ĭ'bĕks), the general name of several species of wild goats, of which the common ibex is the best known. This species, called *bouquintin* by the French and *steinbock* by the Germans, is about five feet long from the nose to the tip of the tail, and is two feet eight inches high at the shoulders. The horns are large, about thirty inches long, have flattened sides, and contain numerous ridges and knots. The hairs are short and thick, reddish-brown in summer and grayish-brown in winter, and the beard is short and dark. The females have shorter horns than the males and are of an ashy color. This species of ibexes inhabits the Alps of Europe and the Spanish side of the Pyrenees. Three other species are found in Asia and in the Abyssinian Mountains, of which the *Himalayan ibex* is the most important. The ibexes have similar habits to those of other wild goats, preferring the highest mountains. They are skilled in passing over precipitous places.

**IBICUI** (ĕ-bĕ-kwĕ'), or **Ibicuy Guassu**, a river in the province of Rio Grande do Sul, Brazil, which is formed by the Rio de Santa Maria and several other sources, and after a



course of 400 miles joins the Uruguay near Yapeyu. Its upper branch is called Ituzaingo.

**IBIS** (ī'bīs), a genus of wading birds allied to the storks, herons, and spoonbills. The species, of which there are ten or twelve, are widely distributed in America, Eurasia, Africa, and the islands of the sea. The *red* or *scarlet ibis* is an American bird and is found most abundantly in the Amazon region of South America. It is about three feet long, the ex-

is rapid. They lay three or four eggs, which are considered excellent as food, but the flesh is not eaten, except by natives. Being aquatic birds, they prefer to feed on fish, mollusks, frogs, and other forms of animal life common to rivers and the sea.

**IÇA** (ê-sä'), or **Putumayo**, a river of South America, rises in the Andes of Colombia, and joins the Amazon near San Antonio, in Brazil. The general course is toward the southeast. It

is about 1,000 miles long and the greater part of this distance is navigable. The valley of the Iça is covered with fine forests and the region is sparsely settled.

**ICE**, the name of water when it is congealed or frozen into a solid mass. This occurs in case the temperature is reduced to 32° Fahr., when a condition is reached which is designated as zero on the Réaumer and Centigrade scales. At 39.2° Fahr. water begins to expand as the cooling process goes on, and continues until 32° is reached. Thus a given quantity of ice is lighter than an equal quantity of water, on account of which ice floats on the surface of water. It is due to this fact that the lakes and oceans do not freeze solid, since the protective covering formed by ice on the surface prevents the escape of heat stored in the water. If it were not for this phenomenon, the solid masses of ice formed in large bodies of water would not be melted by the heat of a tropical sun in the warmer seasons of the year, and at least three-fourths of the earth would be incapable of sustaining its present life.



SACRED IBIS.

WOOD IBIS.

tended wings measure over three feet, and the bill is about seven inches long. The *white ibis* abounds in Florida, the *strawneck ibis* is native to Australia, and the *glossy ibis*, a bird of fine silky plumage of dark green color, is found in Eurasia and Egypt. The *wood ibis* found in the southern part of the United States is not an ibis, but belongs to the stork family. However, the most remarkable species of this genus of birds is the *sacred ibis*, which is found throughout Africa. It was worshiped by the ancient Egyptians. They reared and cared for this bird in their temples and embalmed the body after death. It is about the size of a common fowl, has white plumage with black tips on the wings, and the head and neck are bare. It formerly inhabited the Lower Nile, but is found farther south at present, in the regions of the lakes and Central Africa. The flight of ibises

The freezing point of water is affected by various circumstances, such as pressure and ingredients held in solution by liquids. With an increase of pressure on a liquid the freezing point is lowered, and it is raised by a removal of pressure. Bodies of water holding salts in solution, as is the case in the ocean and many lakes, freeze at a lower temperature than pure water. The freezing point of sea water is about 28° Fahr., varying somewhat with its saline ingredients and the atmospheric pressure. Water at perfect rest and not containing dust particles requires a lower temperature to be congealed into ice, since in that state it more effectually retains its latent heat, but it is influenced to some extent by the depth. In freezing, the saline matters are separated from the salty water, hence fresh and pure water may be procured by melting the ice.

The formation of ice has a marked effect in



disintegrating rocks and stones. This is due to the circumstance that water fills the cavities and pores, and the expansion which results in freezing causes particles or even large pieces to break off the main body. The largest masses of ice occur in nature in the form of glaciers and icebergs, and in their clefts the deep blue of pure ice is most beautiful.

Ice formed in nature and by artificial processes is an important article of commerce, and is transported in large quantities for general consumption. Ice-cutting tools for harvesting the ice of rivers and ponds are numerous. The ice is cut into large blocks by an ice plane, which is usually moved by one or two horses. These blocks are cut about two feet wide and four feet long, though this depends somewhat upon the thickness, about eighteen inches being preferred. After the blocks are cut they are severed from each other and loaded in wagons to be transferred to an ice house, in which the ice is preserved for consumption. The ice houses usually have two or three walls, between which are spaces of dead air, and the ice is packed in sawdust or spent tan bark.

**MANUFACTURE OF ICE.** The manufacture of ice is an important industry in countries where it does not form in nature. It is made in vast quantities even in moderately cold climates, but especially in the large manufacturing establishments where perishable articles are produced, such as packing houses and canning factories. This enterprise began to develop about 1850, but the industry assumed extensive proportions only within recent years. The process involves lowering the temperature below the freezing point by permitting pure ammonia liquid to expand within iron pipes that are coiled in tanks filled with salt brine, from which the heat is drawn by the ammonia in evaporating. The machines consist generally of a congealer, in which the evaporation of the ammonia takes place; a pump for aspirating the gas as it forms in the vaporator; and a condenser. In the condenser the gas is compressed by a pump, the liquefaction being aided by a condensing stream of cold water, and by this means the ammonia is restored to its original state, being used successively for the same purpose. Cans filled with pure water are set into the brine tanks and there are frozen. The cans contain from 100 to 300 pounds of ice. Another plan is to produce the ice in plates or sheets, in which form it is generally known as plate ice. It is obtained in this form from pure water in sheets about eight by twenty feet in size, and with a thickness of ten to fifty inches. When frozen and reduced to a comparatively low temperature, the plates are

cut into blocks suitable for transportation. It requires from five to ten days to form plate ice of these dimensions, the time depending somewhat upon the outside temperature. In some factories sulphurous oxide is utilized instead of ammonia, and the brine is made of magnesium chloride instead of salt. Scientists have perfected machinery for the production of liquid air (q. v.), which may take the place of ice in refrigerators and for other purposes, but at present its production is too expensive for commercial use. See **Refrigeration**.

**ICEBERG** (is'bërg), a large mass of ice, usually floating in the ocean, but sometimes located on the shores or on breakers. These phenomena arise from glaciers that move through channels, from which, when they reach the shore of the sea, large masses glide into the ocean, thus forming icebergs. They are seen both in the northern and southern seas in latitudes between 68° and 70°, but increase as we proceed toward the poles, finally merging into the frozen seas which inclose the polar region. Icebergs rarely drift nearer the Equator than 40° N. and 39° S., owing to their melting in the warmer regions. In size they differ widely, sometimes attaining a circumference of several miles and rising to a height of 250 to 300 feet above sea level. However, only about one-ninth of their volume is seen above the surface. The bluish-green tint of the solid ice masses is very beautiful, and in their cavities fresh water often occurs from the melting ice. In some regions they are carried by winds and oceanic currents into warmer seas, where they give rise to fogs, but melt rapidly. Large masses of rocks and earth are carried by them, and they likewise transport seeds of plants and sometimes animals. Ice which covers a large portion of the sea is called an *ice field*, a small field is designated a *floe*, and a field which is broken up forms an *ice pack*. Field ice covers a vast portion of the sea in winter, but it is broken up on the approach of summer.

**ICELAND** (is'land), an island of volcanic origin, situated in the North Atlantic Ocean, about 230 miles southeast of Greenland and 600 miles west of Norway. The area is 39,756 square miles. It is 300 miles long from east to west, with a central breadth of 200 miles. Its coast lines are indented by great bays or fiords, and adjacent to it are many small islands. The surface is diversified by several mountain chains, a number of which contain active volcanoes. Numerous lakes abound and many streams penetrate through the valleys, of which the Thjorsa, Skja Danda, Jökulsa, and Axarfirdi rivers are the most important. Geysers are distributed in



many portions, but are found most numerous in the southwestern part, near Reykjavik. Sulphur is the most abundant mineral, but it has workable deposits of rock crystal, chalcedony, refracting spar, and brown coal.

The climate of Iceland is extremely cold, but mild considering the latitude, while the summers are short and damp. Vegetation abounds only in narrow confines, mostly along the coast, and the timber is limited to several stunted species, the principal tree being the birch. Other plants include the willow, bilberry, heath, and lichens. Nutritious grasses of different kinds mingle with the shrubs and afford good grazing for sheep. The manufactures are largely of a domestic nature, such as earthenware, clothing, utensils, leather, and canned fish. The principal imports include breadstuffs, timber, hardware, clothing, sugar, and tobacco. Among the chief productions are cattle, sheep, potatoes, radishes, vegetables, horses, and ponies. The exports include seal skins, sulphur, wool, cattle, fish, eider down, and the edible Iceland moss.

The inhabitants are of Scandinavian origin and speak the oldest form of the Scandinavian group of languages. Their literature is extensive. It has been enriched by translations from many master productions of German and English writers. The *Sagas* are histories and works of a romantic character, and have been translated into various languages, forming at present an interesting portion of reading matter for schools in many countries.

The government is administered under a constitution adopted in 1874. It is vested in the governor general, who is appointed by the King of Denmark, and in the althing or parliament. The latter is the local legislative body. It consists of thirty-six members, six members being nominated by the King of Denmark and forming the upper division, and the remainder, or lower division, being elected by popular suffrage. Practically all the people belong to the Lutheran Church. The educational institutions include elementary schools, several colleges, and a university at Reykjavik. This city, located in the western part, is the most important seaport and the capital of the island.

The history of Iceland begins with the end of the 8th century, when scattered settlements were made by Irish emigrants. Shortly after people immigrated from the Scandinavian countries, and in 870 Harold Haarfager by his arbitrary rule caused many Norwegians to emigrate to Iceland. By 925 the coast regions were largely populated and an aristocratic republic was formed, which maintained itself through several centuries. In 981 Christianity was introduced,

schools were established, and considerable advancement was made in agriculture, commerce, and other civilized arts. At that time Iceland attained to its highest degree of prosperity. Within that period Greenland was discovered, in 983, and North America was visited under Lief Ericsson about 1001. Magnus VI. of Norway annexed Iceland to his dominion in 1264. In 1380 it was made a territory of Denmark, and since then has remained a Danish possession. Population, 1906, 78,685.

**ICELAND MOSS**, the name of several species of lichens found in cold climates, so named from its wide distribution in Iceland. It is widely distributed in Northern Europe, especially in Norway, and is found on the upper parts of many elevated mountains. Iceland moss is gathered as a food by the inhabitants of Iceland and Lapland, and is either boiled with milk or the plant is dried and used in making bread. To render it palatable and remove a bitter taste, it is necessary to steep it in water. It is important in the manufacture of sizing paper, in dressing warp in weaving, and as a diet for those suffering of pulmonary diseases.

**ICELAND SPAR**, a transparent variety of calcite, so named from the fact that the best specimens are obtained from Iceland. Being transparent and having a double refraction property, it is employed in optical instruments.

**ICE PLANT**, the name of an annual herb native to Africa and Europe, so named because the leaves are covered with vesicles that appear



ICE PLANT.

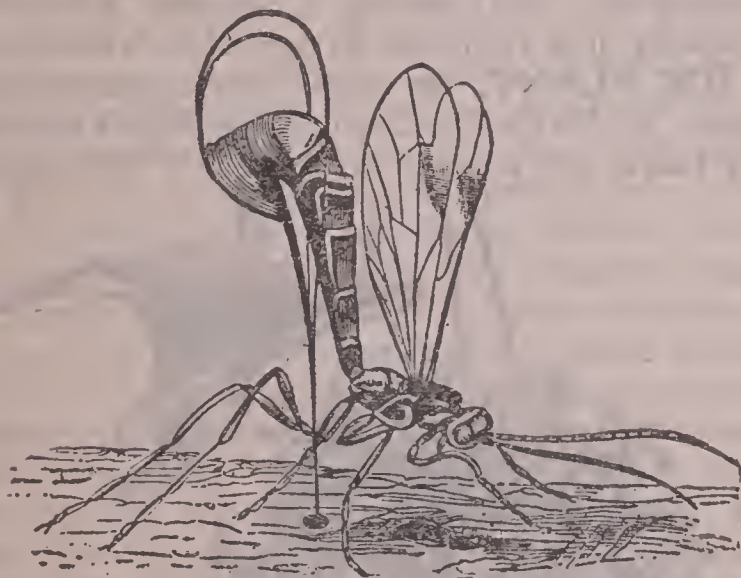
like crystals of ice. Several hundred species have been described and all of them are native to moderately warm climates. A few of the plants have been introduced in California, where they are cultivated for their flowers. The natives of the Madeira Islands use the seeds as food, and the ashes of the plant yields carbonate of soda, useful in making glass and soap.

**ICHNEUMON** (ik-nū'mōn), a genus of carnivorous animals which belong to the civet fam-



ily. They are noted for their destruction of rats, mice, reptiles, and insects. They are especially fond of the eggs of crocodiles, on account of which they were held sacred among the Egyptians. The best known ichneumon is found in Egypt and a smaller kind is native to India. Several of the species are kept as useful domestic animals in many homes of Egypt and Asia, serving to destroy pests. The Egyptian ichneumon is somewhat larger than a cat. It is yellowish-brown in color and has a long tail. This species is popularly known as *Pharaoh's rat*, while the Indian ichneumon is now commonly called *mongoose*.

**ICHNEUMON FLY**, an insect of a large group of *Hymenoptera*, including about 5,000 known species. They deposit their eggs either on the bodies or within the eggs of other insects and spiders. The larvae devour the eggs, insects, or animals, either mature or immature, in which they are developed. When the insect reaches maturity, the worm on which it fed expires from exhaustion, and the fly begins to feed on the juices of plants. In this way they are of vast benefit to man, since they destroy grubs, caterpillars, the Hessian fly, and other pests, while they themselves are harmless in a state of maturity. The adult ichneumon does not attack



ICHNEUMON FLY.

insects, except to make a deposit of eggs, which it does by making a minute puncture.

**ICHOLOGY** (ik-nōl'ō-jŷ), the branch of science which treats of fossil imprints. The rocks bearing fossil footprints or other impressions are found largely in deposits which were in the form of mud at the time imprints were made, but many occur in sandstone. The Jura-Trias sandstones of North America contain many trails, tracks, and other impressions, especially of birds, fishes, and ornithopod dinosaurs, all of which have been studied systematically. See *Fossils*.

**ICHTHYOLOGY** (ik-thī-ōl'ō-jŷ), the branch of zoölogy that treats of fishes. Aristotle is the most eminent ancient authority on this science, and is practically the only writer of antiquity to furnish data of value regarding fishes, their habits, and their culture. Modern treatises on ichthyology date from the middle of the 16th century. Among the most eminent writers are Max-Müller, Agassiz, Cuvier, Owen, and Pierre Belon (1518-1564). See *Fish Culture*.

**ICHTHYOSAURUS** (ik'thī-ō-sā'rūs), a remarkable fossil reptile which inhabited the sea in the period when the secondary strata were



FOSSILS OF THE ICHTHYOSAURUS.

deposited. The form was somewhat like that of the porpoise. It had four paddlelike limbs, an enormous head, a long tail, and broad vertebrae, the last mentioned resembling those of fishes. Fossil remains of this animal occur from the lower Lias to the Chalk periods, but they are most numerous in the Lias Oölite. More than thirty species have been discovered, some resembling the gavial of the Ganges and others the common crocodile. They are represented in the deposits of Australia, Europe, Asia, and South America. Only one species, the *Baptanodon*, is found in North America.

**ICONOCLAST** (i-kōn'ō-klāst), the name given in the 8th century to one who supported a movement against the religious use of images. Those who worshiped images were called *iconolaters* and they became particularly numerous in the Eastern church. At first images of bishops and martyrs were used to commemorate their lives, but later they were worshiped and incense was offered to them on altars. Leo III., Emperor of Byzantium, promulgated an order against the worship of images, and directed that pictures and other movable objects should be placed sufficiently high so as to prevent people from kissing them and showing other marks of devotion. In 842 a council at Constantinople sanctioned the worship of images in the Greek church, and this order was subsequently affirmed by other councils. Similar decisions were made by the popes, hence image worship became established and has since been practiced in the



Western church. Iconoclasm became quite general in some sections of Europe during the Reformation, when many sacred statues and images were destroyed. During the time of Cromwell it reached its height in England.

**IDA**, a mountain range of Asia Minor, forming the southern boundary of the Troad. It extends from Phrygia into Troad and overlooks the valley of Troy. Mount Gargarus, height 5,745 feet, is the culminating peak. This range of mountains is celebrated in ancient mythology as the place from which the gods witnessed the battles of the Trojan War. The highest peak of the mountain chain that trends the island of Crete from east to west is known by the same name. It is covered by beautiful forests of maple, cedar, and pine, and is noted for its alleged connection with the education of Zeus, the chief Grecian god. Its height above sea level is 8,050 feet.

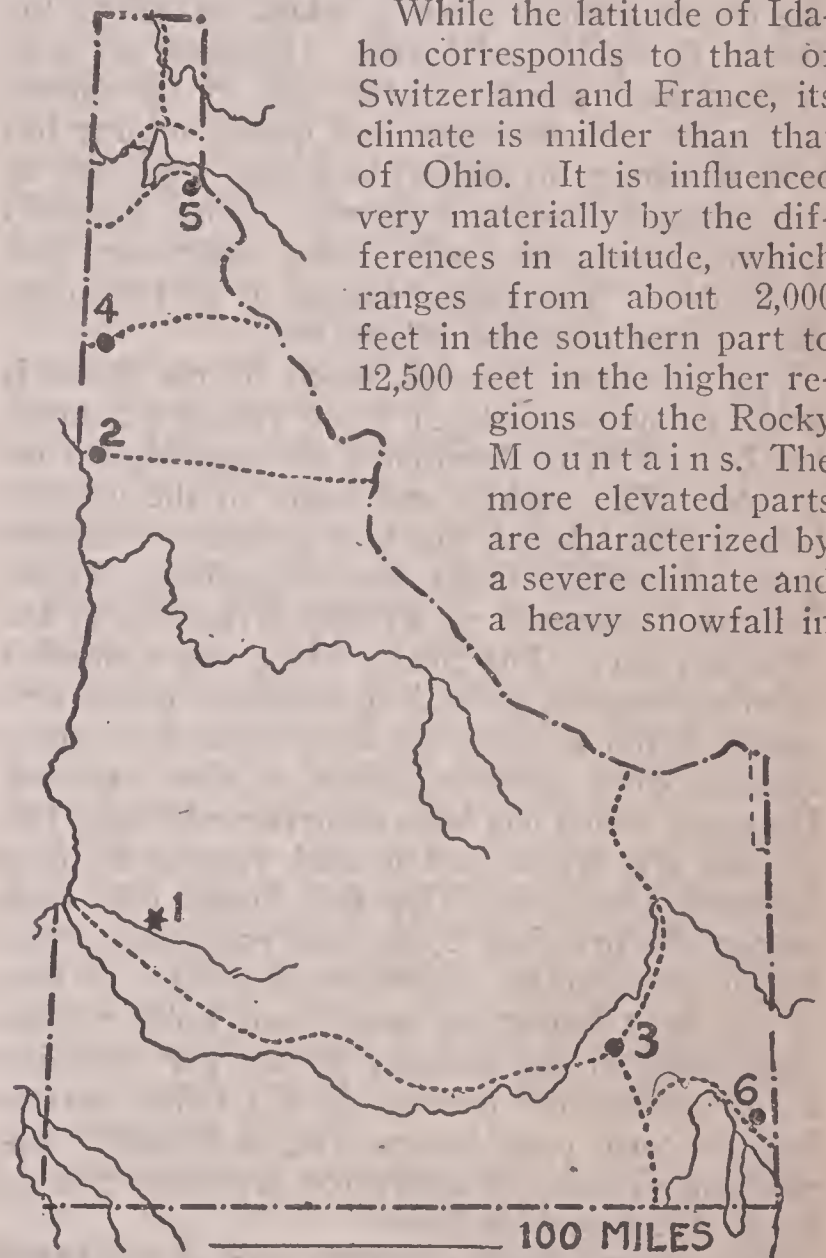
**IDAHO** (i'da-hō), a northwestern state of the United States, so called from the Indian language, the name meaning Gem of the Mountains. It is bounded on the north by British Columbia, east by Montana and Wyoming, south by Nevada and Utah, and west by Oregon and Washington. The length from north to south is 490 miles and the width varies considerably, being 45 miles at the northern boundary and about 300 at the southern. It has an area of 84,800 square miles, including 510 square miles of water surface.

**DESCRIPTION.** The State consists chiefly of an elevated and mountainous region. It lies mainly between the Cascades on the west and the Rocky Mountains on the east, and a large part of the southern portion is in Great Basin, which has an elevation of from 2,000 to 5,000 feet above sea level. Many mountain summits in the northern and eastern parts are elevated above the snow line. The Bitter Root and Salmon River ranges are highest near the eastern border, but spurs extend from them in a westerly direction almost across the State. In the northern part are the Cabinet and Coeur d'Alene ranges, which extend to the border of Canada, and the Black-foot and Snake River ranges are in the southeastern part. Many of the valleys lying between the ranges have a soil of great fertility, though much of the surface is made up of regions of canyons and sandy and rocky formations.

Though the State has many streams of considerable size, the drainage is almost exclusively into the Columbia, which receives the inflow from the Snake, Clark Fork, Spokane, and Kootenay rivers. The Snake, which is the largest of these rivers, flows through the south central part, forms a part of the western boundary, and

near Lewiston enters the State of Washington. It drains a basin of about 60,000 square miles and receives the inflow from the Salmon, Boise, Wiser, and Clearwater rivers. In its course are the three falls known as the Salmon, the Shoshone, and the American, the first mentioned having a descent of nearly 200 feet. A small portion in the southeastern part of the State is drained into Bear Lake and Great Salt Lake, the former of which is situated partly in Idaho. Several lakes are located in the northern part, including Coeur d'Alene, Kaniksu, and Pend Oreille. The two last mentioned discharge by the Clark Fork into the Columbia near Waneta, Canada.

While the latitude of Idaho corresponds to that of Switzerland and France, its climate is milder than that of Ohio. It is influenced very materially by the differences in altitude, which ranges from about 2,000 feet in the southern part to 12,500 feet in the higher regions of the Rocky Mountains. The more elevated parts are characterized by a severe climate and a heavy snowfall in



IDAHO.

1, Boise; 2, Lewiston; 3, Pocatello; 4, Moscow; 5, Wallace; 6, Montpelier. Chief railroads are indicated by dotted lines.

winter, but the plains and valleys are exceptionally free from extreme. The mean temperature at Boise City is 51°, and in the moderately elevated parts in the north it is 54°. In summer the thermometer may rise as high as 100° in the southern part of the State, but the refreshing mountain breezes have an invigorating effect. The rainfall is very light in the south, but an abundance of moisture is common to the



northern part of the State, where the western winds give up their humidity when coming in contact with the elevated ranges. Fine grazing is afforded on the uplands. In many places are valuable forests of evergreen and deciduous trees, especially along the streams and in the mountains.

**MINING.** The mineral resources are of great importance. Gold was first discovered about 1861, and this mineral is distributed in nearly all parts of the State. Placer mining has been conducted to a considerable extent, but quartz mining has been developed to a high degree of prominence. Silver and lead are obtained in the Coeur d'Alene district, which is one of the richest in the United States. Dredging for gold is conducted chiefly in the bed of the Snake River and its tributaries, and quartz mining has been developed in several localities, especially in the Thunder Mountain district. Other minerals include coal, iron, salt, soda, magnesia, and quicksilver. The annual output of all the mines has a value of about \$25,500,000.

**AGRICULTURE.** Though much of the State is arid and not capable of being reclaimed, much has been done in developing the agricultural resources. The valleys and many of the uplands have a rich alluvial soil that produces excellent crops of cereals, fruits, and vegetables. Farming can be carried on without irrigation in the northern part. The Snake River and a number of other streams have deep channels, hence irrigation is not possible the entire length of these streams, or is quite expensive in some sections. However, much has been done in reclaiming fertile but arid tracts, and in such regions farming is highly profitable. Hay and forage take rank among the principal crops, and particular attention is given to the cultivation of alfalfa. Wheat is the most important cereal and holds a high place both in the quantity grown per acre and in its quality for making flour. Other cereals include corn, oats, barley, rye, and spelt. Apples and prunes are cultivated profitably and all kinds of vegetables thrive.

The pasture lands cover an area of 25,750,000 acres, and the grasses are peculiarly nutritious. Live stock is kept on the elevated table lands during the summer, and in winter it is withdrawn to the valleys along the streams, where the climate is less severe and both cattle and horses can subsist without much feeding. Sheep raising is an important enterprise of the State, and the annual production of wool has a value of about \$2,750,000. Swine are not grown extensively, owing to the fact that corn is not raised on a large acreage, but large interests are vested in the rearing of mules, horses, and cat-

tle. The Bitter Root Timber Reserve, which comprises an area of fine pine and fir forests, is located chiefly in Idaho.

**MANUFACTURES.** Rapid progress has been made in manufacturing the last two decades. Since the State has about 20,000,000 acres of valuable timber, much material for manufacturing is available. To this may be added the product of the mines, which furnish large quantities of products for smelting and other industrial enterprises. Many flouring mills are operated profitably, although they are devoted chiefly to the grinding of wheat. Other manufactures include machinery, cigars, clothing, utensils, and lumber products.

**TRANSPORTATION.** Several transcontinental railway lines pass through the State, all of which have numerous branches in different directions. The Oregon Short Line crosses the State from east to west, affording convenient transportation from Granger, in Wyoming, through the Snake River Valley. Four lines cross the northern part of the State, including those of the Oregon Railroad & Navigation Company, the Northern Pacific, the Great Northern, and the Chicago, Milwaukee and Saint Paul railroads. The total railroad lines aggregate 1,500 miles, but this is insufficient to supply the demand, since a large portion of the central part of the State is without railroad communication. Many wagon roads have been constructed and numerous telephone and telegraph lines are in operation. The export trade is chiefly with ports on the Pacific, especially through San Francisco, Tacoma, and Seattle. Gold, silver, lead, wool, lumber, hides, and live stock are the chief products exported. The imports consist mainly of manufactured articles.

**GOVERNMENT.** The present constitution was adopted in 1889. It vests the executive authority in the Governor and other State officials, who are elected for terms of two years by popular vote. The legislative branch consists of the senate and house of representatives, the former having 24 and the latter 60 members. Meetings of the Legislature begin in January of even years, but extraordinary sessions may be convened by the Governor. Members of both branches are elected for terms of two years by popular vote at the time and place of voting for State officers. Local judicial power is vested in justices of the peace. Each county has a prosecuting attorney, who is elected for two years. The higher courts consist of those organized in the judicial district, and the supreme court has final jurisdiction. The latter consists of three judges, who are elected for a term of six years by the people of the State.



**EDUCATION.** The common school system is very similar to that of all other states of the Union. The school district is the territorial unit and is composed of an indefinite and varying number of families residing within its limits. A board of three trustees, elected by the qualified voters of the district, has general charge of the school property, employs teachers, and supervises locally the buildings and the school. The county superintendent, elected for two years, has general supervision of all the schools within the county, issues certificates to teachers, and stimulates professional interest by correspondence and personal contact. The State Superintendent has supervision over all the schools and the work of county superintendents. This officer prepares the courses of study for use in the schools and the questions to be used in the examinations for county and state certificates and life diplomas, the two last mentioned being issued by the State Board of Education.

The schools and public instruction are supported by a system of local taxation, which is supplemented by an income from the State fund. The latter is obtained from the lease and sale of school lands, consisting of sections 16 and 36 of the congressional townships. Only 4.6 per cent. of the population ten years of age and over were unable to read and write in 1900, a record of illiteracy smaller than that of the whole country. The University of Idaho is located at Moscow and is the chief institution of higher learning. An agricultural and mechanical college is located at Idaho Falls, two normal schools are maintained at Albion and Lewiston, and a State academy is at Pocatello. The private and denominational institutions include Saint Aloysius Academy, Lewiston; College of Idaho, Caldwell; Episcopal College, Lewiston; Saint Teresa's Academy, Boise; and an industrial school for Indian girls, Desmet. Ample provisions have been made for the care of unfortunates, and for benevolent, reformatory, and correctional purposes. An asylum for the insane is located at Blackfoot, a soldiers' home near Boise, an industrial and reform school at Saint Anthony, and a penitentiary at Boise.

**INHABITANTS.** The population of the State formerly consisted largely of miners and ranchers, but the development of agriculture, lumbering, and manufacturing has caused all industrial and professional classes to be well represented. About one-sixth of the people are foreign born and the male sex is considerably in excess. Boise, in the western part of the State, is the capital. Other cities include Idaho Falls, Moscow, Pocatello, Wallace, Lewiston, and Montpelier. The State has grown constantly in popu-

lation since it was admitted into the Union, the growth in the last decade being 92 per cent. In 1900 its population was 161,772. This included a total colored population of 7,277, of which 293 were Negroes, 1,291 Japanese, 1,467 Chinese, and 4,226 Indians. In 1910 the population was 325,594.

**HISTORY.** Idaho was acquired by the Louisiana Purchase. The first explorations were made by Lewis and Clark in 1805 and 1806. A mission was established at Coeur d'Alene in 1842, but those who visited the region were largely hunters and prospectors. Gold was discovered in 1858 on the Oro Fino Creek, after which settlements began to develop rapidly, and on March 3, 1863, Idaho was created a Territory by act of Congress. In 1890 it was admitted to the Union as the forty-fourth State and the thirty-first under the Federal Constitution. Considerable hostility was shown against the Mormons, who formed large settlements in the southern part and for some time practiced polygamy, but in 1893 the leaders of that denomination renounced polygamy as an institution. Several strikes took place at the Coeur d'Alene mines, those of 1892 and of 1899 being the most noteworthy. As a whole the State is on a sound educational and industrial basis, and its public institutions are making rapid strides of development.

**IDAHO, University of,** a State institution established in 1892 at Moscow, Idaho. Free instruction is offered to students of both sexes who reside within the State and others are required to pay a nominal tuition. Five regents have general control. The courses comprise instruction in the sciences, classics, agriculture, civil and mining engineering, and military tactics. The library has about 20,000 volumes, including books and pamphlets, and the institution is endowed by a large grant of land. About 400 students attend, about one-half of whom are in the collegiate department. The annual income approximates \$70,000.

**IDEA** (ī-dē'ā), any product of mental apprehension or activity considered as an object of thought. Plato regarded ideas as the eternal and immaterial forms of all material things, while Kant treated them as the primitive elements of intelligence, not as products, and modified and developed the Platonic theory of innate ideas into the modern doctrine of intuitions. See **Intuitions.**

**IDEALISM** (ī-dē'al-iz'm), in philosophy, the doctrine held in contradistinction to realism. According to realism three positively distinct things are implied and involved in any act of vision. For instance, in seeing a book there are the book, the image or apprehension of the book,



and an apprehending mind, ego, or self. These three facts are dealt with in idealism as subjective, objective, and absolute. Subjective idealism embraces the view that the book and the image are one thing and that a modification of the mind is the only fact which is perceived. According to objective idealism the book and the mind are existences equally real or ideal, but they are regarded manifestations of an objective fact of some kind. Absolute idealism teaches that the only thing really perceived is the idea or relation, of which the mind and the book are but two terms, and to which idea or relation they owe all the reality they have. Idealism has been influenced more or less by the teachings of Plato. The modern advocates of it include Fichte, Kant, Schelling, Berkeley, Hegel, and Descartes.

**IDES** (īdz), a term applied by the Romans to the 15th day of March, May, July, and October, and to the 13th of the other months. Caesar's assassination occurred on the ides of March, on account of which it was an *ater dies*, or black day, when the senate did not convene.

**IDIOT** (īd'ī-ōt), a person who is in a large degree destitute of intelligence, or who suffers from a condition of mental imbecility. Although the term is of Greek origin, it expresses a condition different from the idea contained in the root from which it was derived. In ancient Greece an idiot was primarily the private individual, in distinction from an educated man or one who took part in public affairs. The Spartans used the term to describe an ignorant or unlettered man, and it finally came to be applied to those who did not possess the capacity to learn. Idiocy is now regarded as an arrest of mental development, either from congenital defect or some disease occurring subsequent to birth. In idiocy the will has but partial control over the muscular system and external impressions are not readily communicated to the mind. The brain of idiots is sometimes quite regular in conformation, but in most cases it is abnormal. In many instances the forehead is depressed and flattened, sometimes receding backward from a point near the eyebrows, and in others the back part of the head is greatly enlarged. Idiots rarely live beyond the age of forty years, due probably to their inactivity or certain sensual emotions. The education of idiots received attention as early as the 17th century. At present they are classed largely with the feeble-minded, but separate institutions for the training of this class are maintained in many countries.

**IDOL** (ī'dōl), an image intended to represent a divinity and as such to be worshiped. One

worshiping an image is called an *idolator* and the worship is known as idolatry. However, it must be distinguished from *iconolatry*, in which the mind is directed to the Deity or saints represented, while in idolatry the things themselves are worshiped. Various forms of idolatry have been practiced from remote antiquity, the worshipers making greatly diversified things the objects of their worship, such as the sun, moon, stars, the elements, heroes, animals, and various forms of manufactures. The Phoenicians are thought to have originated the worship of heavenly bodies and objects of nature, while to the Egyptians is attributed the origin of animal worship, such as that of the sacred ibis, oxen, and ichneumon. Hero worship was general in Greece and Rome. The mythology of these peoples deals chiefly with such gods as Zeus, Jupiter, Apollo, Mars, Neptune, and many others. Idol worship has been practiced by many of the Chinese from remote antiquity, and the construction of earthen and other images of human form still prevails among them and other classes. Many of the savages prepare peculiar figures representing animals and human beings, which they adore with feelings of intense devotion. Some writers regard idolatry among the so-called heathens as a degradation of the true God, while others think it is the result of an innate longing common to the human breast and through which a knowledge of the true God is sought. Man is a worshiping being, and activity in this line is common among all peoples, whether it prevails in the worship of one God, in that of idols, the imaginary deities, or the lower forms of fetichism.

**IDYL** (ī'dīl), or *Idyll*, the term usually applied to a poem that represents scenes of pastoral life, or which is highly descriptive in treating one or more subjects. Theocritus, who published 31 idyls, is a famous ancient writer of this class of poems. Tennyson's "Idylls of the King" embraces twelve poems based on the romances of Arthur. They include "The Coming of Arthur," "Gareth and Lynette," "The Marriage of Geraint," "Geraint and Enid," "Balin and Balan," "Merlin and Vivien," "Lancelot and Elaine," "The Holy Grail," "Pelleas and Ettarre," "The Last Tournament," "Guinevere," and "The Passing of Arthur."

**IGNEOUS** (īg'nē-ūs), the term applied in geology to rock which is formed by the action of heat intense enough to produce fusion, including such as basalt, lava, and granite. Rocks of this class occur with formations of different geological ages, on account of being forced up from below the surface. They prevail in an unstratified condition.



**IGNIS FATUUS** (ig'nīs fāt'ū-ūs), a Latin term applied to a luminous appearance in the atmosphere a few feet above the ground in marshes, burial grounds, and other places where there is vegetable or animal matter in a state of decay. It appears to recede when approached. The cause is thought to be the escape of gaseous substances liberated from decaying bodies, which ignite spontaneously by a union of different forms of gases. Common names applied to this phenomenon are *Jack-o'-lantern* and *Will-o'-the-wisp*. The best examples of it are found in the marshes of Ireland and the low regions of Germany near the North Sea.

**IGORROTE** (ē-gōr-rō'tā), a race of people native to the Philippine Islands. The Igorrotes are a mixture of Malay and Mongol races and may be classed as warlike. They are found chiefly in the island of Luzón, but the term is applied generally to any uncivilized Filipinos of Malay blood, such as the Ygolots.

**IGUANA** (i-gwā'nà), a genus of lizards native to tropical America, including about a hundred species. The common iguana is from two



to five feet long and is mostly of a greenish color. Natives consider the flesh edible, but it is not particularly wholesome. The female lays from four to six eggs in the sand, where they are incubated by the sun. The eggs are hunted by the natives and form a wholesome food. In the adults the claws are sharp, enabling them to crawl on trees. They paddle through the water with a rapid, serpentine movement, being aided by the long, flat tail. They feed largely on vegetable substances, such as fruits, fungi, and tender plants. The *spiny agama*, an allied animal about seven inches long, is native to South Africa.

**IGUANODON** (i-gwā'nō-dōn), an extinct lizard of immense size, so called from the similarity of its teeth to those of the iguana. Fossil remains indicate that the fore feet were comparatively small and the hind ones were large. While walking the animal moved largely on its

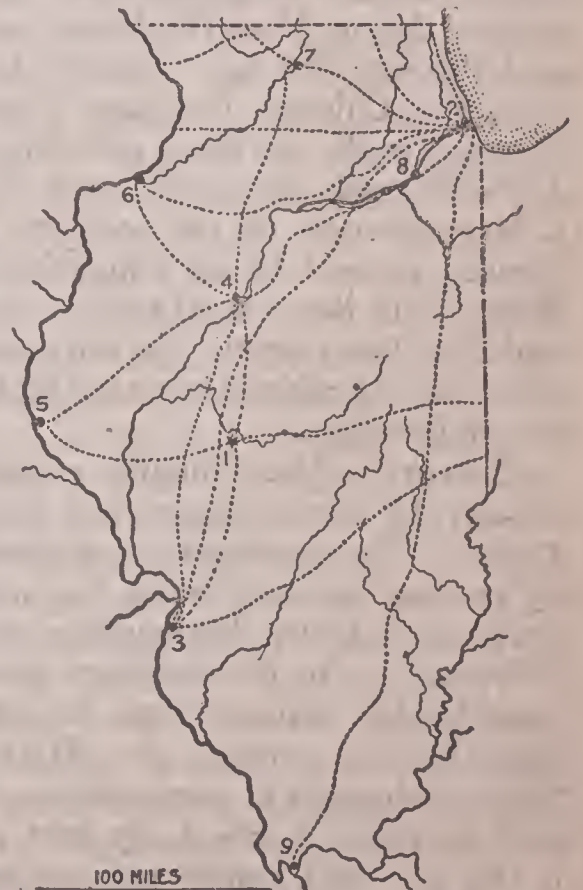
hind legs. Fossil remains have been found in the British Isles and other European countries, and from them it is held that the animal was between twenty and forty feet long. These animals are represented in North America by the *Laosaurus* and the *Camptosaurus*, of which remains are found in the Mesozoic deposits.

**ILION** (il'i-ūn), a village of New York, in Herkimer County, twelve miles southeast of Utica, on the West Shore and the New York Central railroads. It is located on the Mohawk River and the Erie Canal. The surrounding country is fertile. It has manufactures of bicycles, firearms, clothing, and machinery. Electric lights, waterworks, and a public library are among the general utilities. It has considerable trade in farm produce and manufactures. Ilion was settled about 1816 and its incorporation dates from 1852. Population, 1910, 6,588.

**ILLIMANI** (ēl-yē-mā'nē), Mount, a lofty peak of the Andes, situated in Bolivia, about 25 miles southeast of La Pas. The summit is 21,040 feet above sea level. Vegetation ceases at about 11,400 feet and the snow line is 14,900 feet above the sea. In its vicinity are rich deposits of minerals and fine forests.

**ILLINOIS** (il-li-noi'), a state of the United States, one of the north central section, popularly called the *Prairie State*. It is bounded

on the north by Wisconsin; east by Lake Michigan, Indiana, and Kentucky; south by Kentucky; and west by Missouri and Iowa. It is separated from Iowa and Missouri by the Mississippi, from Kentucky by the Ohio, and partly from Indiana by the Wabash River. The length from north to south is 376 miles, and the greatest breadth is 212 miles. The area is 56,650 square miles, including a water surface of 650 miles.



1. Springfield; 2, Chicago; 3, East Saint Louis; 4, Peoria; 5, Quincy; 6, Rock Island; 7, Rockford; 8, Joliet; 9, Cairo. Chief railroads are shown by dotted lines.

The area is 56,650 square miles, including a water surface of 650 miles.



**DESCRIPTION.** The surface is largely a gently undulating plain, containing practically no waste lands, and constituting an extensive fertile area. Next to Delaware and Louisiana, it is the most level State, though the surface is made up of broad valleys and low, smooth hills. In the southern part the altitude is 300 feet above sea level, whence it rises gradually toward the north, where the general elevation is 800 feet. The highest land is in the south central part, where a spur of the Ozark Mountains extend into it from Missouri, having an altitude of 1,150 to 1,400 feet. In this section the hills are more or less abrupt, especially on their northern slopes, and the descent southward to the Ohio is quite gradual. The general slope of the State is toward the south and southwest, which is the direction of nearly all of the larger streams.

Since the State borders on Lake Michigan and the boundary is formed in part by the Wabash, Ohio, and Mississippi rivers, it is supplied with important waterways for transportation. The three rivers mentioned receive the discharge from nearly all streams within the State. The Illinois River, which is formed by the junction of the Des Plaines and the Kankakee, drains the central part of the State, and discharges into the Mississippi. It receives the inflow from the Sangamon, Mackinaw, Vermilion, Spoon, Fox, Kankakee, and Des Plaines, and through the last mentioned has connection with the Chicago Drainage Canal. The Rock River is in the northern part, and the Embarras, Little Wabash, Kaskaskia, and Big Muddy drain a large portion of the southern section. Lake Peoria, formed by an expansion of the Illinois River, is in the central part of the State. Grass and Fox lakes are in the northeastern part, and a number of other lakes are located in the vicinity of Chicago.

**CLIMATE.** The climatic conditions are temperate, the mean temperature ranging from 46° to 54°. The summers are pleasant and marked by cooling breezes, while the winters are moderate, though the thermometer occasionally falls below zero. In the southern part the climate is considerably warmer than in the northern section, but in general the State is subject to marked changes in temperature. Vegetation begins to grow in the early part of April, which is the principal month for seeding, and the first frosts occur late in September. All parts of the State have an abundance of rainfall, which averages 38 inches, but is somewhat heavier in the south than in the north. As a whole the climate is healthful and favorable to agriculture.

**MINING.** Though mining has been developed to a considerable extent, it is surpassed in im-

portance by agriculture and manufacturing. In the output of bituminous coal Illinois takes high rank, and the total mined is equal to ten per cent. of the amount produced in the entire country. The coal area is estimated at 42,500 square miles, most of which is workable, and the deposits are south of a line drawn through Rock Island and Joliet. Several veins of marketable coal are located from 80 to 1,200 feet below the surface, ranging in thickness from three to nine feet, but most of the mines now operated do not exceed a depth of 400 feet. The annual output of coal in Illinois is about 52,500,000 tons, making the State second in the production of coal, being exceeded only by Pennsylvania. Zinc is obtained in the northern part and sandstone, limestone, and commercial clays are abundant in nearly all sections. Petroleum is obtained in the southeastern part and galena, a lead ore, is worked in the northwestern section. Gypsum and limestone are abundant, hence cement and lime are manufactured extensively.

**MANUFACTURING.** Illinois ranks third as a manufacturing State, being exceeded only by New York and Pennsylvania. This favorable condition is accounted for largely by its extensive coal fields and convenient location for collecting and distributing. Fully seventy per cent. of the manufactured products of Illinois are credited to Chicago, which is the most important meat-packing center of America. All parts of the slaughtered animal are utilized, hence a number of industries have developed aside from the enterprise of producing fresh, cured, and canned meats. These include principally the manufacture of leather, soap, candles, brushes, and lard and tallow products. South Chicago and Joliet are centers for the manufacture of iron and steel products, the ore being obtained from the mines of Minnesota and Michigan. Elgin and Aurora are noted for the manufacture of watches and clocks; Moline, Dixon, and Rock Island have extensive factories of agricultural implements; and Peoria has the largest distilleries in America. Other manufactures include clothing, musical instruments, electrical apparatus, flour, lumber products, bicycles and automobiles, railway cars, and earthenware. Among the manufactures depending for raw materials upon agriculture are cheese, butter, and condensed milk. About twenty per cent. of the corn crop of the State is consumed in manufacturing enterprises, including chiefly spirituous liquors and glucose.

**AGRICULTURE.** The farm acreage embraces 92 per cent. of the land area and agriculture is the leading industry. In the volume of farm products the State long held first rank and at



present it is exceeded only by Iowa. The soil is exceptionally rich and free from stones. Much of the surface has been improved by tile drainage and the cultivation of crops which invigorate the land, such as clover. Aside from stable manure, only a small quantity of fertilizers is employed, and the methods of farming are modern and progressive. Corn is the principal cereal, the annual production ranging from 350,000,000 to 410,000,000 bushels. Oats is the second crop of importance, hay the third, and wheat the fourth. Considerable quantities of potatoes, rye, barley, and spelt are produced. Fruit, though grown in all sections of the State, is especially abundant in the southern part, where both the soil and climate are favorable to the endurance of orchards for a long term of years. The chief varieties grown generally are grapes, apples, plums, strawberries, and cherries, and pears, quinces, and peaches thrive best in the central and southern parts. Formerly heavy belts of timber extended along the streams and through the valleys of the southern section, but a large part of the area formerly in forests are utilized for farming and pasturage, though considerable valuable timber still abounds along the streams and in artificial groves.

Although Illinois is located near the great markets of Chicago, Peoria, and Saint Louis, stock raising has continued to be an important industry. This is accounted for largely by the fact that agriculturalists appreciate the value of feeding their hay and grain upon the farms as a means to maintain the fertility of the soil. In the number of milch cows Illinois is exceeded only by Iowa and New York. Though all departments of dairy farming are well developed, fully 65 per cent. of the income is obtained from the sale of milk. Large quantities of swine and cattle are fattened for the market each year. The State ranks next to Iowa in the number of horses, and particular attention is given to the rearing of well-blooded animals. In the number of domestic fowls it ranks next to Missouri. Mules and sheep are grown profitably, though there has been a noticeable decrease in the latter for several decades.

**TRANSPORTATION.** Illinois has the largest railroad mileage of the states, the lines aggregating 11,750 miles. It likewise holds high rank in the mileage of electric railways, both urban and interurban. Chicago, located at the terminus of many lines articulating in all directions, is the greatest center of railways in the world. The lines that cross the State include the Chicago and Alton, the Chicago, Burlington and Quincy, the Chicago and Northwestern, the Chicago, Milwaukee and Saint Paul, the Chicago

Great Western, the Chicago, Rock Island and Pacific, the Illinois Central, the Wabash, and the Atchison, Topeka and Santa Fé, all of which furnish extensive communication toward the southwest, west, and northwest. The Erie, the Nickel Plate, the Wabash, the Pennsylvania, the Baltimore and Ohio, the Monon, the New York Central Lines, and the Grand Trunk furnish the principal connections toward the southeast, east, and northeast. Rock Island, Alton, East Saint Louis and Cairo are the principal cities of the Mississippi. Peoria, Springfield, and Bloomington are thriving inland cities. Chicago, on Lake Michigan, is the largest inland port city of the world. Lake Michigan is connected by the Illinois and Michigan canal with the Illinois River at LaSalle. It is probable that the Chicago Drainage Canal will eventually become a ship canal.

**EDUCATION.** The educational institutions take a high rank and include some of the finest schools of America. Free schools have been maintained since 1855. The rate of illiteracy is 4.2 per cent. of the population over ten years of age, as compared with 10.7 for the entire country. The system of schools is under the supervision of a State superintendent, who is assisted by superintendents in the cities and counties. All the rural communities have district schools, the terms ranging from seven to nine months per year, and township high schools may be organized where the people vote to establish them. The University of Illinois, located at Urbana, is at the head of the school system. Five normal schools are maintained for the instruction of teachers at Carbondale, Charleston, De Kalb, Macomb, and Normal. A noted training school, the Cook County Normal School, is situated in Chicago. About 35 institutions that are classed as colleges and universities are within the State, all of which carry representative courses of study and are liberally patronized. Among these may be mentioned the Northwestern University, Evanston; the Illinois Wesleyan University, Bloomington; the University of Chicago, Chicago; the Augustana College, Rock Island; the Lincoln University, Lincoln; the Knox College, Galesburg; the Illinois College, Jacksonville; the Armour Institute of Technology, Chicago; the Rush Medical College, Chicago; the Lake Forest University, Lake Forest; and the Monticello Seminary, Godfrey.

Illinois maintains a high class of correctional and charitable institutions. It likewise has several hospitals and homes for the care of soldiers' orphans and for the soldiers and sailors of the wars. The correctional institutions include a penitentiary at Joliet, a reformatory at Pontiac,



a home for juvenile female offenders at Geneva, and a prison at Chester. Among the charitable institutions are the Soldiers' Orphans' Home at Normal, the Soldiers' and Sailors' Home at Quincy, the Soldiers' Widows' Home at Wilmington, hospitals for the insane at Elgin, Jacksonville, Anna, and Kankakee, and institutions for the blind and the deaf and dumb at Jacksonville and Chicago. Many scientific and educational societies are in a flourishing condition, most of which are centered in Chicago, and reference and reading libraries are maintained in all the towns and cities.

**GOVERNMENT.** The present constitution was ratified by a vote of the people in 1870. By it the chief executive authority is vested in the Governor, who is elected for a term of four years by popular vote. The other State officers include the lieutenant governor, auditor, secretary, treasurer, attorney general, and superintendent of instruction, who are elected for four years, except the treasurer, who is elected for two years and cannot be reelected to succeed himself. Legislative authority is vested in the General Assembly, which consists of a senate of 51 members elected for four years and of a house of representatives of 153 members elected for two years. In voting for representatives each elector is allowed three ballots, which he may cast for one candidate, or he may cast one and a half ballots for each of two candidates, or he may cast one ballot for each of three candidates. This provision works to the advantage of the minority party. Local judicial jurisdiction is exercised by police magistrates and justices of the peace. Counties having a population of more than 50,000 inhabitants may have probate courts, but each county has a judge, a clerk of courts, and an attorney, all being elected for four years. In addition there are circuit and inferior appellate courts. The highest judicial authority is vested in the supreme court, constituted of judges from seven districts, who are elected for terms of nine years.

**INHABITANTS.** About one-fourth of the inhabitants are of foreign birth, this portion in 1900 numbering 966,747. Germans of foreign birth constitute over one-third of the foreign born population and next in order are the Scandinavians, Irish, and Slavs. More than half of the people reside in cities and towns. The density of population is 86 per square mile. All of the leading Christian denominations are well represented, including principally the Methodist Episcopal, Lutheran, Baptist, Roman Catholic, Christian, Presbyterian, and Episcopalian churches. The United Brethren and Congregational sects likewise have a large membership. Springfield

is the capital of the State. Other important cities are Chicago, Peoria, Quincy, Rockford, Bloomington, Aurora, Elgin, Galesburg, Belleville, Decatur, Rock Island, East Saint Louis, Jacksonville, Danville, Moline, Alton, Cairo, Streator, and Freeport. In 1900 Illinois held the third rank in population among the states, being exceeded only by New York and Pennsylvania. In that year the population was 4,821,550. This number included 86,677 colored inhabitants, of whom 85,078 were Negroes. Population, 1910, 5,638,591.

**HISTORY.** Illinois was first visited by white men in 1673, when Louis Joliet and Father Marquette ascended the Illinois River, and by way of the Des Plaines and Chicago rivers reached Lake Michigan. In 1680 La Salle and several companions erected Fort Crevecoeur on the Illinois River, and Catholic missions were established about the same time. The region came under English dominion by the conquest of Canada in 1763, when many French settlers removed to the towns in the Mississippi Valley, especially to Saint Louis and Natchez. Kaskaskia, the oldest town in the State, was settled in 1680, but it declined after the English occupation. In 1787 it was included with the Northwest Territory.

Illinois was erected into a territory in 1809, comprising at that time the region now included in the present states of Illinois, Wisconsin, Minnesota, and part of Michigan. Fort Dearborn (Chicago) was destroyed and the garrison was massacred in 1812. The first constitution was adopted and it was admitted into the Union in 1818. The Black Hawk War of 1832 terminated in the removal of all the Indians to regions farther west. Congress made appropriations for the improvement of the Chicago River in 1834. In 1840 the Mormon excitement occurred. About that time a large number of Mormons removed from Missouri to Nauvoo, Ill., and four years later Joseph and Hiram Smith were confined in the jail at Carthage and there murdered. Subsequently about 20,000 emigrated under the leadership of Brigham Young and settled in Utah. The State furnished six regiments of troops for the Mexican War. The Illinois and Michigan Canal, from Lake Michigan to LaSalle, was opened for traffic in 1848. A great fire destroyed a large part of Chicago in 1871, but it was rapidly rebuilt, and in 1893 was the seat of the World's Columbian Exposition. The capital was located successively at Kaskaskia, Vandalia, and Springfield. At the time of the Civil War Illinois furnished 260,000 men to support the Union. It has since made rapid strides of advancement in wealth, commerce, education, and influence in the national government.



**ILLINOIS, University of**, an educational institution situated between Champaign and Urbana, Ill. It was established in 1867 as the Illinois Industrial University and assumed the present name in 1885. At first the institution was open for men only, but women were admitted as students in 1870. It consists of the six colleges of law, agriculture, literature and arts, science, engineering and medicine. Courses are maintained in military science, art and design, music, pedagogy, and preparatory work. It has 25 buildings, 310 instructors, and about 4,125 students, of whom about one-fourth are of the undergraduate college. The library contains 100,000 volumes. The buildings and grounds are valued at \$1,250,000.

**ILLINOIS AND MICHIGAN CANAL**, a waterway that connects Lake Michigan with the navigable waters of the Illinois River, hence furnishes transportation facilities from the Gulf of Mexico to the Great Lakes. It extends from the south branch of the Chicago River to the Des Plaines, thence follows that stream to the mouth of the Kankakee, and thence follows the valley of the Illinois River to its terminus at LaSalle. The canal is 96 miles long, has seventeen locks, and is six feet deep and sixty feet wide at the bottom. Work upon it was commenced in 1836, and it was opened for traffic in 1848, costing a total of \$8,750,000. Formerly it was important as a waterway, but the construction of railways has caused it to be used very little at present.

**ILLINOIS INDIANS**, a family allied to the Dakotas, who formerly inhabited Illinois and tracts west of the Mississippi. They were classed with the Algonquins, constituted a brave race, and were identified with the French in their wars against various Indians, especially the Sacs and Foxes. They now occupy a small reservation in Oklahoma and have taken kindly to the arts of peace and education.

**ILLINOIS RIVER**, the most important river of Illinois. It is formed in Grundy County by the Kankakee and Des Plaines rivers, receives the Fox and Sangamon, and after a course of about 500 miles joins the Mississippi fifteen miles above Alton. Formerly it was navigable only to Peru, a distance of 250 miles, but it is now serviceable for vessels to points farther up by reason of its receiving the water of the Chicago Drainage Canal, which enters the Illinois River through the Des Plaines.

**ILLITERACY** (il-lit'ēr-ā-sŷ), the term used generally to denote inability to read and write. Although it is not important as to how many persons in any community are unable to read and write, this fact is of interest in that it

marks the dividing line between those who are hopelessly ignorant of books, and are therefore deprived of all the advantages to be derived from perusal or study, and those who have at least the rudiments of an education. This standard, though marking a primitive degree in the development of culture and intelligence, is at present a dividing line to which a large majority of the people have not attained. However, the statistics exclude all who have not reached school age, which differs somewhat in the various countries, and in some cases an age limit is fixed in the census reports. For instance, the law of Italy fixes the age under which children are omitted at six years while in the United States those under ten years are not counted. Since Germany has enforced the compulsory school attendance laws a long term of years, it occupies the foremost position in the world when measured on an educational standard, although Sweden and Norway hold a very high rank in elementary instruction. Illiteracy in the United States is somewhat higher than could be expected, this being due to a large colored population. Below is a table showing the per cent. of illiteracy for the different countries.

	PER CENT.		PER CENT.
Germany.....	0.11	Ireland.....	17.00
Sweden.....	0.11	Austria.....	23.80
Switzerland.....	0.30	Hungary.....	28.10
Scotland.....	3.57	Greece.....	30.00
Holland.....	4.00	Italy.....	38.30
France.....	4.90	Russia.....	61.70
England.....	5.80	Spain.....	68.10
Canada.....	10.20	Portugal.....	79.00
United States.....	10.70	Servia.....	86.00
Belgium.....	12.80	Rumania.....	89.00

**ILLUSION** (il-lū'zhŭn). See **Eye**.

**ILLYRICUM** (il-lir'ī-kŭm), or **Illyria**, the name of an ancient country in Europe, which extended from the northeastern coast of Italy into Macedonia. Philip of Macedon conquered the country as far west as the Drino River and annexed it to Macedonia. The western portion comprised the territory corresponding to Bosnia, Croatia, Dalmatia, and Herzegovina, and this region remained independent until the middle of the 18th century before the Christian era, when it was made a Roman province. Illyricum was generally divided into two parts, known as *Illyris Graeca* and *Illyris Romana*, and both of these divisions were afterward incorporated with the Eastern Empire. Napoleon organized the Illyrian provinces in 1809, but they were formed into a kingdom and annexed to Austria in 1816. Later the kingdom was dissolved and the territory was subdivided into provinces, all of which are now Austrian possessions, except Albania, which is a part of Turkey.



**ILOILO** (ē-lō-ē'lō), a city of the Philippines, capital of the province of Iloilo, located on the southeastern shore of the island of Panay. It has an excellent harbor on Iloilo Strait, which separates Panay from the island of Guimaras. The chief buildings include a cathedral, several schools, a seminary, and the buildings used by the government. It ranks next to Manila as a commercial center in the Philippines, and has a large trade in coffee, sugar, rice, tobacco, and dyewoods. A foundry, a machine shop, and a pottery are among the industrial enterprises. The United States bombarded and occupied the city in 1899, at the time of an insurrection. Population, 1906, 19,150.

**IMAGINATION** (im-āj-i-nā'shūn), that faculty of the mind by which it receives concepts of absent objects, not as they are or were, but as they might be. The original material with which it builds is derived through memory by sense perception, thus imagination is created in a limited sense. The material secured in this way is used with modification, or it may be modified and then used, and thus new images or mental pictures are created that differ from any product that memory gives. In the combining of images, or the formation of new ones, the laws of the association of ideas govern the operation, but imagination is governed at least partially by the will, for by it the thoughts are controlled to some extent and the limits are determined within which the laws of association are to act. The products of imagination are termed according to the results, as phantasmal, fanciful, artistic, and inventive. Imagination makes possible the culture of fine arts, gives vividness and force to language, lightens life's burdens, and leads to the attainment of success in the practical affairs of life. Its culture is important, since it may serve a good or evil purpose, this depending upon its early and right training.

**IMAM** (i-mām'), or *Iman*, a priest among the Mohammedans, one who is looked upon as a leader among the learned men. He has the ordinary care of a mosque, calls the people to prayer, and reads the prayers before the congregation. The imam is elected by the people and is ecclesiastically independent from the mufti or chief priest. Imam is the name which is applied to the founders of the four principal Mohammedan sects, but among the Shiites it refers especially to the twelve legitimate successors of Ali. The Sultan, being supreme in ecclesiastical affairs, has the title of imam.

**IMMIGRATION** (im-mī-grā'shūn), the act of coming into a country for the purpose of

residing there permanently. It is closely associated with colonization, since progress in the development of a new country increases labor. Immigration is not only encouraged by the authorities of a new country, but a gain in population is considered an advantage. In the past century the over-populated states of Europe have had a constant movement of emigration to the newer portions of the world, especially to the United States, Canada, Australia, Africa, and South America. The annual immigration to Argentina is 112,000 persons and to Uruguay it is about 10,000. These countries continue to attract settlers owing to their extensive natural resources being undeveloped. In 1908 Canada received 218,500 immigrants, of which number about one-third came from the United States. Formerly the immigrants into Canada came largely from Europe, but since 1905 a constant stream of settlers moved from the United States into the new country of the Canadian west, especially to Manitoba, Saskatchewan, Alberta, and British Columbia. The newer element in general includes Galicians, Germans, Hungarians, Mennonites, Chinese, and Negroes. Australia has been receiving about 60,000 immigrants annually, who are attracted chiefly by its gold mines and fertile lands.

Immigration to the United States has varied greatly from year to year since 1850, and was smallest in 1862, owing to the progress of the Civil War. Below is a table showing the annual immigration since 1850:

PERIOD.	IMMIGRANTS.	PERIOD.	IMMIGRANTS.
1851.....	379,466	1880.....	457,257
1852.....	371,603	1881.....	669,431
1853.....	368,645	1882.....	788,992
1854.....	427,833	1883.....	603,332
1855.....	200,877	1884.....	518,592
1856.....	195,857	1885.....	395,346
1857.....	112,123	1886.....	334,203
1858.....	191,942	1887.....	490,109
1859.....	129,571	1888.....	546,889
1860.....	133,143	1889.....	444,427
1861.....	142,877	1890.....	455,302
1862.....	72,183	1891.....	560,319
1863.....	132,925	1892.....	479,663
1864.....	191,114	1893.....	439,730
1865.....	180,339	1894.....	285,631
1866.....	332,577	1895.....	258,536
1867.....	303,104	1896.....	343,267
1868.....	282,189	1897.....	230,832
1869.....	352,783	1898.....	229,299
1870.....	387,260	1899.....	311,715
1871.....	321,350	1900.....	448,572
1872.....	404,806	1901.....	487,918
1873.....	459,803	1902.....	648,743
1874.....	313,339	1903.....	857,046
1875.....	227,498	1904.....	815,361
1876.....	169,986	1905.....	1,027,421
1877.....	141,857	1906.....	1,215,684
1878.....	138,469	1907.....	1,333,166
1879.....	177,826	1908.....	1,343,685

Following is a table showing the immigration into the United States for each decade since 1821, and giving the population at the beginning of each period of ten years:



DECADE.	IMMIGRANTS.	POPULATION AT BEGINNING.
1821-1830.....	143,439	9,633,822
1831-1840.....	599,125	12,866,020
1841-1850.....	1,713,251	17,069,453
1851-1860.....	2,598,214	23,191,876
1861-1870.....	2,314,824	31,443,321
1871-1880.....	2,812,191	38,558,371
1881-1890.....	5,246,616	50,155,783
1891-1900.....	3,844,420	62,622,250

In this connection is given the following table, showing the population and foreign-born inhabitants for each year stated:

YEAR.	FOREIGN BORN.	POPULATION.
1850.....	2,244,602	23,191,876
1860.....	4,138,697	31,443,321
1870.....	5,567,229	38,558,371
1880.....	6,679,943	50,155,783
1890.....	9,308,104	63,069,756
1900.....	10,460,085	76,303,387

Immediately following the close of the Civil War a large number of immigrants came from Germany, Sweden, and other countries of Europe to take advantage of the cheap lands and excellent opportunities afforded by the new country in the Northwest. However, at present the largest number of foreign born are attracted to the cities. Below is given a list of eighteen cities, showing the foreign-born and native population in 1900:

CITIES.	FOREIGN BORN.	POPULATION.
New Bedford.....	25,529	62,442
Holyoke.....	18,921	45,712
Manchester.....	24,257	56,987
Lowell.....	40,974	94,969
Woonsocket.....	12,518	28,204
Lawrence.....	28,577	62,559
Passaic.....	12,900	27,777
Fall River.....	50,042	104,863
Milwaukee.....	88,991	285,315
Detroit.....	96,503	285,704
Buffalo.....	104,452	352,387
Saint Louis.....	111,356	575,238
San Francisco.....	116,885	342,782
Cleveland.....	124,631	381,786
Boston.....	197,129	560,892
Philadelphia.....	295,340	1,293,697
Chicago.....	587,112	1,698,575
New York.....	1,270,080	3,437,202

In 1900 the foreign born constituted 13.7 per cent. of the total population of the United States, of which number only about half a million were in the Southern States. The North Atlantic states had 4,762,796 of foreign birth, and the North Central states had 4,158,474. In the Western states there were 846,321. Immigration to America comes largely from Western Europe. The number of inhabitants of the United States in 1900 who came from Italy were 484,207; from Austro-Hungary, 579,042; from Russia, 807,606; from Sweden, Norway, and Denmark, 1,064,309; from England, Scotland,

and Wales, 1,169,737; from Ireland, 1,618,567; and from Germany 2,666,990.

**IMMORTALITY** (im-mör-täl'i-tý), the term employed to designate the endless life of the soul. In theology it is applied to the eternal, personal, and conscious existence and union with God. Belief in the immortality of the soul is very ancient. It implies a continuation of our personality, or consciousness, and of the will. The most rude people hold views regarding a future state, one in which the arts of this life will be pursued with even greater satisfaction than the present existence affords, a state in which nature and the chase will yield enlarged gratifications. Among the ancient Egyptians the idea of immortality led to a belief in a dwelling place of the dead and of a future judgment. Their beneficent god Osiris judged the departed, and, "having weighed their hearts in the scales of justice, he sends the wicked to the regions of darkness, while the just are sent to the god of light."

Among the early Grecians the belief was prevalent that the departed passed into the realms of light or hades, the place for the dead. Thus we read of Achilles, the ideal hero, that he declared he would rather till the soil than live in pale Elysium. Socrates discourses on the doctrine of immortality in the "Apology" and the "Phaedo," and concludes that the soul is the immaterial and superior part, and is not dispersed into nothingness when separated from the body. He thought that to study how to die calmly is true philosophy, and that the soul spends the rest of its existence with the gods, freed from the evils of humanity. The Christian religion teaches the immortality of the soul, as do also other religions, and some Christians and others hold to the belief in a state where purification of the soul takes place after death. Man is taught by reason and religion to strive for continued perfection, and that the truthful and rightful will not pass unrewarded.

**IMMORTELLES** (im-mör-télz'), or **Everlasting Flowers**, a term applied to a class of flowers which do not lose their color or beauty in drying. They are native to Northern Africa and Western Asia, and are cultivated extensively in gardens and greenhouses. The name immortelles was compounded in France, where they are grown extensively and used in making wreaths. In many countries wreaths made of immortelles are placed on graves to symbolize immortality.

**IMPEACHMENT** (im-pēch'ment), the calling into question of the motives of an individual or of the validity of the law. It is applied particularly to the accusation and prosecution of



an officer for maladministration, by a legislative body. The proceeding is sanctioned in England, where the House of Commons is the prosecutor and the House of Lords is the trial court. Lord Latimer was the first to be prosecuted by this method. However, the proceeding is now practically obsolete.

In the United States the Constitution vests the right of impeachment exclusively in the House of Representatives, but the right of trial is vested in the Senate. The officers liable to impeachment are the President, Vice President, and all civil officers of the United States. Among the causes for which an officer may be impeached are treason, bribery, and other high crimes and misdemeanors. In the trial by the Senate the regular officer presides, but when the President is impeached the Chief Justice of the Supreme Court is the presiding officer. A two-thirds vote of the senators present is necessary for conviction. Punishment extends only to removal and disqualification to hold any office under the Constitution of the United States, but the offender is still liable to an ordinary trial by law. Impeachments of State officers are provided for by the constitutions of the various states. In the United States seven Federal officers have been impeached, two of whom were convicted. The number embrace Senator William Blunt of Tennessee, in 1797; District Judge John Pickering of New Hampshire, in 1803; Supreme Judge Samuel Chase of Maryland, 1804; District Judge James H. Peck of Missouri, 1830; District Judge West H. Humphreys of Tennessee, 1862; President Andrew Johnson, 1868; and Secretary of War William R. Belknap, 1876. The only convictions secured were in the trials of John Pickering and West H. Humphreys.

**IMPERATOR** (im-pĕ-rā'tōr), the term applied to a military commander in ancient Rome. During the time of the republic the term *imperator* followed the name, but when the empire was organized it was changed to *emperor* and as a title preceded the name of the supreme ruler. The title became extinct with the fall of the Byzantine realm in 1453. Charlemagne, the founder of the German Empire, assumed the title of emperor. The term *imperator* was applied to triumphant generals throughout the Roman Empire.

**IMPERIALISM** (im-pĕ'rī-al-izm), the policy of territorial extension by conquest, the spirit of empire, or the system of government under an emperor or empress. The term is used in France to designate the revival of the Napoleonic empire, and in England it refers to a policy of territorial extension. In the presi-

dential campaign of 1900, in the United States, the term was employed largely for the purpose of designating the policy of the national administration in dealing with the Philippine Islands.

**IMPRESSIONIST** (im-prĕsh'ūn-ist), the name applied to a painter of the school of painting whose aim is to produce works of art in exact accord with nature. The painters of this group are usually called *impressionists*, since they seek to reduce to the canvas an exact impression of their subjects, so they will impress the mind in a way similar to the object or scene painted. From this circumstance they are sometimes called *naturalists*, owing to the fact that they seek to reproduce according to nature. Formerly these terms applied more particularly to painters, but now they are used likewise in reference to sculpture and literature. The impressionist school of painting is concerned chiefly in rendering the effects of light and shade. The painters of this school oppose the practice of painting in the studio, because they think it gives untrue tones, but instead do their painting in full light.

**IMPRESSMENT** (im-prĕs'mĕnt), the act of impressing into the public service, or of seizing property for public use. Formerly the power of impressment was claimed by many governments, but since the War of 1812 it has been abandoned by most countries. The British government claimed the right of searching American vessels prior to the War of 1812, and of impressing into service British seamen who were employed under the American flag. At that time England was at war with France and claimed the service of all her maritime citizens, refusing to recognize allegiance to the United States even by naturalization. The willful impressment of many American sailors was instrumental in bringing about the embargo system and the War of 1812.

**IMUS** (ē'mōos), a town of the Philippines, on the island of Luzón, in the province of Cavite. It is located a short distance from Manila Bay, about eighteen miles south of Cavite, and is surrounded by a fertile farming and fruit-growing region. The manufactures include clothing, pottery, and machinery. It has a cathedral and a number of schools. Population, 1906, 15,808.

**INAGUA** (ĕ-nā'gwà), **Great and Little**, the names of two islands in the West Indies, belonging to the Bahama group. Great Inagua, the larger of the two, is located sixty miles northeast of Cuba and has an area of 660 square miles. Little Inagua, located ten miles northeast of Great Inagua, has area of 35 square



miles. The population of the two islands is 1,640.

**INCA** (in'kà), the name of the governing class of the Peruvian Indians, and later the title of the chief or imperial head of the Empire of Peru. The Incas took rank with the Aztecs and the Mayas in the scale of intellectual and industrial advancement. Their territory extended from the Equator southward a distance of about 38°, and embraced the Andean region south of the Equator and much of the slope toward the east, extending far into the valleys of the Amazon and the Orinoco. Their capital was at Cuzco until a short time before the Spanish conquest, when it was removed to Quito by Atahualpa. At that time the Incas were highly developed in agriculture and fruit raising. They maintained a considerable commerce, manufactured clothing and implements, promoted mining, and built substantial forms of architecture. They were finally conquered by the Spaniards in 1532, when their empire had a population of about 10,000,000. Prescott, the historian, in speaking of the Peruvians, says that "they originated civil and social institutions of much perfection, possessing an indefinite power of expansion, and suited to the most flourishing condition of the empire, as well as to its infant fortune." Many relics of Incan architecture are found in Peru and other countries of South America. They constructed of adobe bricks and of stone, built aqueducts and waterways, and attained to much proficiency in embalming and entombing the dead. Many of the respected and educated people of the Andean countries of South America trace their ancestry to the Incas.

**INCARNATION**, the manifestation of the Deity in a human form, as in the union of God and man in the person of Christ. The doctrine is clearly stated in the first chapter of the Gospel according to John, in which Christ is spoken of as the *Word*. Here it is made clear that the Word is God, existing from the beginning, but yet in some sense He is different from God. The doctrine of incarnation is a vital part of the religion of the Hindus, who believe in many incarnations, as the nine incarnations of Vishnu.

**INCENSE** (in'sens), an aromatic substance which emits a sweet odor when burned. Perfumes of this kind were used from remote times in religious rites. The substance employed consisted anciently of a mixture of gums, spices, and balsams, which form a large portion of the ingredients still used. Among the Jews incense was burned on a special altar, called the *altar of incense*. They employed it only as an act of worship, and not as a sacred offering. The

worshiping of gods in ancient Assyria, Babylonia, Egypt, India, Greece, and Rome included incense burning daily, a practice usually performed in the morning and evening. It is still employed by the adherents of divers religions of Asia, especially by the Buddhists. The Greek and Roman churches both employ incense in worship, especially in the most sacred services, such as high mass, in funerals, and the consecration of churches.

**INCLINED PLANE** (in-klind' plān), any plane surface that makes an angle with a horizontal surface, used for raising heavy weights. If a ball is placed upon a horizontal plane, it retains its position and presses upon the plane with its entire weight. However, as soon as one end of the plane is raised, the entire weight of the ball will not rest upon the plane and it will begin to roll toward the lower end. It is one of the machines designed to use force advantageously, as in loading a barrel of salt upon a wagon, when one end of a plank may rest upon the ground and the other upon the wagon, and the barrel may be rolled over the plank to much better advantage than in lifting it direct. Steep grades in constructing highways are avoided by building them in a winding position around a hill.

**INCOME TAX** (in'kūm), a tax levied upon the annual income of individuals, investments, and corporations. This form of taxation has been levied more or less extensively since mediæval times. In 1646 the first income tax levied in America went into effect under the direction of the Massachusetts Bay Colony. Massachusetts has maintained a tax of this character during most of its history. It and a few other states still impose this class of taxes. In Great Britain the first income tax of modern times was levied in 1799, a form of taxation still existing in that country. The first income tax imposed by the United States went into effect in 1861, when a tax of three per cent. was levied on incomes of \$800 per annum and over, and the following year Congress imposed an income tax of three per cent. upon the excess of incomes above \$600 to \$10,000, and five per cent. on the excess above \$10,000. The graduated scale was somewhat revised in 1864 and in 1867, and in 1872 the law was repealed. From the available statistics it is learned that the taxes collected under these laws were as follows:

1863.....	\$ 2,741,858	1868.....	\$41,455,598
1864.....	20,294,732	1869.....	34,791,856
1865.....	32,050,017	1870.....	37,775,871
1866.....	72,982,159	1871.....	19,162,654
1867.....	66,014,429	1872.....	14,436,862

The total amount derived from the income tax, including some arrears, was \$346,911,760.48.



In 1894 Congress imposed an income tax of two per cent. upon the excess of all incomes above \$4,000 per annum, and included all corporations, companies, and associations other than partnerships. On May 20, 1895, the law was declared unconstitutional by the Supreme Court of the United States. This decision was based upon the theory that, although a direct tax, it was not apportioned among the states according to population. Since the tariff reduction effected by the same law that included the income tax, known as the Wilson Law, did not provide sufficient revenue aside from that of the income tax, a deficit in the funds of the nation was created. Much criticism has been made of the court on account of rendering this decision.

**INCUBATION** (in-kû-bā'shŭn). See **Egg**.

**INCUBATOR** (in'kû-bā-tēr), a machine used for hatching eggs by artificial heat. Various forms have been manufactured and are in common use by those who raise poultry. However, the enterprise of hatching eggs by artificial incubation is very old. It is certain that this method was practiced anciently in China and Egypt. The earliest forms of incubators were formed like a barrel and the heat was obtained by fermenting manure. Modern incubators are divided into a number of chambers suitable to receive the eggs and the heat is furnished by a lamp, which either warms the air direct or conducts it to a reservoir filled with water, whence the warm water is conducted by pipes so as to maintain the temperature uniformly. The proper temperature ranges between 90° and 100°, a somewhat higher degree being necessary during the first week, after which it should be lowered gradually. The eggs should be turned frequently during the first few days of incubation, and a thermometer should be adjusted so as to permit observing the temperature at any time. The incubators in use range in size from a capacity of a few dozen eggs to several hundred. About eighty per cent. is the average hatch of fertile eggs, but to obtain the best results much experience and careful attention to details are required.

**INCUBUS** (in'kû-bŭs), a male sprite or demon connected with the superstition of the Middle Ages. It was commonly believed that these demons were the cause of *nightmare*. The corresponding female demon was known as *succuba*.

**INDEPENDENCE** (in-dĕ-pĕnd'ĕns), a city in Iowa, county seat of Buchanan County, on the Wapsipinecon River. It is on the Illinois Central and the Chicago, Rock Island and Pacific railroads. The surrounding country is farming and dairying. It has an excellent high school and

is the seat of the State hospital for the insane. Among the facilities are a public library, electric street railways, waterworks, and street lighting. Population, 1905, 3,838.

**INDEPENDENCE**, a city of Kansas, county seat of Montgomery County, 85 miles southwest of Fort Scott, on the Missouri Pacific and the Atchison, Topeka and Santa Fé railroads. It is located on the Verdigris River, in an agricultural section, and is surrounded by a productive petroleum and natural gas region. The chief buildings include the public library, the county courthouse, the city hall, and several schools and churches. It has a growing market for agricultural produce and merchandise. The manufactures include glass, sugar, crackers, flour, pottery, and machinery. The rapid and healthful growth of the city in recent years is due to the development of its manufacturing and commercial enterprises. Population, 1905, 11,206; in 1910, 10,480.

**INDEPENDENCE**, a city in Missouri, county seat of Jackson County, five miles east of Kansas City. It is on the Missouri Pacific, the Chicago and Alton, and other railroads. The noteworthy buildings include the Kansas City Ladies' College, Woodland College, the county courthouse, the high school, and the public library. It has many fine residences and is the home of many Kansas City business men. The surrounding country is agricultural and fruit growing. It has manufactures of flour, woolen goods, ironware, and machinery. Pavements, street lighting, waterworks, and other improvements are among the municipal facilities. It was settled in 1827 and received an influx of many Mormon settlers in 1831, before their removal to Utah. The place was chartered as a city in 1889. Population, 1910, 9,859.

**INDEPENDENCE DAY**, the national holiday of the United States, celebrated on the 4th of July in commemoration of the signing of the Declaration of Independence (q. v.).

**INDEPENDENCE HALL**, a building erected between 1729 and 1734 as a meeting hall, on Chestnut Street, Philadelphia, Pa. In 1775 it was the meeting place of the Continental Congress, when Washington was made commander in chief of the American army. On July 4, 1776, that body adopted the Declaration of Independence, which was read to a vast public assemblage in the street. The structure is of brick, though much of the woodwork and finishing has been replaced or restored. It is now used as a museum of historical relics and is open to the public.

**INDEPENDENTS**, the name of a Protestant sect that originated in England in the 16th



century. Robert Brown, an English clergyman, organized the sect in 1586, and for some time they were known as Brownists or Separatists. They included those Protestants who believed that each individual church should administer its own affairs, instead of being under the authority of a civil or ecclesiastical official or potentate. Later the members were merged largely with the Congregationalists, who represent a strong following both in England and America at the present time.

**INDEX LIBRORUM PROHIBITORUM**, the name of a catalogue of books proscribed by the Roman Catholic church, which its members are not permitted to read. Such a catalogue was first prepared by the Council of Carthage in the year 400, but a much larger edition was compiled by the inquisition at Rome under the direction of Pope Paul IV. in 1557. This work forbade the reading of the works of Luther, Calvin, and other reformers, and later other authors of the Protestant faith were placed on the list. With these publications were included a number of books relating to magic, mesmerism, and some of the sciences, but it was provided that bishops could permit educated people to read some of the works of the prohibited list. The *Index Expurgatorius* is a similar catalogue. The latest edition of the latter was issued in 1895, under the direction of Leo XIII.

**INDIA** (in'di-à), a region of Asia, the most populous member of the British Empire. Formerly the name Hindustan was frequently used instead of India, but it has reference to the land of the Hindus, which is located in the north central part of India. The Empire of India, as the subject of this article is known officially, is in the form of a great triangle. It extends from north to south a distance of 2,000 miles, which is about the extent east and west when Baluchistan is included. The northern boundary is formed by Afghanistan and the Chinese Empire; the eastern, by the Chinese Empire, Siam, and the Bay of Bengal; the southern, by the Indian Ocean; and the western, by the Arabian Sea, Persia, and Afghanistan. The area, including Burma, Baluchistan, and the native states, is 1,766,650 square miles. Popularly the native states and the dependencies are spoken of as Hither and Farther India. With the empire are officially included Aden, on the Arabian Coast, and Socotra, a dependency of Aden.

**DESCRIPTION.** India is separated from the interior of Asia by the great ranges of the Himalayas, Hindu Kush, and Sulaiman mountains. The surface is naturally separated into three vast regions. In the southern portion is the table-land of Deccan, with a general elevation

of from 1,800 to 3,000 feet; north of it is the Great Plain, which is the most fertile and populous region; and the elevated highlands of the Himalayas, which comprise the northern part. These mountains are the most lofty in the world, many of the peaks rising to heights of from 20,000 to nearly 30,000 feet above sea level. They include vast regions that are perpetually covered with snow. Mount Everest, the loftiest of the Himalayas, is the highest mountain in the world. The Hindu Kush extend in ranges westward from the Himalayas, and chains of the Sulaiman and Hala stretch southward along the western border. These mountains can be crossed only by lofty passes, some of them fully 18,000 feet above the sea, hence they have served as a great barrier against invasions from the north. They constitute the height of land between the slopes of India and the Chinese Empire, and the drainage is generally toward the south, being toward the southwest in the western part and toward the southeast in the eastern section.

The Brahmaputra, Ganges, Indus, and Irrawaddy are the four largest rivers of India, the last mentioned being in Burma. The Brahmaputra and the Ganges drain the northeastern section. They have their sources on the southern slopes of the mountains, where the rainfall is heaviest, hence they carry an immense volume of water in proportion to their length and the basins drained. Both discharge by many mouths into the Bay of Bengal, where they have deposited an immense quantity of silt. In the northwestern part is the Indus, which receives the inflow from the Chenab and the Sutlej rivers. It drains an immense basin into the Arabian Sea, which it enters by an extensive delta. Among the rivers of the Peninsula are the Nerbudda and Tapti, flowing into the Arabian Sea; and the Godavari, the Kistna, and the Kavery, discharging into the Bay of Bengal. The Jumna, a tributary of the Ganges, drains a large portion of the central plain. As a whole the coast line is quite regular and not deeply indented, the largest inlet being on the western shore and including the Gulf of Cutch and the Gulf of Cambay. The only lakes are Kolar and Chilka, both of which are located near the eastern coast.

**CLIMATE.** In most parts of India the climate is tropical, with two distinctive periods, the rainy season and the dry season. The rainy distribution of humidity is more or less irregular season continues from November until March and the dry from May until November, but the on account of which droughts are not infrequent. In the summer or dry season the heat is very great, especially in the southern portion, but the elevated interior and the mountains in the north



have a moderate climate. A marked influence is exercised by the monsoons that blow across the country from the Indian Ocean, which carry considerable humidity against the mountain slopes, where the rainfall is excessive. In the northwest, in the region of the Indian Desert, the mean temperature for July is about 96°, which is the hottest part of the country. As a whole the climate is healthful for Europeans, except in the jungle and marsh land along the coast and in the lower courses of the larger streams. In the north central part is an arid region, where famines are quite frequent on account of excessive droughts. The precipitation at Madras is 52; at Bombay, 74; and at Calcutta, 65 inches. The heaviest rainfall occurs in Assam and Lower Burma, where the precipitation ranges from 500 to 600 inches per year.

**FLORA AND FAUNA.** The growth of vegetation is diversified according to elevation and the distribution of rainfall. Desert conditions prevail in the region lying east of the Indus, in the vicinity of the Gulf of Cutch, where plant life is very scant. Dense jungles are located along the Gulf of Bengal and in the lower course of the Ganges, where the plants are numerous and of large size. In the Deccan, east of the Western Ghats, the rainfall is scant and the plants are correspondingly limited, and in the mountain region the flora is arctic in form. The alluvial lands of the Indus and the Ganges are very fertile, and these regions are the seat of a vast population and the nativity of many useful plants. Among the forest trees are the sandalwood, blackwood, cedar, teak, and many species of palms. Numerous fruit trees abound, especially the mango, banana, and cocoanut. The large species of wild animals are becoming scarce, though the elephant, wild cattle, deer, antelope, and wild goats are still met with. The lion, tiger, and numerous birds and reptiles are plentiful. Many species of the ape, bear, rhinoceros, jackal, leopard, and jungle fowl occur in different sections.

**MINING.** Though India has vast mineral wealth, the mining industry has not been developed to a considerable extent when compared to its possibilities. The construction of railways and the building of manufacturing enterprises have stimulated a greater interest in the coal resources of the country, and the output of this product shows a steady increase the past two decades. Most of the coal mining is confined to the province of Bengal, but profitable mines are worked in Assam and a number of places in the peninsula. Gold is found in the river gravels of the Himalayas and elsewhere and quartz deposits are worked in Mysore and other regions,

Petroleum is obtained in large quantities from Upper Burma, being used in the manufacturing enterprises and for fuel. A monopoly is exercised by the government in the production of salt, which is obtained principally by the process of evaporation along the coast and in some of the small lakes of the interior. Other minerals obtained in paying quantities include lead, copper, and manganese. Though India was long famous for its diamonds, the output of this mineral is now insignificant. Building stone and commercial clays are abundant.

**AGRICULTURE.** The people of India have looked upon agriculture as an important enterprise for many centuries and it still takes precedence as the chief industry. Improved means of tillage and harvesting are utilized, including much steel machinery, and a vast area has been reclaimed by irrigation. Little farming can be done in Sindh and Lower Punjab without an artificial supply of water, and this is true likewise of many other sections, especially in the Deccan and some districts of the upper region of the Ganges. The irrigated lands aggregate 38,500,000 acres, though the need of supplying water artificially varies somewhat with the prevailing winds at certain seasons of the year. Rice is the most important crop and the acreage cultivated in that product is nearly five times as great as that devoted to the cultivation of wheat. Hay is grown on about half the area cultivated in rice. Other important crops include pulse, cotton, flax, sugar cane, opium, tea, indigo, tobacco, and coffee. Rice is cultivated extensively in the region of the deltas and along the coast, while wheat is the leading cereal in the northwest provinces, and sugar cane is grown largely in Bengal. The latter likewise has large interests in the cultivation of indigo.

Stock raising does not take rank with that enterprise as developed in Canada and the United States. This is due to various reasons, especially to the fact that people in tropical climates subsist largely on a vegetable diet, and because the caste or religious prejudices bar a large number of Hindus from eating pork and beef. To these must be added the circumstance that excessive droughts during the dry season deprive a large scope of country almost entirely of vegetable growth, owing to which stock is frequently reduced almost to starvation. The cattle grown in India belong to the humped variety, a breed that is scarcely known in America. Buffaloes are the chief animals of draft and burden. Interest is developing in the rearing of horses and mules and considerable enterprise is shown in growing sheep and goats.



**MANUFACTURING.** The people of India have been celebrated from ancient times for their skill in manufacturing textile fabrics and beautiful metal work. They do not engage extensively in building large enterprises, but work of this kind is done chiefly in small shops or in the houses of the natives. Very simple implements are used and the labor is done almost entirely by hand. Rugs, carpets, and laces obtained from India are in a class by themselves, and are remarkable for their beautiful designs and exquisite workmanship. Within recent years modern machinery has been introduced, especially in the manufacture of cotton and woolen textiles, flour, sugar, spirituous liquors, and paper. Many of the larger manufacturing enterprises are fostered by English capital and superintended by expert laborers, but the work is done chiefly by natives who have been carefully trained by Europeans. Large smelters and machine shops have been constructed and several extensive shipyards are operated. European methods have been introduced in the manufacture of copper, brass, and steel products, but work in ivory and wood carving is still done by native artisans by ancient methods. The sawmills and manufactories, especially those producing furniture and other lumber products, employ European methods and machinery. Formerly large quantities of various commodities that are now manufactured within the country were imported. The list of home manufactures is constantly increasing.

**TRANSPORTATION.** India has a larger mileage of railways than all the other countries of Asia combined. Important lines cross it in all directions, hence the chief centers of industry and population have extensive connections for transportation purposes. This fact is a potent factor in promoting the welfare of the country, both in the development of its resources and in conducting the affairs of the government. Lord Dalhousie originated a policy in 1850 to extend the construction of railways, under which private corporations were guaranteed a reasonable income on the capital invested for a term of years. In 1870 the government began to build and operate new lines and at present the publicly owned lines represent about one-half of the total mileage. In 1908 there were 28,500 miles in operation. A number of canals communicate with some of the principal railway lines, while others connect or supplement the rivers, hence all the sections have adequate transportation facilities, except the mountainous regions in the northern part. Navigation is possible for long distances on many of the rivers, particularly on the Indus, Ganges, and

Brahmaputra. The country has 85,000 miles of telegraph lines, mostly under government control, and the postal system includes 30,750 post offices. Many highways have been improved with macadam, affording communication to points considerable distances from the cities and railroads.

**COMMERCE.** India has held high rank in the trade of the world from an early period of the history of Asia. This is due to the fact that a large number of commodities of value in commerce are produced, as well as to its convenient location on important routes of oceanic transportation. The East India Company established trading posts in India as early as 1600, and through its commercial relations the influence of England was greatly augmented in the trade of Asia. At present the total annual imports have a value of \$352,500,000 and the exports are placed at \$387,280,000. Great Britain continues to have the largest share of the trade. Other countries that participate to a great extent in its foreign commerce include Germany, France, the United States, Belgium, Egypt, and Japan. Calcutta on the east and Bombay on the west are the two principal ports of foreign trade, and both have commodious and safe harbors. Extensive harbors have been completed recently at Rangoon and Madras. The exports consist chiefly of rice, cotton, coffee, opium, indigo, jute, tea, leather, wool, wheat, drugs, silks, and gunny bags. Formerly considerable raw material was imported, but at present the imports consist chiefly of manufactured products. Manufactured cotton has been imported for many years and still continues to be an important item. Other imports embrace woolens, sugar, iron and steel manufactures, farming utensils, machinery, and railway supplies. A very large majority of the articles represented in the foreign trade are carried by vessels under the flags of Great Britain, Germany, and Austria-Hungary.

**GOVERNMENT.** In 1858 the Parliament of England declared the king of that country to be the sovereign of India, and in 1876 the queen was proclaimed its empress. The government is administered by the Secretary of State for India, who is a member of the British Cabinet. He has the assistance of an undersecretary and a council of fifteen members. The executive functions are vested in a Viceroy, or Governor General, who is appointed by the crown for a term of six years, and his residence is at Calcutta. He is under the control of the Secretary of State for India, is assisted by a council of five members, and has general jurisdiction of foreign affairs. This council, of which he is a



member, is increased by sixteen additional members chosen by the Viceroy, some of whom are natives. In this body is vested the power to make all laws of British India, but certain restrictions are placed upon it. For local government India is separated into a number of presidencies and states, each under the control of a single executive officer, such as a governor or commissioner. The provinces are divided into districts for purposes of local administration, and each district is under the direct charge of a deputy commissioner. The British government at Calcutta has direct political control of three-fifths of the area in India, this portion being included in fourteen local governments and administrations, and the remaining two-fifths comprise feudatory states under native rulers. It is the policy of the British government to permit the native inhabitants, as far as possible, to have the responsibility of local government. This is true in a large measure of the local courts, but the courts of appeal are in the hands of Europeans. The courts of appeal are located at Calcutta, Madras, Bombay, and Allahábád, the judges being appointed by the home government, but supreme judicial power is exercised by the privy council in England, which is the court of last resort. The army of India proper consists of 210,000 men, including that of the feudatory states, about 350,000, and the officers are almost exclusively Europeans.

**EDUCATION.** About three-fourths of the inhabitants descended from the tribe known as Arya, from whom the term Aryan is obtained, and these people are generally known as Hindus. The language of this class is spoken by a large majority, but the dialects differ materially. This fact, and the circumstance that caste exercises a wide influence, has made it difficult to promote a system of education modeled after that of Europe and America. Instruction is given in the native languages, though English is included in the advanced courses. The school-attendance is about 6,500,000, though the males in attendance greatly exceed the females. Many schools and institutes are maintained by foreign missionary societies, all of which have an influence for the betterment of social, religious, and educational conditions. Numerous colleges and high schools are maintained throughout India and there are five universities of note, including those in Bombay, Calcutta, Madras, Allahábád, and the Punjab. The present system places special stress upon higher education, but much is done by the government to further instruction in the trades and in agriculture. As a rule the state schools reach the middle classes, while those conducted

by the missionaries are attended principally by those belonging to the lower castes.

Many forms of religious worship are conducted and the creeds professed are very numerous. However, Brahmanism is the faith of a great majority of the people, being professed by over 200,000,000 of the inhabitants. Mohammedanism has been extending since its introduction in the 11th century, the number of adherents throughout India being placed at 62,625,000. The inhabitants of Burma are largely Buddhists, who include about 9,500,000 adherents in India. Those who worship nature are placed at 8,500,000, while the Sikh religion is professed by 2,000,000, and the adherents to Jainism number 1,050,000. The Christians embrace 3,125,000 souls. The denominations represented by the largest numbers include the Roman Catholics, Anglicans, Baptists, Syrians, Lutherans, Methodists, Presbyterians, and Congregationalists.

**INHABITANTS.** India is densely populated and contains nearly one-fifth of the population of the world. It has about 190 inhabitants to the square mile, as against about 26 in the United States and 283 in China. The valley of the Ganges contains about two-fifths of the entire population, and the greatest density is in the province of Bengal. A small number of inhabitants speak European languages, such as English, German, and French, but these are confined to the cities and to those who hold official positions. The native dialects include principally the Bengali, spoken by about 45,000,000, and the Hindi, which is the vernacular of about 87,500,000 people. The languages or dialects are numerous, but they belong chiefly to the Indo-Germanic group of tongues, which in different forms are common to about 215,000,000 people. English is spoken by about 240,000 of the inhabitants.

Calcutta, in the province of Bengal, is the capital and largest city. Twenty-two cities, in 1906, had a population of more than 130,000. These included, in the order of size, Calcutta, Bombay, Madras, Hyderábád, Lucknow, Rangoon, Benares, Delhi, Lahore, Cawnpore, Agra, Ahmedábád, Mandalay, Allahábád, Amritsar, Jaipur, Bangalore, Howrah, Poona, Patna, Bareilly, and Nágpur. The population of India has increased steadily the past several decades. In 1891 it was 287,314,691; in 1901, 294,360,356; in 1906, 301,054,108.

**HISTORY.** The history of India begins with legends and sketches from Sanskrit literature. The first authentic facts come to us from about the year 2000 B. C., when the original inhabitants were subdued by the Aryans, a people of



much advancement in civilization and industrial arts, who inhabited the regions in the northwestern part of India. In 518 B. C. a Persian army under Darius invaded India, and in 327 Alexander the Great led an expedition to the Indus. Buddhism was established in the 3d century B. C., but it yielded almost entirely to Brahmanism in the several succeeding centuries. The Moham-medans invaded India in 711 A. D., and in 1001 the entire country was occupied by them, under Mahmud of Ghazni. Powerful invasions occurred under Genghis Khan in the 13th century, and under Timour, or Tamerlane, in the 15th century. In 1525 the Mogul Empire was established by Sultan Baber. From 1556 to 1607 Akbar, a grandson of Baber, reigned successfully and extended the boundaries so as to include almost the entire peninsula in his dominion, his government being the most important and powerful under the Indian sovereigns. After his death the empire became divided and Europeans began to manifest an interest in the riches of India. Travelers, traders, and missionaries of various European nations frequented the country in the beginning of the 16th century. The first of these to secure a foothold were the Portuguese, who established fortresses and trading posts on the Malabar coast, and soon after obtained control of the ports of Persia, India, and the adjacent islands.

The Dutch established a foothold in India in 1595 and carried on important trade relations with interior river points. In 1613 the British East India Company formed a settlement at Surat and later obtained territory at Madras and Calcutta. The French founded settlements about the same time, giving rise to conflicting claims, and in 1746 a war occurred in which the French won Madras, but later restored it by the Treaty of Aix-la-Chapelle. The Deccan and Carnatic were under the influence of the French governor, Dupleix, at Pondicherry in 1751, and soon a second war resulted, after which Carnatic fell into the hands of the British, and in 1757 Clive won Bengal by a victory over the Moguls at the Battle of Plassey. Charters were granted to a company soon after, which were renewed successively, and at each renewal more control became vested in the home government. In 1838 an effort to establish a British protectorate over Afghanistan failed. The Sepoy mutiny occurred in 1857, in which British residents at Cawnpore and other localities were massacred. However, Queen Victoria had already assumed the government of the principal territories of India in 1855, giving the British decided advantage in the occupation of many strategic points. The mutiny was finally sup-

pressed in 1858, after which vast internal improvements in canal and railroad building were carried forward. In 1877 Victoria assumed the title of Empress of India. Wars with Afghanistan and Upper Burma occurred in 1878 and in 1884, and the latter was annexed in 1886.

The boundary between India and Afghanistan was surveyed under the supervision of the home government, which was practically determined upon by the Durand Treaty of 1893. In the same year the Earl of Elgin became Viceroy, in whose administration much was done to improve the condition of the natives. A region lying in the basin of the Chitral River, known as Bashgal, was taken from the sphere of British influence and annexed to Afghanistan in 1895. Two years later a serious outbreak occurred on the Afghan frontier, in which the British were victorious after several decisive engagements. Several million people were affected by the severe famine of 1899, which was attended by local revolts against the government. In the same year Lord Curzon of Kedleston became Viceroy, gold was established as the monetary standard, and several regiments were sent to assist the British in the war in South Africa.

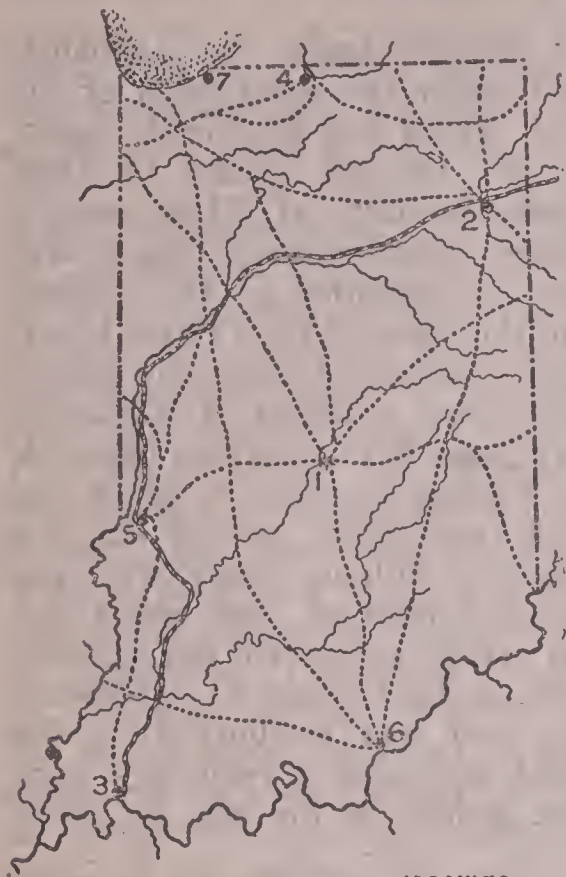
Complications arose in 1903 between England and Russia on account of the affairs in Tibet, which both countries determined to protect as neutral territory. The British government sent an expedition under Colonel Younghusband into the country as a means of protecting certain commercial rights, which had been denied by the grand lama, but that official fled when the expedition took Lhasa after some severe fighting. Though Russia objected to the proceedings, the English government announced that its policy was to maintain the commercial rights of India and not to annex Tibet. Gilbert John Elliot, who held the position of Governor General of Canada from 1898 to 1904, was made Viceroy of India in 1905.

**INDIA INK**, the name of a kind of black ink originally made in China and Japan, but so named because it became known to Europeans from its manufacture in India. It is a true black ink, having no tinge of some other hue, and is indelible. Soot or lampblack is used in its manufacture by the Chinese, who mix with it glue or size and a little camphor. Another variety is made from the dried pigment of certain cuttlefishes, which is browned by the action of an alkali and is known as *sepia*. The Chinese use India ink for writing and painting. In America and Europe it is employed in pen and ink drawing. The depth of the shade can be reg-



ulated by the amount of water used in mixing the ink.

**INDIANA** (in-dī-ān'ā), an east central State of the United States, popularly called the *Hoo-sier State*. It is bounded on the north by Michigan and Lake Michigan, east by Ohio,



INDIANA.

1, Indianapolis; 2, Fort Wayne; 3, Evansville; 4, South Bend; 5, Terre Haute; 6, New Albany; 7, Michigan City. Dotted lines indicate chief railroads. Heavy line shows Wabash and Erie Canal.

**DESCRIPTION.** The surface is an undulating plain, sloping toward the southwest. Along the Ohio River is the lowest land, being 300 feet above the level of the sea in the southwest corner. The northwestern part has an elevation of 500 to 650 feet, and in the northeastern section the elevation attains a height of 1,200 feet. Sandy hills extend along the shore of Lake Michigan, which are interspersed more or less with swamps, and the counties bordering on the Ohio have a broken and hilly surface. Several large marshes abound in the sandy region of the north, some of which assume the form of shallow lakes, and these are characterized by a growth of rushes, slough grasses, and evergreen trees. Much of the surface is a fertile, rolling prairie. Several large caverns occur in the south central part, especially in Crawford County, where is located the celebrated Wyndotte Cave.

Among the principal rivers are the Wabash, White, and Kankakee, all of which belong to the Mississippi system. In the northern part is the Saint Joseph River, which flows into Lake

Michigan, and the northeastern section is drained by the Maumee into Lake Erie. However, the larger part of the State is drained by the Wabash, which receives the inflow from the Eel, Salamonina, Tippecanoe, Wild Cat, and Mississinewa rivers before reaching the western border, and about fifty miles from its confluence with the Ohio it receives the White River. English Lake, Turkey Lake, and Tippecanoe Lake, all in the northern part of the State, are the largest bodies of water. It has a length of 275 miles from north to south and the greatest breadth is 145 miles. The area is 36,350 square miles, which includes 440 square miles of water surface.

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**CLIMATE.** The climate is very similar to that of Ohio and Illinois. In the southern part the mean temperature is considerably warmer than that of the northern section. The mean annual temperature of the State is about 62°, with extremes ranging from 22° below zero in winter to 95° above in summer. Cold winds blow across the lake and noticeably affect the climate in the winter. Vegetation appears in April and early frosts occur in September. All parts of the State have an abundance of rainfall, which is somewhat heavier in the south than in the north, and the average is about 42 inches. Heavy snows fall in the winter, usually affording from one to three months of sleighing.

**MINING.** The coal fields are estimated at 6,500 square miles, located chiefly in the western and southwestern part. In quality the product takes rank as a good grade of bituminous coal, being similar to that of Illinois, and it is used and shipped largely for heating purposes. In 1908 the output was about 12,500,000 tons. Petroleum is a valuable product and is found extensively in the Lima district, which includes the counties of Adams, Blackford, Grant, Jay, and Wells. The State has a natural gas field of about 2,550 square miles, located chiefly in the central part, and a large quantity is transported by pipe line to Whiting and other manufacturing points near Chicago. Limestone and sandstone quarries are worked extensively and a grade of rock known as Bedford limestone, which is exported in large quantities, is classed among the best known building material in America. Marls used in manufacturing cement and brick and fire clays are abundant.

**AGRICULTURE.** The soil generally is fertile and well adapted to the production of agricultural products. Most of the rivers and smaller streams are skirted by valuable belts of timber, and forests of greater or less extent are found in different regions of the State, but a large area formerly well timbered is utilized in farming. About 95 per cent. of the tillable land is cultivated. The farming is conducted on progressive methods, involving careful cultivation and fertilization. Much of the surface formerly



wet and marshy has been redeemed by drainage. Corn is the chief cereal and the acreage planted is nearly equal to that cultivated in both wheat and hay. It holds a high rank among the leading corn and wheat growing states, both in the quality of the product and in the yield per acre. Other products include oats, potatoes, rye, and vegetables. Fruit is grown in all parts of the State, but the best quality of quinces, pears, and peaches thrive in the southern section. Vast interests are vested in the live-stock industry. Horses, cattle, and swine receive an equal share of interest, and mules and poultry are grown profitably. There has been a decrease in the number of sheep, but the interests in dairying have grown steadily with every decade.

**TRANSPORTATION.** Michigan City is the only port on Lake Michigan, and through it communication is maintained by steamship navigation with the leading cities of the Great Lakes. The Ohio River is navigable the entire distance along the southern border, and the Wabash furnishes communication for small boats. Transportation facilities are provided by the Wabash and Erie Canal and the Whitewater Canal. The National Road, though not important at present, formerly constituted a highway of much value. Few states are as well provided with steam and electric railways as Indiana. It has a total steam railway mileage of 6,750 miles. The railroads crossing the State include lines of the great systems that connect Chicago with the commercial centers of the east and south, hence they furnish direct connection with New York, Philadelphia, and Saint Louis. Indianapolis, located in the center of the State, is the focus of many railways and is noted as a jobbing and manufacturing center.

**MANUFACTURING.** Since the State has a large supply of coal and natural gas, in addition to being located conveniently to the coal fields of Illinois and Ohio, it is highly favored in facilities to manufacture. In addition must be considered its favorable situation for transportation, giving it points of vantage rarely excelled. Steel and iron take high rank among the manufactured products. The quality and quantity of its glass products have opened a market in many countries of Europe. Terre Haute is a center of distilling interests. Many of the cities are noted for their output of flour and meal. Gary, East Chicago, Hammond, and Whiting are among the manufacturing centers located near Chicago, and their growth in various enterprises, such as the manufacture of machinery, books, packed meats, and steel and iron products, give evidence of constant and health-

ful growth. Other manufactures include paper, railway cars, furniture, clothing, textiles, carriages and wagons, and butter and cheese.

**GOVERNMENT.** The government is organized under a constitution which was ratified by the people in 1851. It vests the chief executive power in the Governor and the Lieutenant Governor, who are elected for a term of four years. Other State officers include the treasurer, secretary, auditor, attorney-general, and superintendent of public instruction, each elected for two years. The General Assembly consists of a senate and a house of representatives. In the former are 50 members elected by districts for four years, while the latter has 100 members elected for two years. Annual meetings are held by the Legislature and all revenue bills must originate in the house, but amendments may be proposed by the senate. Circuit courts, an appellate court and the supreme court comprise the judicial system. Superior courts may be established in the large cities. Justices of the peace are elected in the townships. Local government is vested in the towns, cities, and counties.

**EDUCATION.** Indiana has an efficient system of public instruction, which is maintained under the supervision of a state superintendent, who is assisted by county and city superintendents. The township is the smallest unit in the educational system and is under the direct management of a trustee, who is elected by the voters of the townships, while the county superintendent is chosen by the school trustees of the entire county. Adequate and well articulated courses of study are maintained, hence the instruction is in a systematic order from the lower schools to the higher institutions. Indiana University, situated at Bloomington, is the highest institution in the system of the State. A large proportion of the teachers have received training in normal schools and colleges. The state normal school, with an attendance of about 2,000 students, is located at Terre Haute. Other institutions of higher learning include the Northern Indiana Normal School, Valparaiso; the Tri-State Normal, Angola; the Eastern Indiana Normal University, Muncie; the Rochester Normal University, Rochester; the Concordia College, Fort Wayne; the De Pauw University, Greencastle; the Earlham College, Richmond; the Butler College, Irvington; the University of Notre Dame, Notre Dame; and the Indianapolis University, Indianapolis.

An efficiently managed system of correctional and charitable institutions is maintained by the State, some of the institutions being supported partly by the county, and other benevolent insti-



tutions are maintained by private interests. Knightstown has a soldiers' orphans' home, Lafayette has a soldiers' home, Jeffersonville has a reformatory, Michigan City has a penitentiary, and Indianapolis has a school for the deaf, dumb, and blind. Hospitals for the insane are located at Evansville, Indianapolis, Logansport, and Richmond. The public institutions maintained for charitable and reformatory purposes are generally under the control of non-partisan boards. Indianapolis is noted for its efficiently managed system of public schools.

**INHABITANTS.** The population is made up largely of native-born inhabitants and a large number who settled in the State from Virginia, Kentucky, and South Carolina. About half of the foreign born are Germans. Indianapolis is the capital and largest city. Other cities include Evansville, Fort Wayne, Terre Haute, South Bend, New Albany, Lafayette, Logansport, Richmond, Michigan City, Elkhart, and Jeffersonville. In 1900 the total population was 2,516,462. This included 57,960 colored inhabitants, of whom 223 were Indians and 57,505 were Negroes. Population, 1910, 2,700,876.

**HISTORY.** The territory comprised within the present limits of Indiana was first visited by white men in 1679. La Salle crossed the State the following year, when he visited the Illinois Indians. The first settlement was made at Vincennes, on the Wabash River, in 1702 by the French under La Salle. It was a part of New France until 1763, when it became a possession of England. The United States acquired it in 1783, having been conquered under George Rogers Clark and a number of frontiersmen during the Revolution. In 1800 the Territory of Indiana was separated from Ohio; Michigan Territory was cut off in 1805; Illinois Territory, in 1809; and what remained was admitted as a State in 1816. Indian wars occurred at various times, but the success of General Harrison at Tippecanoe in 1811 terminated the more important contests. The center of population of the United States was calculated by the census of 1890 at a point southwest of Greensburg, the county seat of Decatur County, twenty miles east of Columbus. Ten years later, in 1900, the center of population in the United States was in southern Indiana, about six miles southeast of Columbus, the county seat of Bartholomew County. Its growth in wealth and population has been uninterrupted from its admission into the union.

**INDIANAPOLIS** (in-dī-an-ăp'ô-lis), the capital and largest city of Indiana, county seat of Marion County, 182 miles southeast of Chicago, Ill. It is located on the White River, in

the center of the State, on the Pennsylvania, the Monon, the Big Four, the Lake Erie and Western, and other railroads. The surrounding country is rich in agricultural resources and in its vicinity are productive coal fields. Though an inland city, it is the seat of a large commerce. A belt railway encircles the city, by which it is possible to handle a large volume of freight with facility. The street railway system includes 140 miles of tracks, and with it are connected numerous interurban electric lines that furnish transportation facilities with other centers of commerce. Near the principal business section is a handsome union depot, into which the railway passenger trains enter.

Indianapolis is noted for its beautiful streets, which are regularly platted and substantially paved. From a circular plaza in the center of the city, called Monument Place, radiate the four principal avenues. Georgia, Market, Maryland, and Washington are the most important business streets. Many of the thoroughfares are beautiful on account of fine lawns and imposing residences, and all are amply lighted by gas and electricity. Delaware, Meridian, and Pennsylvania are especially noted as residential streets. The parks include 1,250 acres. Riverside Park, extending along the White River, Woodruff Place, and Military, Garfield, University, and Saint Clair parks are among the most noted public grounds. Many fine monuments and statues ornament the public places. The Soldiers' and Sailors' Monument, designed by Bruno Schmitz of Berlin, was erected in Monument Place to commemorate the Union veterans of the Civil War. In the capitol grounds is a monument of Thomas A. Hendricks and University Park has a statue of Schuyler Colfax. Among the statues are those of William Henry Harrison, Oliver Perry Morton, and George Rogers, and a fine memorial has been erected to the memory of Benjamin Harrison. The cemeteries include Greenlawn, Crown Hill, and those maintained by the Lutheran, Roman Catholic, Jewish, and other denominations.

Indianapolis is noted as a center of learning. The public school system has a national reputation for its carefully articulated courses of study, which range from the kindergarten through the grades to the high school, and are designed to prepare for college and university work. It is the seat of the University of Indianapolis, which has an academic department known as Butler College, and maintains departments of dentistry, medicine, and law. Other institutions of learning include the State institutions for the education of the blind and of the deaf and dumb, a



Roman Catholic seminary, United Brethren College, and several schools of law and medicine. It is the seat of numerous charitable and reformatory institutions. The principal buildings include the city hall, the county courthouse, the public library, the Commercial Club, the Columbia Club, the post office, the Claypool Hotel, and numerous office buildings. All of the leading Christian denominations have fine churches. The State capitol, erected at a cost of \$2,125,000, occupies two large blocks and is a fine specimen of modern architecture.

The city has large interests in various manufactures and other enterprises. It has many grain elevators and extensive stock yards. The chief manufactures include cotton and woolen goods, pianos, sewing machines, furniture, railroad cars, flour, drugs, terra cotta, and milling machinery. It is an extensive market for grain, fruit, and merchandise, and has a large jobbing and wholesale trade that extends far beyond the borders of the State. The first settlement on its site was made in 1819. Two years later it became known as the village of Indianapolis. It was made the capital of the State in 1825, when the seat of government was removed from Corydon. Its growth as a commercial center dates from 1847, in which year it was connected by a railway with the Ohio River at Madison. Natural gas was piped to the city in 1889 and introduced in manufacturing enterprises. In population it takes rank as the twenty-first city of the United States. Population, 1910, 233,650.

**INDIAN ARCHIPELAGO.** See **Malay Archipelago.**

**INDIANA UNIVERSITY,** a coeducational institution of learning at Bloomington, Ind., founded in 1820 as Indiana Seminary. It was chartered as a State institution in 1838, since which time it has been a part of the public school system. The departments include those of law, philosophy, medicine, engineering, and collegiate work. A biological station is maintained at Winona Lake. Degrees of bachelor of law, bachelor of arts, master of arts, and doctor of philosophy are conferred. It has a library of 60,000 volumes, a faculty of about 100 and endowments amounting to \$650,000. The attendance is about 1,700 students.

**INDIAN CORN.** See **Corn.**

**INDIAN MALLOW,** or **Stamp Weed,** a plant of the mallow family, found native in many parts of Asia. It has been naturalized in Canada and the United States, and is troublesome as a weed in the cultivated lands of the Mississippi Valley and elsewhere. The leaves are heart-shaped, the flowers are orange-yellow colored, and the stem grows to a height of three

to four feet. It is difficult to destroy by cultivating with machines, hence it becomes obnoxious in corn fields during the principal part of the growing season.

**INDIAN OCEAN,** the third in size of the five great oceans. It lies south of Asia, west of the Sunda isles and Australia, north of the Antarctic Ocean, and east of Africa. A line drawn from the southern extremity of Tasmania to the Cape of Good Hope is its southern boundary, from which it gradually narrows toward the north. India divides it into the Bay of Bengal and the Arabian Sea, and from the latter the Persian Gulf and the Red Sea branch toward the northwest. Its length from north to south is about 6,500 miles, and the breadth is from 4,000 to 6,000 miles. The Equator passes through it, along which the equatorial current flows from east to west. Its navigation is influenced by periodic monsoons and trade winds. The principal rivers flowing into it include the Limpopo and Zambezi from Africa; the Ganges, Indus, Tigris, Euphrates, and Irrawaddy from Asia; and the Ashburton, Gascoire, and Murchison from Australia. Ceylon and Madagascar are the only large islands, though there are many small islands and several important groups of islets. Its depth is greatest near the coast of Asia, southeast of Java, where soundings to a depth of 20,340 feet have been made. The greatest depth in the Arabian Sea is 15,000 feet and in the Bay of Bengal it is about 13,500 feet. Its depth near the southeastern coast of Africa ranges from 7,500 to 12,000 feet.

**INDIANOLA** (in-dī-an-ō'la), a city of Iowa, county seat of Warren County, eighteen miles south of Des Moines, on the Chicago, Burlington and Quincy and the Chicago, Rock Island and Pacific railroads. It is surrounded by a fertile agricultural and coal-mining region. The principal buildings include a courthouse, a public library, and several fine schools and churches. It is the seat of Simpson College, a Methodist Episcopal institution founded in 1867. Population, 1905, 3,396.

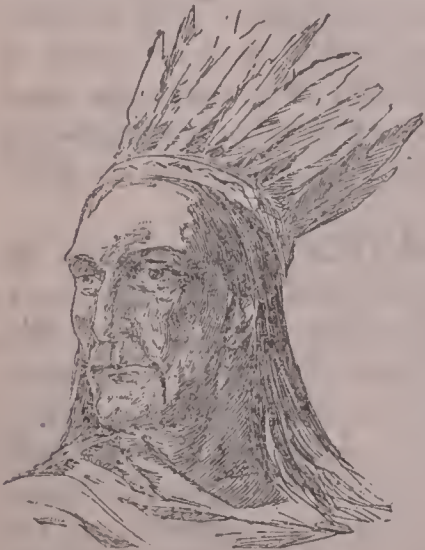
**INDIAN RESERVATIONS,** the tracts of land set apart for the Indians by treaty or by executive orders. It was long the policy of the government of the United States to reserve certain tracts of land for the Indians, from which white trespassers were excluded, and the Indians themselves could not pass beyond the limits except for necessary purposes or by special permission. This system of reserving lands had its origin in the difficulty of keeping peace in the frontier territory. After being defeated in war, the Indians usually agreed to a treaty of peace that bound them to retire to a



certain reservation, where they could live by themselves and under the peaceful protection of the government. In some cases the tribes agreed to accept the value of a part of their possessions in money, hence released it and confined their residence to a smaller area. Reservations of the latter class were usually made by an act of Congress, while the former were set apart by an executive order under the approval of the Senate. The largest reservation at present is that of the Navajo Indians in Arizona, which embraces 9,500,000 acres. Several reservations in South Dakota cover an area nearly as large. The total number of reservations in the United States at present is about 140. An agent or superintendent has charge of the affairs of a reservation and is responsible to the commissioner of Indian affairs who is under the direction of the Secretary of the Interior. Citizenship is not extended to Indians on reservations, but they may settle on other lands and thus become entitled to the privileges of a citizen. Many Indians have lost their racial characteristics and are now regarded as white citizens, but purely Indian citizens in the United States who are entitled to vote exceed 20,000.

**INDIAN RIVER**, a tidal inlet of Florida, located in Brevard and Volusia counties, extending along the east coast of the State. It is about ninety miles long and communicates with the Atlantic Ocean at Indian Inlet. The width varies from several hundred feet to three miles, but it is shallow and can be navigated only by boats drawing not more than five feet. Several resorts for invalids and sportsmen are located on its banks.

**INDIANS**, American, the collective name applied to the people found in America when it was discovered by Columbus. The name origi-



INDIAN CHIEF.

inated from the incorrect idea that the continent is a part of India, and that these people were only a portion of the great population of Southern Asia. However, they generally called themselves *Onkwé Honwé*, meaning men. More recently they came to be called the *American* or *Red* race.

**INDIAN POPULATION.** The most trustworthy early writers place the number of Indians east of the Mississippi River at the time America was discovered at 200,000. Aside from this we

have no reliable data, but it is generally assumed that the Indian population of both North and South America was fully 12,000,000. California alone, at the time of the gold discovery, had an estimated Indian population of 200,000. At present Alaska has 29,536; British America, 100,000; and the United States, 266,760, or a total of less than 400,000.

**DISTRIBUTION.** The distribution of the Indians at an early period depended upon the existence of forests and game. They lived in tribes and clans. All were members of one great family, but they ranged from the rudest savages to the cultivated Aztecs of Mexico and the Peruvians of South America. In the extreme north were the Eskimos, who still occupy the northern part of the British possessions. Those formerly dwelling in the vast regions south of the Eskimos have been widely diversified by intermarriage and scattered from the regions they formerly occupied. The tribes occupying the northeastern portion of the United States were classed either with the Algonquin or Iroquois races. Those in the northwest, extending far into Canada, were classed as Siouan Indians, while in the southern regions were the Mobilians and the Natchez. The Aztecs occupied large portions of Mexico and Central America, but in these regions were also the Otomis, Maya, and Quiches Indians. The Peruvians of South America were advanced in civilized arts quite as much as the Aztecs, and included the Inca and the Aymaras races. In Chile were the Araucanians; on the Atlantic slope, the Guaranis; and on the northern coast, the Caribs, who also occupied most of the West Indian islands. In the extreme south lived the tall Patagonians.

**INDIAN WARS.** The Algonquins and Iroquois included many branches, but these two great families were continually at war with each other for supremacy, and later offered formidable resistance to the onward march of the Europeans. At intervals they made incursions toward the West, where they were met by the warriors of the many affiliated tribes of the Sioux Indians, who were often at war with each other when not in conflict with their more powerful rivals of the East. The English first engaged in hostilities with the Indians in Virginia in 1622, and these were followed by engagements in New England in 1637. The Indian wars waged between 1790 and 1795 against the Miami Confederation in Ohio were the most destructive of human life, but General Wayne dealt a crushing defeat to them in 1793. The success of General Harrison at Tippecanoe, in 1811, checked them materially, but in the following year the Indians became allied with the British, and were again





CHIEF STANDING BEAR.







defeated by Harrison in 1813 at the Thames, when Tecumseh was killed. General Jackson in the same year conducted operations against the Creeks in the south and defeated them at Talladega and the Horse Shoe Bend of the Tallapoosa River. He likewise defeated the Seminoles in Georgia and Alabama in 1817, and on the same expedition executed two Englishmen, Arbuthnot and Ambrister, after conviction by court-martial on a charge of inciting the Indians to cause disturbances. The last battle with the Indians taking rank as a severe contest occurred on the Little Big Horn River, near the Black Hills, in 1876, when General Custer was slain.

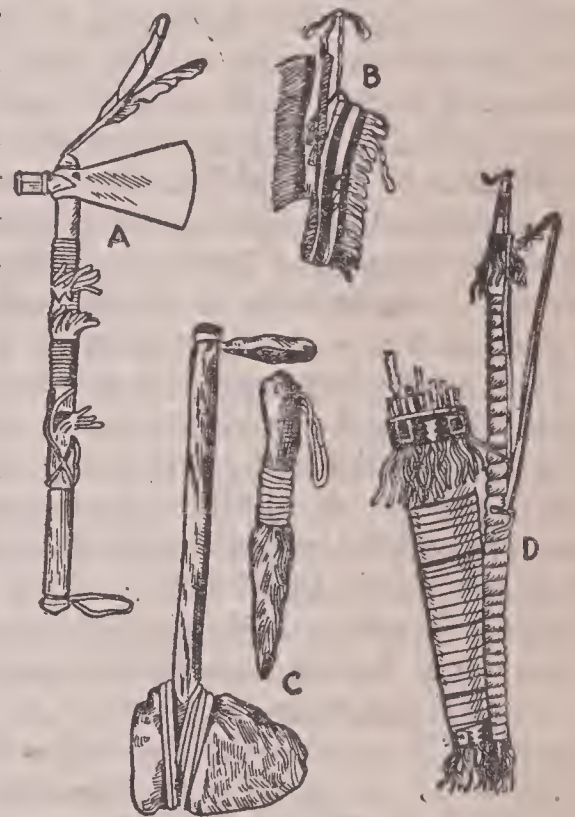
**GOVERNMENT AND INDUSTRIES.** Government among the Indians was loosely administered, and, though confederations were formed among the tribes, they were not of long duration. Their occupations were principally hunting and fishing. They dwelt largely in tents and other perishable buildings, but some, as the Pueblos, built of stone or adobe, or constructed *kivas*, or public rooms, underground. Some tribes developed skill in the culture of corn, beans, and tobacco, and the more highly civilized of Mexico and Peru were considerably advanced in civilized arts. They built dwellings and cities; constructed aqueducts, canals, and highways; had a recognized system of government and a fixed form of worship; and left to future generations massive pyramids and innumerable mummies. The manufactures of the Indians in the region now occupied by the United States and Southern Canada included bows, arrowheads, pottery, snowshoes, stone pipes, canoes, baskets, and other articles useful to them in domestic life and in the arts of war. Their dress was largely of the skin of animals, and their food consisted of vegetables and a few cereals, but principally of the wild game which was then very abundant. They had few domestic animals aside from the dog, but became very fond of horses, which they first obtained from the Spaniards.

**RELIGION AND CHARACTERISTICS.** In religion the Indians held that there is a future life and that the spirit after the death of the body enjoys the happy hunting grounds. It was commonly believed that a spirit animates every living plant and animal. While many of the tribes believed that virtue and bravery constitute essentials to welfare in this life, they did not make a distinction as to the influence that the conduct in the present life might have in attaining to happiness beyond. The name *Red* race originated from the reddish tint observable in their complexion, which varies from almost white to dark brown. In nearly all Indians the hair is

long and straight, usually black, but sometimes brownish. The eyebrows are heavy, the beard is scant, the eyes are sleepy and dull, the lips are compressed, and the face is broad. Some ethnologists think they descended from the Mongolian race, while others regard them a mixture of the Polynesian and Caucasian with the Mongolian. From the tradition of their tribes it is learned that they themselves thought that they emigrated from some region, but know not from whence. The sun worship of the Incas and Aztecs has been taken to indicate some connection with early Asiatic peoples, while the Eskimos of North America are quite identical with those of Siberia.

**POLICY OF THE GOVERNMENT.** The policy of the government in Canada and the United States

for many years has been to make citizens of the Indians by giving them every possible encouragement in educational facilities, landed possessions, and financial support. It has been the aim from an early date to make them self-supporting. Indian Territory was set apart for this purpose by the United States with



INDIAN IMPLEMENTS.

A, Tomahawk; B, Head dress; C, Stone implements; D, Quiver and bow case.

the view of inducing them to found homes and give them greater opportunities in educational and industrial advancement. When that region was annexed to Oklahoma, in 1906, this policy was continued. However, the larger number of Indians are on reservations, both in Canada and the United States, and each country maintains a Department of Indian Affairs. The Indians in territory of the United States are located principally as follows: Oklahoma, 64,455; Alaska, 29,536; Arizona, 26,480; Michigan, 6,354; South Dakota, 20,225; Minnesota, 9,182; California, 15,377; Montana, 11,343; Mississippi, 2,203; Oklahoma, 11,945; North Dakota, 6,968; New Mexico, 13,144; New York, 5,257; Nevada, 5,216; Oregon, 4,951; Kansas, 2,130; Nebraska, 3,322; Idaho, 4,226; Utah, 2,623; North Caro-



lina, 5,707; Wisconsin, 8,372; Washington, 10,039; and Wyoming, 1,686.

Many of the tribes do not look with favor upon an intermingling with the whites, but others take readily to education and intermarry extensively. Some of the Indians have attained to much educational advancement and have become famous as scholars and educators. Large numbers attend the higher institutions of learning, where they make an honorable record. Besides taking up farming and other industries, they engage in the practice of medicine and law, the publication of newspapers, and the various arts and trades. Under certain conditions the Indians are admitted to full citizenship, when they may hold office under the government, exercise the right of suffrage, and have all privileges and benefits accorded to other citizens. The condition under which these privileges are extended is that they stipulate with the government to waive all claims to public support.

**INDIAN SUMMER**, the name of a season of warm and pleasant weather that occurs late in the fall, usually in October or November, and is confined chiefly to the northern part of the United States and the southern part of Canada. Usually it occurs but once in a season, though sometimes it may be noticeable two or three times. It is distinguished by a dry and somewhat hazy atmosphere. A similar season in England is known as All Hallow Summer or Saint Martin's Summer, and in Germany it is called Saint Luke's Summer and Old Woman's Summer. The name Indian Summer is supposed to have been derived from predictions of fair weather made by the native Indians while in conversation with the early settlers in America.

**INDIAN TERRITORY**, a former territory of the United States, located south of Kansas and west of Missouri and Arkansas. It was set apart in 1834 for Indian reservations, but was united with Oklahoma in 1906, which was admitted as a State the following year. The Creeks, Choctaws, Cherokees, and Chickasaws settled in this region in 1834. Later the Seminoles and other tribes received reservations. The name *Five Civilized Nations* was applied to those mentioned, and the others were distributed on seven reservations within the region. See **Oklahoma**.

**INDIA RUBBER**, or **Caoutchouc**, a soft, flexible, and very elastic substance derived from the milky sap of various tropical plants. It is a composition formed chiefly of carbon and hydrogen. Many species of shrubs and trees produce gummy products that have commercial value. The principal tree yielding juices from which India rubber is manufactured is tall and pos-

sesses an abundance of the fluid. The juice is secured by making incisions in the trunks of the trees, under which receptacles are placed. From ten to twenty-five gallons of the juice are obtained from a single tree in a season, and about two pounds of good rubber is secured from a gallon. The rubber is obtained in a crude form by evaporating the juice in the sun, or in tanks placed over a fire. It may also be coagulated by mixing with it sap from the bejuco vine. The raw material is purified by boiling and subsequently by pressing through powerful machines, after which it is rolled into plates and dried.

The India rubber of commerce is produced largely in Mexico, Central America, South America, Java, Singapore, Assam, Penang, and the Congo basin of Africa. In 1823 Mackintosh patented a water-proofing process by which India rubber came largely into use. At present its applications are innumerable. It is now rarely employed in a pure state, but is vulcanized by heating the pure rubber with sulphur. In this way it is hardened and serves many useful purposes, such as for belting, shoes, hose, tires, cloth, combs, bracelets, furniture, paper knives, water packing, life preservers, paving, gas bags, and gloves. The harder products, such as buttons, inkstands, rulers, canes, and artificial teeth, are secured from rubber which is vulcanized under an application of sulphur exposed to a high temperature. In making covering for telegraph wires it is vulcanized with asphalt, sulphur, and oils.

**INDIGIRKA** (ĕn-dyĕ-gĕr'kà), a large river of Eastern Siberia, rises in the Stanovoi Mountains, and after a course of 900 miles flows into the Arctic Ocean. It enters the sea through a large delta about 450 miles east of the mouth of the Lena. The region traversed by it consists largely of frozen marshes, and the inhabitants support themselves chiefly by the chase.

**INDIGO** (in'dĭ-gŏ), a vegetable dyestuff that yields a beautiful and very durable blue dye. It is employed extensively in forming a basis for black dye in woolen goods, for dyeing, and for calico printing. The product is obtained from numerous plants of a shrubby and herbaceous character which thrive in equatorial regions. These plants belong to the order of *Leguminosae*, of which the *Indigofera tinctoria* is a genus. The plants are from two to six feet tall, have rounded leaves, and bear blue, purple, or white pea-shaped flowers. Ordinarily they are classed with the bean family. They are cut at the time of blooming, which occurs when the plants are about three months old. The seeds are sown early in the spring and the cutting



takes place in midsummer. After several months a second crop shoots up, and in some localities a third. The indigo market of Southern Asia centers largely at Bengal, whence large quantities are exported to the ports of Europe and America. The plants which yield indigo are now grown extensively in warmer parts of Europe, Africa, and America, especially in Central America. Only from fifty to sixty per cent. of the indigo of commerce is pure indigo blue, and the other portion consists of indigo yellow,



INDIGO PLANT.

A, Fruit.

indigo gluten, indigo red, or some allied substances. From history it is learned that indigo has been produced in India from remote times. It was imported from that country by the Phoenicians, Grecians, and Romans.

**INDIGO BIRD**, a North American finch, native to the southern part of the United States, Mexico, and Central America. In the summer time it comes north as far as Missouri, where it is captured and domesticated as a cage bird. It is about six inches long. The general color is greenish-blue, but the wing feathers are brown, and it is black beneath the bill. It nests in the tallest trees and is noted for its beautiful song. The female is somewhat smaller than the male and has a yellowish-brown body with the wings several shades darker. From three to four eggs of a pale bluish-white, without spots, are laid early in the spring.

**INDIUM** (in'dī-ŭm), a metal found in various zinc minerals, in some galenas from Italy, and in the flue dust of the furnaces in which zinc ores are treated. Reich and Richter discovered this metallic element in 1863 with the aid of the spectroscope, while analyzing specimens

of zinc blende obtained from Freiburg. In a pure state the metal has a bluish-silvery luster, and in softness and ductility it resembles lead. It is slightly volatile, has a very low fusion point, and tarnishes slowly in air. See **Chemistry**.

**INDO CHINA** (in'dō chī'nà), a name frequently applied to the larger part of the southeastern peninsula of Asia, which is situated between the Bay of Bengal on the west and the gulfs of Siam and Tonquin and the China Sea on the east. The area is estimated at 363,422 square miles. It includes Anam, Laos, Cambodia, French or Lower Cochin China, and Tonquin. The name is sometimes applied to the entire peninsula, in which sense it includes Burmah. This region contains natural resources of much commercial value and has been developed under a colonial policy fostered largely by France. Railroad construction, canals for navigation and irrigation, telegraph and telephone lines, and municipal facilities have received aid from the French government. The exports and imports are alike extensive. Among the chief imports are machinery, woolen goods, cotton products, and various manufactured articles. The exports embrace principally rice, rawhides, pepper, volatile oil, copra, cocoa, and many species of fruits. Mining has developed in copper, coal, tin, iron, and zinc. It has productive fields of gas and mineral oils. The region is well watered by the Menam and Mekong rivers and their tributaries, which furnish extensive navigation facilities and supply water for the irrigation canals. Stock raising and lumbering are important industries. The governor general of the French possessions is resident at Hanoi, which is the chief seat of political influence, and in the separate divisions are local and subordinate governors.

**INDO-EUROPEAN** (in-dō-ŭ-rō-pē'an), **Indo-Germanic**, or **Aryan**, the names applied to the most important of the groups of languages into which human speech has been classified. It is subdivided into numerous branches, of which the Germanic or Teutonic is the most important, which includes the German, English, Dutch, Scandinavian, and extinct Gothic. Other branches are the Slavonic, including the Russian, Polish, and Bohemian; the Latin or Italic; the Celtic, which embraces the Breton, Irish, Welsh, and Gaelic; the Lithuanian; the Greek; the Persian; the Armenian; and the Sanskrit. The oldest literature is included in the Sanskrit and is found among the Hindus. All these branches of the Indo-European language descended from a parent or ancestral tongue which prevailed at a remote period in Central Asia, and spread



through succeeding centuries into India and westward through Asia to the western extremities of Europe. Searching study has demonstrated that there is a similarity in construction and meaning sufficient to warrant a classification through succeeding ages, tracing the tongues to a common source.

**INDRA** (in'drā), a diety of the Hindus, worshiped as the supreme god throughout the Vedic period. He lost his supremacy by the rise of Brahma, Siva, and Vishnu, and is now assigned a subordinate place in the Pantheon. In paintings and sculpture he is represented with numerous eyes and four arms and is seated on an elephant. His powers include the control of rain and shade, the hurling of thunderbolts, and the restoring of the sun to the sky. He has also been assigned a supervisory influence of Swarga, a paradise in which pious men and inferior deities dwell in eternal felicity. Indra is interesting to the student of history for the important connections given him in the literature and legends of the Hindu peoples.

**INDUCTION** (in-dük'shün), a term in logic which implies the process of reasoning by which we proceed from the particular to the general. It is used in contradistinction to deduction, a process of reasoning from the general to the particular. In following the inductive method we not only arrive at conclusions of generals, but rise into higher generalities. It involves the process of proceeding from the known to the unknown, and obtaining a conclusion broader and deeper than the premises. In other words, induction is the process by which we conclude that what is true of certain individuals of a class is true of the whole class, and what is true in certain times will be true at all times. The impossibility of observing all particulars makes it necessary to reason inductively with much care, lest the conclusion be erroneous. The basis of induction is the established fact that nature is uniform, and by observing in detail every material fact the conclusion arrived at must be true.

**INDUCTION**, in electrical science, a term used to describe the action by which an uncharged body will exhibit electrical forces when it is brought near an electrified one. An insulated conductor charged either positively or negatively so acts on bodies in a natural state placed near it as to decompose the neutral fluid, attracting the opposite kind of electricity and repelling the same kind. Heinrich D. Ruhmkorff (1803-1877), a German inventor, produced an instrument called the *induction coil* (q. v.), by which induced currents of great electro-motive force are secured in a long secondary coil by means of rapidly making and breaking the cur-

rent of electricity in a primary short coil of wire. The principle of induction is illustrated in the Leyden jar, in which mutual induction takes place between the two coatings, one being charged positively and the other negatively.

**INDUCTION COIL**, or **Ruhmkorff Coil**, an instrument used for the purpose of getting induced electric currents of high potential difference. Michael Faraday was the first to state the fundamental fact of electro-magnetic induction, which he did in a paper read before the Royal Society of London in 1831. The form in use at present is that of Ruhmkorff, who devised a superior method of winding the coil. The essential parts are a soft iron core, a primary coil of insulated wire connected with a battery, a secondary coil of fine insulated wire, a brake arrangement to work automatically between the battery and the primary coil, a condenser connected with the primary circuit on each side of the break-point, and a switch to make and break the current. When the induction coil is attached to the battery and the switch is turned on, the current passes through the primary and the iron core is acted upon as a magnet. The soft iron armature, which it attached to a vertical spring, is attracted and breaks the current at C, but when this is done the core ceases to be a magnet, hence the armature is thrown back by the spring, and the movement of coming in contact and being released is repeated from time to time in rapid succession. A strong potentiality is secured in the induced current through the length of the secondary coil and the fineness of the wire. When the binding posts of A and B, which are at the opposite ends of the coil, are brought near each other, a spark passes between them. Peculiar physiological effects are obtained by taking hold of the terminals in a small secondary coil, but the effect of a large coil is quite painful. Induction coils are used in telephones, in telegraphy, and in medical laboratories.

**INDUCTIVE METHOD.** See **Deductive Method.**

**INDULGENCE** (in-dül'jens), a partial or total remission of the temporal punishment which still remains due to sin after its guilt is forgiven, or has been remitted by penance. It is a point of doctrine in the Roman Catholic church that without indulgence the offender must undergo temporal punishment here or in purgatory. An indulgence cannot be granted for an unforgiven sin, or as a permit to sin in the future, but it can be gained only after the sin has been remitted by repentance. A partial indulgence is granted for a specified length of time, while a total indulgence is a remission of the en-



tire temporal punishment. These indulgences are never absolutely gratuitous, but can be obtained only by those who are in full communion with the church and have resorted to the sacrament of penance, which, after due contrition and confession, is alone sufficient for the remission of the penalty of sin. In the Middle Ages indulgences were granted to those who made pilgrimages, gave alms, or engaged in holy war, and later they were extended for fighting against heretics. The thesis of Luther published in 1517 were directed against the selling of indulgences. In 1563 the Council of Trent reaffirmed the belief that the church has power to grant them, but laid down the principle that indulgences are to be granted gratis.

**INDUS** (in'dūs), an important river in the northwestern part of India. It rises in Tibet, on the north side of the Himalaya Mountains, flows northwest, thence makes a bold curve and assumes a course toward the southwest. The length is 1,800 miles. It has a basin of 375,000 square miles, and the delta extends about 130 miles along the coast of the Arabian Sea. Its source is 18,000 feet above the sea, on account of which the flow is rapid in many portions of its course. The Indus is valuable as a highway of commerce and vessels enter safely by a number of the mouths of the delta. Among the tributaries are the Gartok, which enters it before it passes the Himalayas, the Shayok, the Sutley, the Chenab, and the Kabul. It is navigable to its confluence with the Kabul, about 900 miles from the sea. Many edible fish, waterfowl, and crocodiles are abundant. The valley of the Indus is famed for its fertility.

**INDUSTRIAL SCHOOL** (in-dūs'trī-əl), an institution devoted to the dissemination of knowledge in the industrial arts, such as agriculture, mining, dairying, horticulture, etc. Many institutions of this character are supported either jointly by the national and state governments, or by either of them separately. Another class of these schools is maintained as private institutions, in which these arts are combined in courses with other branches of learning. In many the instruction is coextensive to both sexes. The term is likewise extended to many reformatory institutions established under state supervision in which youthful offenders of law and vagrant children are confined for correctional purposes. They aim to teach the arts of industry along with the elements of an education. Many governments support industrial schools of this character for both sexes in different localities. The schools in which industrial and mechanical arts are taught as regular branches of study are abundant in European countries, those of Aus-

tria, Germany, Denmark, France, and Russia taking the highest rank.

**INERTIA** (in-ēr'shī-à), the incapability of matter to change its state, whether that be one of motion or of rest. From this follows the two laws: That a body at rest continues at rest forever unless acted upon by some force; and that a body in motion continues in motion forever unless some counteractive force, like that of gravity, acts upon it. The resistance which, especially at first, a body at rest gives to a force operating to move it, is called the *power of inertia*. Newton established the idea that inertia can be measured and that it is a fundamental property of matter.

**INFANT**, in law, a person who is too young to bind himself by what he says, or in a contract. In the law of England and America the term is applied to all persons who have not attained their majority, which is reached at the age of 21 years. Females reach their majority in some states and countries at the age of 18 years. In general the term minor is applied to a male who is under 21 and to a female under 18 years of age. Contracts made by infants are not binding, except for necessities essential to their life and health, and for the purpose of providing for their wants they are subject to their parents or guardians. Though infants may be punished for criminal offenses, the penalty inflicted varies somewhat in degree and kind from that imposed upon adults. The father is the natural guardian of his children until they are 21 years of age, and in case of his death or inability, in some states, this power becomes vested in the mother. An infant cannot contract marriage, except with the consent of the parents or guardians.

**INFANTRY** (in'fan-trÿ), the portion of a military system which is armed and equipped for marching and fighting on foot. It constitutes the largest organization of the military forces of all countries and comprises the most powerful branch of an army, but modern warfare has somewhat changed the importance and effective fighting force of the infantry. Formerly the infantry moved upon the enemy in the form of a solid phalanx, sometimes from ten to twelve files deep, but the rapid-fire guns of modern times throw bullets with sufficient force to penetrate several ranks, hence rapid movement and great perfection in discipline is required. The infantryman of Greece was equipped with helmet, shield, and breastplate, and the fighting was done at close range with swords, battle-axes, or javelins. At present firing usually begins at about 600 yards, but this depends upon position and the character of the arms used.



From fifteen to twenty miles per day is the average distance marched by infantry. The loss of life in the infantry is ordinarily about three times as great as that either in the cavalry or the artillery. In the Franco-German War, which may be taken as a reasonable basis, the percentage of loss in the German infantry was, 17.6; in the artillery, 6.5; and in the cavalry, 6.3.

**INFINITE** (in'fī-nīt), an unlimited or boundless quantity in space or time. The term is used in mathematics to designate a sum greater than any assignable quantity of the same kind. It is employed in music to designate certain forms, sometimes called *perpetual fugues*, which are so constructed that the performance may be incessantly repeated, their ends leading to their beginnings. The term *infinite* is used as opposed to *finite*, the former being boundless and immeasurably great, while the latter is limited in degree, capacity, or quantity. An *infinitesimal* quantity, although immeasurably small, is greater than zero.

**INFLECTION** (in-flĕk'shŭn), the term used in grammar to designate the variation of the terminations of nouns and pronouns in declension, verbs in conjugation, and adjectives and adverbs in comparison. The agglutinative languages, as the Turkish and the Hungarian, combine many of the root words, while in the highly inflectional tongues, as the German and Old English, the endings of many words are inflected. In modern English the analytic form has encroached upon the inflectional. However, many philologists have raised the question whether this marks an advance in the expression of ideas.

**INFLORESCENCE** (in-flō-rĕs'sĕns), the arrangement of flowers upon a branch or stem. When the axis in a flower cluster terminates with a flower, the inflorescence is said to be definite; otherwise it is designated as indefinite, indeterminate, centripetal, acropetal, or botryose.

**INFLUENZA** (in-flŭ-ĕn'zà), or **Grippe**, a contagious and often epidemic catarrhal inflammation of the mucous membrane of the air passages. The early symptoms are similar to those in a cold. It is accompanied by frontal headache, sleepless nights, loss of appetite, discharge from the nose, and feverishness. The affection is not usually fatal, but unless care is exercised it sometimes becomes complicated with bronchitis or pneumonia. Under good care the patient recovers in from four to eight days. In certain seasons and localities it is especially prolific in its spread, and often assumes larger proportions than any other disorder. Epidemic influenza is usually designated *la grippe*.

**INFUSORIA** (in-fŭ-sō'rĭ-à), the name of certain microscopic animals, regarded the highest or most specialized class of protozoans. Formerly the name was applied to many kinds of microscopic organisms common to organic infusions, but some of these later became known as forms of vegetable matter. They occur in both fresh and salt water. Several species are parasites on other animals, in which they are sometimes the cause of disease. They are reproduced by division, by budding, and by spore formation.

**INGERSOLL** (in'gĕr-sŭl), a town of Ontario, in Oxford County, nineteen miles northeast of London. It is located on the Thames River and the Grand Trunk Railway, and is surrounded by a productive farming country. The manufactures include cheese, machinery, woolen goods, and farming implements. It has a well-organized public school system, electric lighting, and a number of fine church buildings. Population, 1901, 4,572.

**INHERITANCE TAX** (in-hĕr'it-āns), an assessment on the property passing from a deceased person to his heirs or legatees. The Romans imposed a tax of this kind before the advent of the Christian era, and it has been the source of considerable revenue in the countries of Europe for many centuries. Since the time of Gladstone such taxes are known as *death duties* in England, and this term is applied in many of the British colonies where such assessments are made, especially in Australia and New Zealand. The United States government imposed an inheritance tax during the Civil War, but subsequently it was repealed. However, inheritance taxes are imposed by a number of the states, though in some instances they apply only where the property inherited does not pass to direct heirs. In most cases the rate is progressive, graduated on a percentage basis according to the amount inherited and the degree of relationship. Some of the states exempt the smaller estates entirely, extending the free limit in most cases from \$500 to \$5,000.

**INIA** (in'ī-à), the name of a mammal classed with the dolphin family, of which only one species is known. The body is seven to nine feet in length, and the color is usually pink mixed somewhat with black. It is found in the lakes of Peru and the Amazon and its tributaries. This animal is remarkable in that it resembles a mammal found in the Ganges, and because it is common to waters located a long distance from the sea.

**INITIATIVE** (in-īsh'ī-à-tĭv). See **Referendum**.

**INJUNCTION**, in law, an order issued by



a court to restrain one or more persons or corporations from doing some act which they threaten to commit, or to continue the prosecution of some act which is already in progress. An injunction is likewise issued to restore certain rights to a plaintiff. The Romans originated the injunction, but their process, which was somewhat different, was known as an *interdict*. Now these writs are designated as *preventive*, when they are issued to restrain, and *mandatory*, when they operate to restore rights. A *temporary* or *preliminary* injunction is issued to restrain only until the defendant may answer, after which, if good cause is shown, it may be made *perpetual*. Those who disobey an injunction are guilty of contempt of court and may be fined or imprisoned. The term *government by injunction* originated from the employment of the injunctions in restraining interested parties from interfering in strikes and other labor troubles.

**INK**, a liquid used for writing or printing, the different classes being known as writing, printing, marking, and copying inks. *Writing ink* consists either of finely divided colored precipitates held in suspension in a liquid by means of gum, or of colored liquids. The inks used by the peoples of ancient times were made with especial care to insure blackness and durability, two qualities in which they surpassed most inks of modern manufacture. Black inks contain as ingredients sulphate of iron, gum arabic, and gallotannic taken from gallnuts. Gallnuts also contain pectose, by which gallotannic acid is converted into gallic acid when it is exposed to the air. Durability and blackness in inks are secured by utilizing iron salt with an infusion of gum and gallnuts, and exposing the compound to the air for some time. The addition of carbolic acid, essential oils, crushed cloves, or corrosive sublimate prevents ink from becoming moldy.

*Copying ink* differs from the ordinary writing ink in being thicker and in drying less quickly. It is prepared by the addition of a little sugar or glycerin to ordinary black ink. *Marking ink* is made of a solution of silver nitrate colored by lampblack and thickened by gum, but some kinds are colored with sap green. *Printing ink* is much thicker than writing ink. It is made by boiling linseed oil and mixing with it lampblack or other pigments, and sometimes soap and rosin are added to give it the proper consistency. Colored inks contain various solutions of coloring matter, such as cochineal and Brazil wood for red and Prussian blue for blue. In printing ink lead chromate is used for yellow, vermilion for red, and ultramarine for blue. The ink used in lithographing is variously composed of lamp-

black, Paris black with shellac, virgin wax, dry white soap, and tallow or lard. Various kinds of *sympathetic ink* are used in secret correspondence. They leave no trace of color upon the paper, but exposure to heat causes chemical action by which the characters become legible. Substances used for that purpose include lemon juice, solutions of cobalt, and dilute sulphuric acid.

**INKERMAN** (ĩnk-ēr-mán'), a town in the government of Taurida, Russia, situated at the eastern extremity of Sebastopol harbor. It is celebrated on account of a battle that occurred on Nov. 5, 1854, between the Russian army and the allied French and English forces. The Russians led an attack early in the morning under cover of darkness, but were defeated by the allies. On the battlefield is a monument to commemorate the event.

**INNOCENTS' DAY**, a day set apart to commemorate the massacre of the children at Bethlehem, who are called the Holy Innocents and considered as the earliest martyrs in the Christian cause. It is sometimes called Childermas and Feast of Holy Innocents, and is celebrated on Dec. 28th by the Roman Catholic and Anglican churches. The Greek church observes this day on Dec. 29th.

**INNSBRUCK** (ĩns'pröök), a city in Austria, capital of Tyrol, situated on the Inn River. Its site has an elevation of 1,875 feet above sea level and near it are ranges of mountains from 7,500 to 8,600 feet high. It is well connected by several trunk railroads and electric railway lines. The manufactures include silks, machinery, woolen and cotton goods, ribbons, and gloves. It has considerable trade in merchandise, live stock, and fruits. Its important buildings include a celebrated university founded in 1677, the Franciscan Church, containing an elaborate monument to Maximilian I., a number of monasteries, and an imperial palace. The university has 98 instructors, 1,150 students, and a library of 100,000 volumes. A famous monument of Walther von der Vogelweide stands in a public place. The streets are handsomely improved, being well paved and drained, and are ornamented by many statues and beautiful parks. Population, 1906, 28,065.

**INNS OF CHANCERY**, the name of certain buildings in London, England. They were erected as places of residence and study for law students, and formerly were subordinate to the Inns of Courts. Several are still maintained as societies, but now have no public function, and are occupied mainly by solicitors. The principal buildings of this class at present are Clifford's Inn and Furnivall's.



**INNS OF COURTS**, the four sets of buildings in London, England, that belong to the legal societies in which is vested the exclusive right of admitting persons to practice at the bar. These four buildings are known as Lincoln's Inn, the Inner Temple, Gray's Inn, and the Middle Temple, and they belong to the four legal societies of the same name. They had their origin about the end of the 13th century, and as early as the Middle Ages became famous as schools of law. The members consist of students, barristers, and benchers. Each inn is self-governing under a committee or board of the benchers, who are usually senior council or king's council. This governing board is self-perpetuated. It has the right to admit to the bar, disbar from practice, and reject a candidate without stating its reasons for refusal. One of the benchers is elected annually as treasurer, and this election qualifies him to be the presiding or chief officer. The term *barrister* is applied to all those members who are at least 21 years of age, and who have been called to the bar by the benchers of the inn of which they were students.

**INOCULATION** (in-ök-ŭ-lā'shŭn), the art of communicating the virus of a particular disease to the system through the skin, or otherwise. Its purpose is to produce a mild form of some contagion and thereby protect the human body against contracting a highly dangerous form of the disease. Emanuel Timoni, a Greek physician, wrote a letter from Constantinople in 1713 favorable to inoculation, but it was not firmly established as a safeguard against smallpox until 1798, when it was introduced by Dr. Jenner. Inoculation is efficient only in diseases which attack the body but once, such as smallpox and measles. A mild form of the disease is experienced by the person artificially inoculated and this protects him against the contagion, but the disease in a dangerous form may be communicated to others.

**INQUISITION** (in-kwĭ-zĭsh'ŭn), a court or tribunal established by the sanction of the Roman Catholic Church in various countries for the purpose of examining and punishing heretics. This tribunal was suggested by Saint Dominic, but was not founded until in the pontificate of Gregory IX., when a synod at Toulouse, in 1229, resolved upon it, and it became formally established in 1233. The plan instituted carried with it the appointment of a priest and several laymen in every parish for the purpose of bringing heretics before the bishops. Soon after the power of trial was delegated to the Dominicans, and the tribunal became known as the Holy Office or the Holy Inquisition. The practice continued for several centuries, torture being applied in

some cases to extract evidence, but in 1560 the power of tribunal courts was transferred to the bishop. The Inquisition was introduced into Italy, France, and other countries, but attained the most widespread influence in Spain. In that country were large numbers of Mohammedans and Jews, who professed Christianity for the sake of shelter from persecution, but continued the practice of their religious rites and even sought converts to their respective faiths.

In 1481 the Inquisition was established at Seville under formal sanction of Ferdinand and Isabella. Two Dominicans were made the first judges. Later it extended to other towns, where it was popular among the clergy and lower orders, but was opposed by the middle classes and the nobles. Fully 2,000 persons were held by the Inquisition the first two years and burned alive. In 1571 it was introduced into Mexico and Peru. Napoleon I. suppressed it in 1808, and it was likewise abolished by the Spanish Cortes in 1813, but was reestablished in 1814 and again abolished in 1820. The decree of Napoleon in 1808 against the Inquisition abolished it in Italy, but Pius VII. restored it to Rome in 1814.

The Inquisition never became established in England. When Conrad of Marburg made an attempt, in the 13th century, to establish the Inquisition in Germany, he was assassinated, and it never gained a firm foothold there. Juan Antonio Llorante (1756-1823), a Spanish historian, estimates that the victims of the Spanish Inquisition, in the period of 481 to 1808, numbered 341,021 persons, of whom 32,000 were burned alive and 17,659 were burned in effigy. In 1848, when the dungeons of the Inquisition were opened in Rome, a powerful sentiment was created throughout Europe against the institution and the Papacy, causing the practice to decline. However, Archbishop Spalding and other creditable authorities assert that it is difficult to prove an instance of death for heresy at Rome. The Inquisition is now known as the Congregation of the Holy Office, under which the press censorship has been supervised for some time. The purpose is to suppress so-called heretical literature.

**INSANE ASYLUM** (in-sān' ä-sĭ'lŭm), an institution established for the care and treatment of the insane. The monasteries were the retreats of those who suffered with unsoundness of the mind in an early period of the Christian era, and out of these grew the bedlams, or bethlehems, formerly common to England. In many countries the insane were greatly neglected. They were imprisoned, tormented, and even executed as criminals. A more humane view was



taken as civilization advanced, and they came to be looked upon as specially unfortunate or stricken for some mortal sin by the Divine. However, asylums for the insane are strictly modern institutions, and they may be said to date from the early part of the 19th century. They are maintained chiefly as institutions belonging to the state or province, and are open to all who are adjudged insane after due examination by a competent committee or commission. In some instances the afflicted are kept at the state asylum until they are cured or until it becomes established that they are incurable, and in the latter case they may be turned over to the authorities in the county from which they were sent, when they are placed as incurable inmates in a county hospital. The treatment of the insane is conducted on a humane basis, at the expense of the state, and a large number of cures are reported every year.

**INSANITY** (in-săn'ĩ-tŷ), a general term applied to disorders of the intellect, or unsoundness of the mind. The nervous textures are primarily involved in this disease. Since the mind manifests itself by the brain, a restoration of the perverted functions of the brain by appropriate treatment of its structures is necessary to effect a cure. Many terms are employed by medical writers to designate the different phases of insanity, but the most common are idiocy, mania, dementia, melancholia, cretinism, and aberration. *Idiocy* is a congenital or an acquired defect of the mental faculties, and prevails as a total want or partial defect of the understanding. Malformation of the cranium or brain is a common origin of congenital idiocy, while a disease of the brain, mechanical injury to the brain, or excessive sensual indulgences may result in acquired idiocy. *Mania* is a form of furious insanity resulting from disorder of one or more of the faculties, and is generally accompanied by frenzy and blind impulses.

*Dementia* differs from idiocy in being curable. It is a gradual weakening of the mental powers, such as loss of memory, confusion of thoughts, weak-mindedness, and loss of volition. *Melancholia* is characterized by a depression of the spirits, brooding over mournful ideas, and grieving about a real or apparent loss. This form is brought on by failure in matters of business, love, religion, and personal ambitions, and not infrequently results in suicide. *Cretinism* is a form of idiocy and is associated with a bodily malformation. *Aberration* is a form of mental eccentricity. It is manifested in rambling thoughts and by error in perception, and is due largely to an abnormal state of the perceptive faculties.

Institutions for the care and treatment of the insane are maintained by provincial or general governments in all civilized nations. Marked strides of advancement have been made in these institutions, though insanity is apparently on the increase. It is of interest to note that the excessive use of tobacco at an immature age and the intemperate use of alcoholic drinks, opium, and morphine are prolific causes, and that during the time of financial panics the per cent. of insane cases, like suicide, are most numerous. Insanity is an excuse in law for the commission of acts which, in others would be crimes, for the reason that an insane person has no intention. It likewise deprives a person from entering into any valid contract.

**INSECTICIDE** (in-sĕk'tĩ-sĩd), a preparation used for destroying insects. The insecticides are in many cases similar to the *fungicides*, which are used for destroying fungi. Agencies to destroy insects are especially valuable in horticulture, since otherwise the plants are defoliated and the fruit is injured. Various devices and methods are employed for this purpose, but the application of poisonous substances through the spray pump or some similar device is in most common use. However, they must be applied with much care, else the person engaged in the work may become poisoned, or the application may be made at a time when the fruit itself will be injured or rendered unwholesome. The best time to spray the plants is when the insects or fungi make their first appearance. All parts of the plant should be carefully sprayed, which usually requires a ladder, especially where the application is to be made to bushes and trees. Plants should not be sprayed while they are in blossom, especially those from which the fruit is to be used.

The successful application of insecticides depends upon the insect coming in contact with the poison, or in absorbing a part of it while feeding upon the sap or leaves of the plant. A good solution for spraying consists of adding one pound of slaked lime to twenty gallons of water, to which two ounces of Paris green is added before mixing. An arsenite of lime obtained in the manufacture of aniline dyes, known as London purple, is used in the same way as Paris green, but it is somewhat more caustic on the foliage. Sucking insects can be destroyed by an emulsion of kerosene. It may be prepared by dissolving a pound of hard soap in a gallon of hot water, to which a gallon of kerosene is added and thoroughly mixed. This may be diluted by twenty gallons of water, if a strong solution is wanted, and about twice that amount may be added for a weak solution. Scale insects and



bark lice common to fruit trees may be destroyed by using a lye wash. The principal fungicides are made of sulphur, copper carbonate, and copper sulphate.

**INSECTIVORA** (in-sĕk-tiv'ō-rā), an order of placental mammals, including about 250 species, none of which is large in size. They are so named because they subsist largely on insects, although many are not exclusively insectivorous. Nearly all of the animals belonging to this order are timid and nocturnal in their habits, and they serve the useful purpose in nature of counteracting an undue increase of worms and insects. The molar teeth are fitted to break the coverings of insects, the legs are short, and most species step squarely on the soles of their feet. This order of mammals includes the mole, hedgehog, and shrew.

**INSECTS**, a group of arthropods known as the class *Insecta* or *Hexapoda*. They comprise the most numerous class of animals, of which

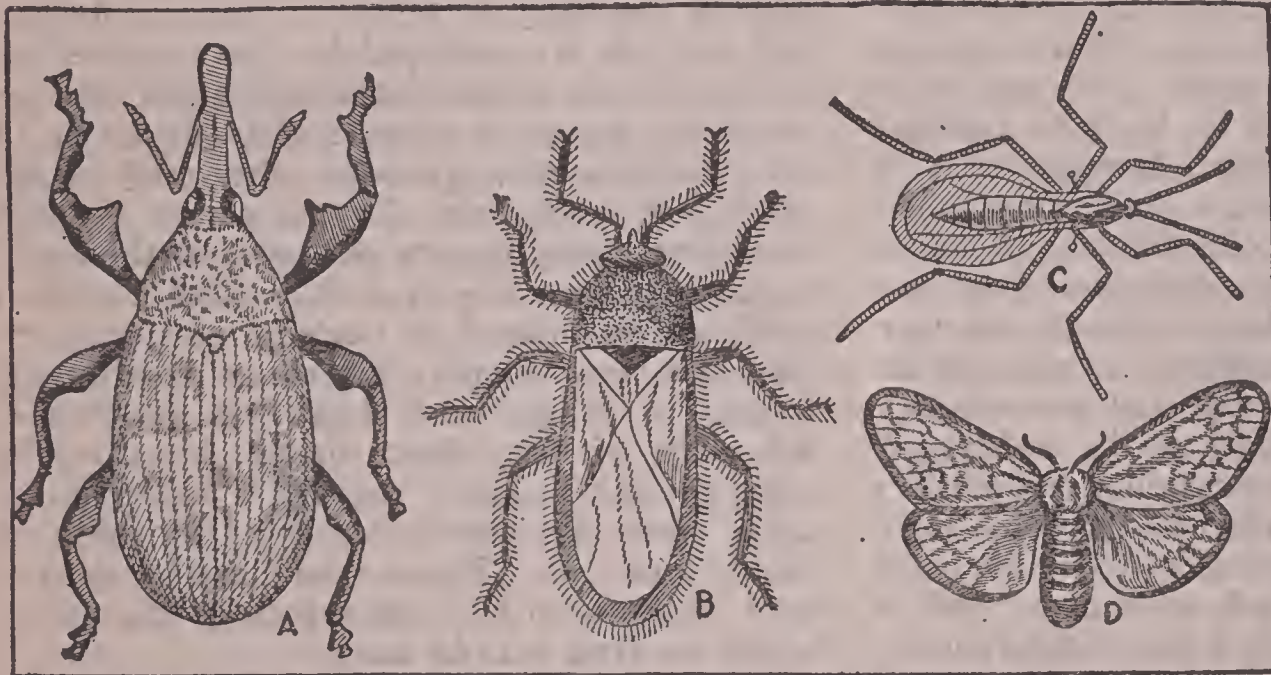
the thorax, have from six to nine joints, and are designed to move with facility, enabling the insect to walk, run, swim, and in a few cases to facilitate flight. Two pairs of wings are present in most species, though in some one or the other of the pairs may be wanting. Two antennae or feelers facilitate movement, or rather aid in guarding against danger, while the eyes are in pairs, but usually compound. The respiration is by air tubes or trachea, which extend through every part of the body.

The typical insect has thirteen segments, one of which constitutes the head, three the thorax, and nine the abdomen. The mouth is of two forms, masticatory and suctorial; the former is typified in the beetles and the latter in butterflies and mosquitoes. The organ of circulation is called the dorsal vessel and consists of a contractile organism with circulatory functions. The alimentary canal is constituted of a gullet, crop, gizzard, stomach, and intestine, and terminates in

a cloaca. A series of ganglia make up the nervous system. Most insects are oviparous, the sexes are in different individuals, and the reproduction is sexual, but in some species nonsexual reproduction occurs.

Most species of insects have a more or less horny skin, and all pass through three stages of development. These phases of life include that of caterpillar, larva, or grub; that of the chrysalis or pupa;

and that of the perfect winged insect or imago. The life of an insect depends somewhat upon climate and season, though the larval state is of longest duration, and that of the perfect insect is the shortest. Some species die immediately after laying their eggs, others live the remainder of the season, and some endure a number of years, as in the case of the queen bee, whose life sometimes extends to a period of five years. Most insects have ample means of protection, though this exists principally in their ability to fly rapidly, and some protect themselves by defensive organs, as in the case of hornets and bees. It is thought that there are fully a half million species of insects, but about 200,000 are known, and these are more or less confined to particular regions. Thus,



A, Cotton Boll Weevil; B, Chinch Bug; C, Hessian Fly; D, Cotton Boll Moth.

the typical species have their bodies divided into three parts—the head, the thorax, and the abdomen. Formerly centipedes and spiders, and some other animal forms, were enumerated with the insects, but now only animals having three pairs of legs are classed as insects. However, a perfect classification has not been established. Linnaeus classified the insects into the seven groups known as the *Coleoptera*, or the beetles; the *Diptera*, or the two-winged insects; the *Hymenoptera*, or gauze-winged insects; the *Lepidoptera*, or the moths and butterflies; the *Hemiptera*, or stinging and sucking insects; the *Orthoptera*, such as the grasshoppers and cockroaches; and the *Neuroptera*, or those having membranous wings and mouth organs fitted for chewing. The legs of insects are all affixed to



the insects of China differ from those of Europe, and those of North America are noticeably different from the species which are common to other grand divisions. However, some of the species are widely diffused, of which the painted lady butterfly is a noted example.

Many species of insects are cumbersome pests to man. Some display great hostility and almost constitute a barrier to his success in some portions of the earth, yet they are a very necessary and useful part of nature. Among the helpful purposes they serve are that they fertilize plants, furnish food for birds, beasts, and reptiles, and consume much of the decaying matters that would otherwise render the climate of some regions extremely unhealthful. They pervade nature everywhere. Some burrow in the ground, bore in trees, live under and above water, or thrive on and in plants. Many species subsist in other insects or larger forms of life as parasitic animal forms.

Among the most useful insects is the bee, which furnishes honey and in some countries produces beebread for the support of human life. Silkworms yield material for clothing, and their culture is a vast industry in many countries. The common wood ant is used extensively in Europe for the manufacture of vinegar, and in France as a valuable material in producing flavoring. In some countries the locusts, though destructive to vegetation, constitute a valuable food for man and animals. The cochineal insects supply a valuable coloring matter, while even the grub is a useful article of food in the West Indies. The bee furnishes wax, the blister beetle supplies useful irritant juices, and others serve like economic purposes.

Among the insects which are most injurious to man may be named the Hessian fly, potato bug, chinch bug, army worm, cotton boll weevil, cotton boll moth, and grasshopper, all of which attack growing crops. The moths, lice, fleas, bedbugs, mosquitoes, flies, ants, and others invade the home, if proper precaution is not taken. Though generally pestiferous, the mosquito is a source of much good in that it is utilized in Central Africa for the manufacture of a form of cakes and serves a wise purpose in devouring decaying substances. While insects inhabit practically all parts of the world, they are much more abundant in tropical climates, where they live longer and attain to larger forms than in the colder zones. Among the noted persons who have written extensively on insects and made valuable discoveries are Aristotle, Humboldt, Linnaeus, Cuvier, Marcello Malpighi (1628-1694), Haeckel, and Pasteur. In America, as

in Europe, many experimental stations are maintained in connection with colleges of agriculture for the purpose of investigating the uses of insects and the agencies that operate to destroy them. Besides, it is aimed to discover new species which are still unknown in their ravages, such as the minute forms in France which for years destroyed the grape industry. However, these and many others have been successfully counteracted by the application of destructive agencies. Among the substances used against insect pests are Paris green, London purple, sulphur, hellebore, kerosene, soaps, tobacco, lime, naphthalene, and arsenate of lead.

**INSESSORES** (in-sēs-sō'rēz), a name applied by many writers to a large order of birds, which includes the perchers. The order embraces all those that live habitually among trees, excluding only the climbing birds and the birds of prey. Their feet are adapted to walking and perching. They possess much contriving ingenuity in building their nests. The order of insectivores embraces all the more noted and beautiful birds of song.

**INSOMNIA** (in-sōm'nī-à), or **Sleeplessness**, a condition due to some emotional disorder, such as exhaustion, worry, or excitement. It is treated by removing the cause, if it can be ascertained, and by applying hygienic measures. Although in practice it is customary to resort to drugs, ventilation, careful dieting, massage, and hot baths are the best curative agents.

**INSPIRATION** (in-spī-rā'shūn), in theology, the influence exercised upon the human mind by the Holy Spirit, through the influence of which the understanding is widened and all the mental faculties are quickened. It is in this sense that the term inspiration is used in regard to the Scriptures, which are held to be the writings of men who were inspired by the divine mind to reveal and communicate to man what is essential for his salvation. However, the degree and extent as well as the mode of inspiration are subjects of dispute.

**INSTINCT** (in'stīnkt), a natural impulse by which animals are directed without reasoning toward the actions that are essential to their existence, preservation, and development. The theories advanced regarding animal instinct include at least three. These are that each species is endowed by the Creator with various faculties and impulses; that the instincts have resulted from consecutive repetition, and these have been transmitted by inheritance to subsequent generations; and that they arise from unknown causes, though the more complex are modified through natural selection and the simpler actions



of an instinctive nature. In some animal forms the instincts are developed to a high state of perfection, as is the case in bees, by which they are enabled to construct cells with a perfection that would tax quite highly the reasoning powers of man, and he would be able to secure equal results only by the application of the higher mathematics. Darwin thought that animals in the past as now have varied in mental qualities, and that those variations are inherited. He likewise thought that by natural selection the instincts of many animals have been developed to a higher degree.

**INSTITUTE** (in'stī-tūt), a scientific body or society established under certain rules for the promotion of some particular object, as a literary or philosophical association. The term is applied in France to the principal society of its kind in the world, which was formed in 1795 by the union of the four principal royal academies—the Académie des Belles-Lettres et Inscription, Académie Française, Académie Royale des Sciences, and Académie Royale d'Architecture. Since 1848 it has been known officially as the Institut National de France, but English writers usually term it the Institute of France. At present this great institution embraces five distinct divisions, each of which represents a particular field of knowledge. The divisions are Académie Française, Académie des Beaux-Arts, Académie des Sciences, Académie des Inscriptions et Belles-Lettres, and Académie des Sciences Morales et Politiques. In each division is a distinct organization, but all are closely affiliated, and the control of the finances of each academy is under a distinct board. Membership is for life, with a salary of 1,500 francs. To become a member of this celebrated organization is a worthy ambition of every Frenchman of educational advancement.

**INSTITUTIONAL CHURCH** (in-stī-tū'-shūn-əl), the name given to a form of organization in a church or society to distinguish it from the so-called ritualistic church. In the former it is made an objective point to secure the general development of the individual, a line of training that involves mental, physical, and moral elevation through personal activity, while in the ritualistic church the belief, sacraments, and forms of worship are emphasized. The movement to demand activity and apparent results in the improvement of both the outward and inward life of the members has gained much ground in England and America since 1840. Though the new function originated about 1840, it may be said that a recognized movement did not begin until fifty years later, and an impetus was added by the extension of university

settlements, evangelistic efforts, and the Salvation Army, and through these agencies many were reached that could scarcely be brought into contact with Christian influences by the use of other recognized lines of church work. Besides calling upon the members for personal work along religious lines, the institutional church required activity in social, educational, and physical effort. To promote these lines extensively, it is made an objective point to establish libraries, gymnasiums, employment bureaus, hospitals, night and day classes, and lecture courses, in all of which the Christian work is made an important feature. In 1894 the Open and Institutional Church League was organized in New York City. It is supported by a number of prominent so-called institutional churches, including the Berkeley Temple, Boston; People's Palace, Jersey City; Pilgrim Church, Cleveland; People's Church, Saint Paul; Plymouth Church, Indianapolis; Judson Memorial, New York; the Tabernacle, Denver; All Souls' Church, Chicago; and People's College, Detroit.

**INSTRUMENTAL MUSIC** (in-strū-iněn'-təl), the music which is produced by instruments, as distinguished from singing or vocal music. Purely instrumental music was known in ancient Greece, and it is said that the flute was played publicly at the Pythian games. However, the art of arranging the part of a composition for the orchestra, which is known as *instrumentation*, is of comparatively recent origin. Johann Sebastian Bach is properly regarded the originator of modern instrumentation, and his masterpieces are unrivaled even at the present time. Proficiency in instrumentation, which is also called *orchestration*, requires a thorough knowledge of music and of musical instruments, since some instruments sound chords in a manner to produce exquisite harmony, which, when sounded by others, result in discordant strains. Beethoven, Haydn, Mozart, Schubert, Wagner, and Weber are among the celebrated masters of orchestration.

**INSULATOR** (in'stū-lā-tēr), a body or substance which offers great resistance to the passage of electricity. A body that carries the charge readily is called a *conductor*, while one which carries it with difficulty is termed an *insulator*. Wire is a good example of the former, though it is not an absolute conductor, since there are no substances that act as perfect conductors or insulators. Among the more notable insulating materials are glass, paper, silk, shellac, gutta-percha, and dry wood. Both temperature and moisture have a decided effect upon the conductivity of bodies. Dry air is an insulator, while moist air is a conductor. Porcelain and



glass cones are used as insulators at points where telegraph and telephone wires are supported on posts or brackets. Wires carrying currents for electric lights usually pass through porcelain cones adjusted in the woodwork of buildings, thus furnishing insulation as protection against electric sparks that may result through a short circuit, or otherwise, in case the covering of the wire becomes impaired.

**INSURANCE** (in-shur'ans), a system by which a company, in consideration of a sum of money paid, becomes bound to indemnify the insured or his representatives against losses by accident, fire, or storm, or, in case of life insurance, to pay a certain amount in the event of death. The different classes of insurance now recognized include principally fire and lightning insurance, life insurance, accident insurance, marine insurance, and insurance against cyclones and tornadoes. Among the earliest instances of insurance is the one connected with the Second Punic War against the Romans. The first systematic insurance mentioned in modern times is that of Barcelona, where the magistrates issued ordinances, in 1435, relating to this class of business, though special instances of insurance by potentates in cases of marine commerce and losses in agriculture by storms are mentioned much earlier. In the reign of Elizabeth, in 1601, the English statutes first recognized insurance, but in continental Europe it was systematized and legalized some earlier. *Marine insurance* is the oldest form, and was instituted for the encouragement of commercial relations with other countries among many of the governments of the Middle Ages.

At present insurance has assumed vast proportions and represents a large volume of accumulated capital. It has become greatly diversified, each class of insurance being subdivided into many departments and covering greatly diversified classes of risks on life and property. Some of the most beautiful and costly buildings in the world are owned by insurance companies as an investment, and they likewise hold large interests in government and railroad bonds, canal securities, stocks, farm and city loans, and mining stocks and bonds. In the insurance business two distinct classes are recognized, mutual and stock companies. The mutual insurance companies are the newer and represent organizations in which the individual insured participates in all the profits of the company and contributes directly in case of losses, while in stock companies individuals are insured for a definite amount and receive definite payments in case of loss. Besides these classes are fraternal insurance companies, in which the fra-

ternal and insurance features are combined in a society or in an association. In this class and several others the assured is assessed each month to cover the losses by deaths. Mutual companies are maintained to a considerable extent among farmers and other classes, in which they insure each other against property losses by fire, lightning, or storms.

Life insurance is based upon the experience of different companies, on which they assume risks and calculate their sources of profit and loss. Below is a synopsis of an insurance table, in which is shown the experience of thirty life insurance companies:

AGE, YEARS.	DEATHS PER 1,000	LIFE EXPECTATION IN YEARS.	AGE AT PROBABLE DEATH IN YEARS.
20.....	7.29	41.49	61.49
30.....	8.43	34.43	64.34
40.....	10.36	27.28	67.28
50.....	15.94	20.18	70.18
60.....	30.34	13.77	73.77
70.....	64.93	8.54	78.54
80.....	140.41	4.78	84.78
90.....	323.73	2.11	92.11
99.....	1,000.00	.50	99.50

A number of terms are used in the insurance business, these being recognized both in law and contracts as more or less clearly implying certain parties or facts. Among them are the terms *underwriter* or *insurer*, meaning the party taking the risk. The *assured* or *insured* is the party who is promised compensation in case of loss. The *premium* is the amount paid for insurance, the *policy* is the written contract, the *risks* or *perils* constitute the events insured against, and the *insurable interest* is the interest, subject, or right to be protected. The laws of all the civilized countries have been constructed with a view of bearing upon the insurance interests and protecting the assured against fraud or loss by unsound companies. In all companies the premium paid is governed by the nature of the risk taken. Property which is exposed to unusual danger requires the payment of a higher premium, while the age and class of individuals influence largely the premium in life insurance companies. Although the adjustment of these matters is left largely to individual companies, they are under legal supervision, and adequate security to the insured is explicitly demanded under all circumstances.

The enormous business done by life insurance companies of the United States has had more or less attention the past decade. Twenty-five leading companies wrote \$1,250,000,000 of new insurance in 1908, and the new policies of these companies for the last three years were \$3,500,-



000,000, which is a billion more than all insurance in force in the country twenty years ago. To obtain the business in 1908 premiums amounting to about \$50,000,000 were paid. Fully \$32,000,000 of the premiums went for commissions to solicitors and \$11,000,000 was paid for establishing agencies and for advertising. Nearly half of all the insurance in the country is carried by three companies in New York City—the Equitable, the Mutual Life, and the New York Life. In 1908 a total of 6,050,000 life insurance policies were in force, and the total amount insured was \$12,235,000,000, or a little more than \$2,000 to the policy. These figures do not include industrial life insurance, which is about twice as large as ordinary life.

**INTELLECT** (in'tel-lĕkt), the power or faculty of the human soul by which it knows. It is sometimes defined as the soul acting. Ideas are communicated to us by the senses or by other means. Through the intellect the soul becomes able to perceive objects in their relations, upon which depends its power of judging, reasoning, and comprehending. It is distinguished from the other two powers of the soul; namely, the power to feel and the power to will.

**INTEREST** (in'tēr-ĕst), an allowance or premium for the use or detention of money. The profit paid on borrowed money is called *interest*, the money on which interest is paid is termed the *principal*, and the interest and principal taken together constitute the *sum* or *amount*. Interest is either simple or compound. *Simple interest* is computed at a certain rate for the whole time on the loan. *Compound interest* arises when the simple interest is not paid when due. To illustrate: \$100 at six per cent. for one year amounts to \$106. For the second year the principal is \$106, the interest is \$6.36, and the amount is \$112.36. The rate of interest depends upon various conditions, among them the amount of money in circulation in a given country or state, the demand for money, the amount offered for investment, and the nature of the security offered, or the personal liability of the borrower. The *legal rate* of interest is a rate allowed by law, and any excess charged is termed *usury*. In some states a rate higher than the legal rate may be provided by contract, as in Iowa, where the legal rate is six per cent., but by contract eight per cent. may be stipulated. Contracts providing more than the rate of interest allowed by law are void and not collectible.

**INTEREST**, in mental science, the excitement of feeling, either pleasant or painful, which accompanies special attention to some object. It

involves a more or less conscious recognition of some relation to self, and is essential to the best success of any mental effort. To awaken interest in worthy things, as in the subjects of instruction, is an indispensable condition to the true success of the teacher. Primarily the young pupil feels no interest in the school studies, since the immature mind is unable to appreciate their importance and has no desire to acquire a knowledge of the subjects of which they treat. But the skillful teacher is able to stimulate curiosity and impress upon the mind of the pupil the idea that he is acquiring knowledge, and thus to awaken an interest in the process of instruction. It is easy to sustain the interest when these processes are appropriate and natural, and a lack of interest is usually due either to previous defective teaching or to the endeavor to teach subjects for which the mind of the pupil is not prepared. Psychologically the mind has as much appetite for knowledge of the right kind as the body has physically for proper food. Hence, the teacher needs to study to determine the character of mental food proper for every age, so as to supply the kind that will stimulate and satisfy the mental appetite.

**INTERIOR** (in-tĕ'rĭ-ĕr), Department of the. See **United States, Departments of the.**

**INTERLAKEN** (in-tĕr-lă'kĕn), meaning between the lakes, a village of Switzerland, situated in the valley of the Aar, between lakes Brienz and Thun. It was founded by Augustine monks in 1130, and is noted as a favorite health and pleasure resort. About 35,000 tourists visit the place annually. It has an old monastery which was founded in 1130, in which both Protestant and Catholic services are held during the season. The railroad connections are convenient, making it possible for tourists to visit many points of historical interest and witness the most celebrated glaciers and other noted natural sceneries within its vicinity. Population, 1908, 3,041.

**INTERMEZZO** (ĕn-tĕr-mĕd'zō), an interlude inserted between two main parts of instrumental works, such as a drama or an opera. The name is sometimes applied to the entire production, intended to be played independently or between two more extensive pieces. Originally the intermezzos were short musical interludes designed to be performed between the acts of a tragedy. In the 17th century they treated largely of mythological subjects or were comic, and these were performed between two serious acts.

**INTERNATIONAL DATE LINE** (in-tĕr-năsh'ün-əl), a line drawn arbitrarily near the 180° meridian of longitude, in the Pacific Ocean,



This line is located quite closely to the 180° meridian of longitude from the South Pacific to the Bering Sea, whence it passes through Bering Strait. It designates the place where a navigator on a trans-Pacific voyage changes his date of reckoning time. The use of the word international in connection with this date line is sanctioned only by practice, as the principal nations have not created a joint commission to locate such a line definitely, but the term has come into general use and the meridian designated is quite generally accepted by navigators. That the 180° meridian has been chosen is based upon the fact that it is located exactly twelve hours from Greenwich, though this is not essential or material, as any point could have been chosen by agreement or established by practice. However, the fact that it is located near the middle of the Pacific Ocean, a great distance from civilization and populous countries, is a practical reason for choosing this locality, and no doubt this fact offers the best argument in its favor.

The explanation for having a date line is founded on the fact that a person traveling west or east lengthens or shortens his day one hour for every 15° traveled, since he moves with the sun in traveling west and in the opposite direction from the sun in traveling east. In moving eastward, a traveler shortens each day four minutes for every terrestrial degree he travels, and when having gone entirely around the earth he will have gained one day. To him the first of the month is the second, and according to his reckoning Sunday is Monday. On the other hand, a traveler who moves westward lengthens each day four minutes for every terrestrial degree traveled, and if he passes entirely around the earth he will have lost one day when he returns to the point from which he started. To him the second of the month is the first, and Monday to him is Sunday. If two persons were to start from the same place and travel around the earth in opposite directions, they would differ from each other two days in their reckoning, when they met in the place from which they started. The reason for having a date line is clear from this explanation, else it would be impossible to reckon days correctly, and travelers would differ in their time from that kept by people located at considerable distances east or west from the starting point.

**INTERNATIONAL LAW**, the term applied to what was formerly called the law of nations. It comprises the rules and established doctrines that govern states and nations in their conduct toward one another, and defines the relations of citizens of different countries in

their social and commercial affairs. The system was created by modern nations and is recognized by the civilized peoples of the world. New rules are introduced by war and by treaties of peace. Among the more important matters provided for by international law is the equal and common right to sail upon the high seas, where all nations have equal authority to enforce their own laws and the established laws of nations. The domains of other nations cannot be interfered with, and, if a fugitive from justice escapes into a foreign state, the nation from which he escaped has no right to enter the foreign country for his arrest, but may request that he be surrendered.

The commercial relations of different countries may be regulated by treaty without the interference of other nations, for which purpose all nations may send and receive public ministers or delegations, and their persons and property must be protected properly. Any visiting foreigner is required to obey the laws of the country in which he sojourns, and is entitled to the same treatment as the natives. In making treaties ministers usually treat with each other or with duly qualified representatives, but the compacts formed are not deemed binding and formal until they have been ratified by the respective governments. Liberties are granted to all nations alike for the purpose of extending their navigation, improving commercial and agricultural industries, developing national resources, making exploring expeditions, and establishing trade relations. In the time of war the property of the different nations involved, as well as of the persons engaged in unfriendly acts, are subject to capture anywhere, and neutral nations are bound to maintain impartiality as between the contending countries. Besides, neutral nations are understood to prevent every interference on the part of their subjects in the matter of aiding the hostile country or in any manner giving aid or support to the enemy.

**INTERNATIONAL PEACE CONFERENCE**, a conference held in The Hague, in the Netherlands, from May 18 to July 29, 1899. It was convened at the suggestion of the Czar of Russia, who advanced an invitation to the principal nations of the world to participate in a conference with the view of securing a gradual reduction of the naval and military armaments. Twenty-six countries of the world participated, and the total delegates in attendance numbered 101. The principal work of the conference consisted of adopting a perfected code of the rules of war, recommending the larger use of balloons in warfare, and recom-



mending that the question of the rights of neutrals and private property be considered by future conventions.

**INTERSTATE COMMERCE**, the name applied to the trade among the several states of the United States. Though considerable commerce was carried among the states at an early period in history, its rapid development properly began with the construction of railroads. In 1887 Congress passed an act known as the Interstate Commerce Act, intended to regulate trade between the states. Previous to the enactment of this law all common carriers, either by rail or water, were permitted to discriminate against individuals or localities in granting rates and providing facilities to carry freights. It was charged that the railroad showed favoritism to certain shippers, and that they granted favorable rates under certain conditions, and, on the other hand, frequently made them exorbitant and oppressive. By the Interstate Commerce Act all this was prohibited, and the transportation companies were barred from concealing the rates charged, from changing rates without due notice, and from pooling the traffic and dividing the profits. This act created a commission of five members, known as the Interstate Commerce Commission, with power to investigate alleged violations of the act and to require reports from carriers in regard to their operations. An important amendment was enacted in 1906, by which the commission became empowered to fix the rates to be charged and to set aside those found to be unreasonable. The operation of the law has been to protect the small shippers against the destructive competition of the larger ones. It has tended toward benefiting smaller communities or cities, in that it operated to cause the rates to be less advantageous to the larger distributing points.

**INTESTINES** (in-tēs'tīnz), the portion of the digestive organ situated below the stomach. It is commonly divided into the small and large intestines. The former has an average length of about 23 feet and includes the duodenum, jejunum, and ileum, while the latter, which extends nearly around the small intestine, includes the caecum, colon, and rectum. The *small intestine* extends from the pylorus of the stomach to a valvelike opening at the entrance of the large intestine, near the right groin. It is from one to one and a half inches in diameter. The first ten inches, known as the duodenum, receives the inflow from the ducts of the pancreas and liver. The upper two-fifths of the remainder constitutes the jejunum, and the lower three-fifths forms the ileum. On the interior

are many transverse projections and an immense number of minute threadlike processes called *villi*. These villi stand up and resemble the pile of velvet when immersed in water. Each villus contains a lacteal, a vein, and an artery. Food in the stomach moves forward through *peristaltic action*, which consists of slow and successive contractions of the muscular fibers within the tube.

The *large intestine* is from five to six feet long, from one to two and a half inches wide, and is greatly wrinkled and sacculated. Only a few glands occur in the depression of its mucous membrane, which is smooth and contains no villi. Between the small intestine and the colon is a valve of two segments, which prevents the contents of the colon from returning to the small intestines. Projecting from the lower end of the first part of the colon is a narrow, tapering tube known as the *vermiform appendix*. In this round objects sometimes stop, such as cherry stones, causing pain or inflammation.

**INTOXICATION** (in-tōks-ĭ-kā'shŭn), the state produced in the system by the excessive use of a stimulant, such as opium, chloral, belladonna, and alcoholic liquids. The intoxication is acute when a considerable quantity of poisonous substances are taken at once, especially by a person not accustomed to its use. In the first stage of slight intoxication the blood circulates quite rapidly and the nervous and mental processes are stimulated. This state of excitement is soon followed by the second stage, in which the baser traits are manifested and the sense of propriety is lost. In the third stage an intoxicated person suffers from dizziness, stupor, double vision, and greatly weakened consciousness, and in some cases by fits of delirium. Delirium tremens often results from habitual intoxication and sometimes it causes alcoholic insanity. The excessive use of liquor frequently induces vomiting, especially in those not accustomed to it. A cathartic, an emetic, or a Turkish bath may relieve a person when becoming drowsy from intoxication, and in extreme cases a stomach pump may be employed.

**INTUITION** (in-tŭ-ĭsh'ŭn), the power of the mind by which we obtain ideas and truths not derived through the special senses, nor by an elaboration of the understanding. The products of intuition are termed *primary ideas*, and include those of space, time, cause, identity, being, right, and personal identity. Primary ideas, or primary truths, as they are sometimes called, are all self-evident, as the axioms of logic and mathematics. The ideas derived through the intuitive power spring up immediately in the mind



upon the presentation of the proper occasion. They are not the product of sensation or perception, but arise spontaneously. Some writers associate intuition with the instinct. Kant speaks of the intuitive power as the reason, a term quite appropriate, since it appears to be the element of the mind that gives to it a condition of rationality.

**INVERNESS** (in-vēr-nēs'), a town in Scotland, capital of Inverness-shire, on the Ness River, 105 miles northwest of Aberdeen. It is located near the Moray Firth, on the Caledonian Canal, and has railway transportation facilities. The chief buildings include the county hall, the cathedral, an insane asylum, and the Royal Academy. Among the manufactures are leather, cordage, spirituous liquors, woolen goods, ironware, and sailing vessels. It has considerable trade, gas and electric lighting, and substantially paved streets. Inverness was the capital of the Picts. It was destroyed by Charles Stuart in 1746. Population, 1906, 22,103.

**INVERTEBRATA** (in-vēr-tē-brā'tā), a subdivision of the animal kingdom. It includes the animals which have no vertebral column or backbone, and are distinguished from the higher group that possess a vertebral column, the latter being known as *vertebrata*. In the invertebrate animals nothing resembling a cartilaginous spinal column is found, and the more solid portions of the body are on the outside, thus constituting a protective shell, as in the case of the oyster, lobster, and clam. Naturalists now recognize five different divisions of the invertebrate animals: the mollusca, protozoa, annulosa, coelenterata, and echinozoa or annuloida.

**INVOLUTION AND EVOLUTION** (in-vō-lū'shūn, ěv-ō-lū'shūn), in mathematics, two operations which are converse to each other. The object of *involution* is to raise a number to any power, which is done by multiplying the number by itself, as  $2 \times 2 \times 2 = 8$ . Thus, the third power of two is eight. On the other hand, *evolution* is the extraction of a root of any number; that is, by means of it we may find what number, when raised to a certain power, gives the known number. For instance, 64 is the power of some number, and by evolution we find that eight is the square root; thus eight multiplied by eight equals 64.

**IODINE** (i'ō-dīn), a bluish-black non-metallic elementary crystalline substance. When heated it yields fumes of a rich violet hue. Iodine belongs to the halogen group of elements, similar to bromine and chlorine. It is obtained principally from the ash of seaweeds called *kelp*, but occurs likewise in oceanic waters and mineral springs. Iodine is found more or less

abundantly in marine molluscos animals, in cod-liver oil, and in certain plants common to the land. The lead, silver, and zinc ores of Mexico and Chile contain this product. It is employed in medicine and photography. In medicine it is used either in the pure state or as iodide potassium, and is useful in the treatment of scrofula, rheumatism, spleen and liver diseases, and many maladies as an agency to kill parasites. It is used in photography to prepare aniline colors and for other purposes. In the treatment of glandular affections, chlorosis, scrofula, and other diseases iodide of iron is a valuable remedy.

**IODIFORM** (i-ōd'ō-fōrm), a compound of iodine, carbon, and hydrogen. It is similar to chloroform, but differs from the latter in that the chlorine is replaced with iodine. Iodoform is a yellow crystalline substance with a penetrating odor and a sweetish taste. In water it is nearly insoluble, but it may be dissolved readily in ether or alcohol. It is valuable as a medicine, both as an antiseptic and an anaesthetic. Being a solid, it is not employed as a general anaesthetic by inhalation, but is used as a local application to relieve pain, as in sores and ulcers. It is employed for cold in the head in the form of a snuff, but its disagreeable odor makes it difficult to use in this way.

**IOLA** (i-ō'lā), a city in Kansas, county seat of Allen County, on the Neosho River, 37 miles west of Fort Scott. It is on the Missouri Pacific, the Missouri, Kansas and Texas, and the Atchison, Topeka and Santa Fé railroads, and is surrounded by a farming and natural gas producing country. The noteworthy buildings include the county courthouse, the high school, and a number of churches. It has manufactures of ironware, brick, cement, clothing, cigars, and machinery. Electric and gas lighting, waterworks, and pavements are among the public utilities. Iola was settled in 1857 and was chartered as a city in 1898. Its prosperity is due largely to the abundance of natural gas in the vicinity and to its extensive smelters and rolling mills. Population, 1910, 9,032.

**IONA** (ē-ō'nā), the modern name applied to the most celebrated island of the Hebrides, an island group lying northwest of Scotland. The length is three and a half miles; breadth, one and a half miles; and area, 2,265 acres. It has a history beginning in 563, when Saint Columba landed with twelve disciples and built a monastery. The soil is exceedingly fertile and from early times yielded extensively. Potatoes, barley, and oats are the chief products. The monastery established by Saint Columba was the first church of the Picts. It has furnished many



interesting pages in the development of the Catholic faith in the British Isles.

**IONIA** (î-ō'nî-à), the name applied anciently to the most flourishing country of the Ionian Greeks in Asia Minor. According to tradition it was so named from Ion, one of the five Greek tragic poets, reputed a son of Apollo. The Ionian Greeks settled in Asia Minor about 1050 B. C., when they were driven from the Peloponnesus by the Achaians. They built twelve towns of much importance, including Ephesus, Miletus, Smyrna, and Colophon, which formed the basis the Ionian League. All the cities of Ionia were captured by Croesus, King of Lydia. In 557 B. C. the region became a possession of Cyrus, King of Persia, but it was acquired in 331 B. C. by the Greeks under Alexander the Great. In the year 64 B. C. the entire region was added to the Roman Empire by Pompey, and subsequently the Turks devastated and destroyed most of the evidences of early civilization, as the temples and amphitheatres. The Ionic dialect was commonly spoken by the people of Ionia, and was noted for its smoothness on account of containing a large number of vowel sounds.

**IONIA**, county seat of Ionia County, Michigan, on the Grand River, 33 miles east of Grand Rapids. It is on the Grand Trunk and the Pèrè Marquette railroads. The surrounding country is agricultural. Among the chief buildings are the high school, the county courthouse, the State Asylum for Insane, and the State House of Correction. It has manufactures of clothing, farm machinery, earthenware, and lumber products. Ionia was settled in about 1832 and was incorporated in 1873. Population, 1910, 5,030.

**IONIAN ISLANDS**, a chain of about forty islands stretching along the southwestern coast of Greece, of which Cephalonia, Corfu, Zante, Ithaca, Paxos, and Santa Maura are the most important. The total area is 1,117 square miles. Much of the surface is mountainous, but the valleys and many of the slopes are fertile. Disturbances by earthquakes have been numerous, but they have not been very destructive. Most of the inhabitants are of Greek descent. They engage in agriculture, fruit growing, and manufacturing. Among the exports are fruits, oil, salt, wine, soap, textile fabrics, and ornamental articles. The Venetians ceded the islands to France in 1797, but they were seized by Russia and Turkey two years later, and by the Treaty of Tilsit were restored to France in 1807. Later they became the scene of various political disturbances, but in 1863 were made a part of Greece, to which country they have belonged since. Population, 1908, 267,095.

**IONIAN SEA**, the name applied since an-

cient times to the portion of the Mediterranean which lies between Greece and Italy. It is connected by the Strait of Otranto with the Adriatic. The Gulf of Taranto, on the coast of Italy, is an extension toward the west. It contains the Ionian Islands, which lie near the shore of Greece. An extensive navigation and coastwise trade is carried on in this part of the Mediterranean.

**IONIC ORDER** (î-ōn'îk), a style of Grecian architecture that originated in Ionia, and which is distinguished particularly by the capital of the columns. It derived several features from Assyria and entered largely into many celebrated temples erected in Greece and Asia Minor. The best examples still existing include the Acropolis at Athens, the Temple of Minerva Polais, and the Temple of Fortuna at Rome. A modified form of this order is known as the Roman-Ionic, of which the last named temple is a representative. See **Column**.

**IOWA** (î'ō-wà), a west central state of the United States, popularly called the *Hawkeye State*, situated between the Mississippi and Missouri rivers. It is bounded on the north by Minnesota, east by Wisconsin and Illinois, south by Missouri, and west by Nebraska and South Dakota. Its length from east to west is about 300 miles, its breadth from north to south is 200 miles, and the area is 56,025 square miles. The eastern boundary is formed by the Mississippi River and the western by the Big Sioux and the Missouri rivers.

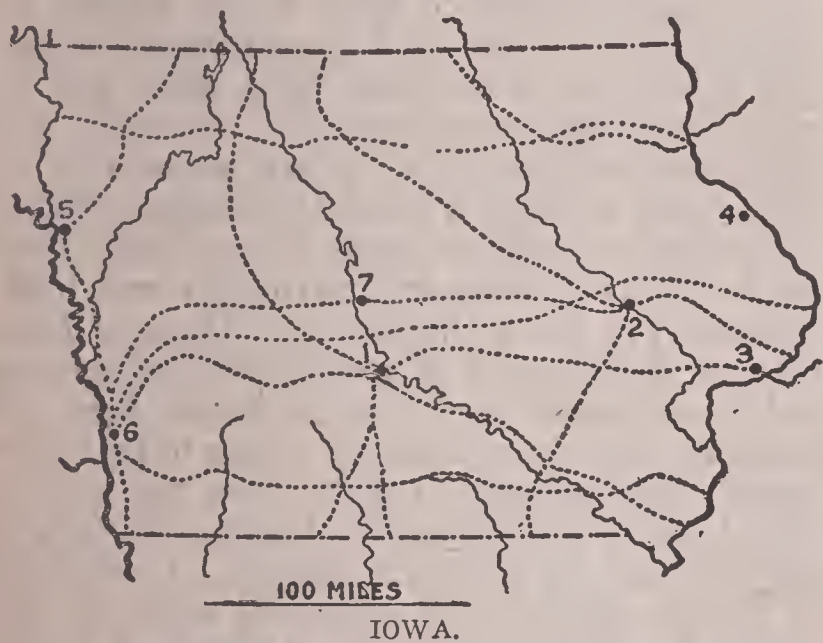
**DESCRIPTION.** The surface is an undulating plain, watered by numerous streams. It has an average elevation of about 900 feet and has no mountains. The lowest point of the State is at the junction of the Des Moines and Mississippi rivers, which is 445 feet above the sea, while the most elevated point is in Dickinson County, near Spirit Lake, where the elevation is 1,690 feet. Along the Mississippi and Missouri rivers are bluffs ranging from 200 to 400 feet above the valleys, which are from one to twelve miles in width. The northern half of the State is more nearly level than the southern half, and along some of the interior rivers, especially the Des Moines, are rugged hills and rocky canyons.

The drainage of the greater part of the State is into the Mississippi, but the western and southern portions are drained into the Missouri. The divide between the two systems runs from southeast to northwest, about two-thirds being drained toward the southeast into the Mississippi. A greater part of the central portion of the State is drained by the Des Moines, which rises in Minnesota, flows in a general direction



toward the southeast, and discharges into the Mississippi at Keokuk. The Boone and Racoon are its principal tributaries. Other rivers flowing into the Mississippi include the Turkey, Red Cedar, Iowa, Skunk, and Wapsipinicon. The Big Sioux, Little Sioux, Soldier, and Nishnabotna flow into the Missouri. A number of streams which discharge into the Missouri cross the boundary on the south, including the Nodaway and Grand rivers. Several lakes are located in the north central part, near the line of Minnesota. These include Clear Lake, Spirit Lake, Okoboji Lake, Storm Lake, and Swan Lake.

**CLIMATE.** The climate is similar in all parts of the State and varies mainly on account of latitude, the altitude not being sufficiently diversified to affect it materially. In type it is continental, having a wide range of temperature



1, Des Moines; 2, Cedar Rapids; 3, Davenport; 4, Dubuque; 5, Sioux City; 6, Council Bluffs; 7, Boone. Chief railroads are indicated by dotted lines.

between winter and summer. The average annual temperature is about 48°, but in the southern part it is notably higher than in the northern section. The extremes of summer range from 90° to 100° in July and August to from 10° to 20° below zero in winter. All parts of the State have an abundance of rainfall, which averages 31 inches, and the greatest amount of precipitation occurs in the spring and summer months. Considerable snow falls in the winter, but there is rarely sufficient in the southern part to make sleighing possible, except for short periods at rare intervals.

**MINING.** Iowa has an extensive area of bituminous coal beds, which include about the southeastern quarter of the State. In the output of this product it exceeds all the states west of the Mississippi River except Colorado. The veins are from two to seven feet thick, and in some places there are two workable veins of marketable coal. Mahaska, Wapello, Appanoose,

Monroe, Polk, and Boone counties are among those that have extensive interests in coal mining. In 1908 the output was 7,500,000 tons. Valuable deposits of lead ore occur in the northeastern part of the State, in the vicinity of Dubuque. Gypsum is mined extensively near Fort Dodge, in Webster County, which is noted as a center for the manufacture of cement. Limestone, sandstone, and fire and potter's clay are widely distributed. The supply of building stone of the finest quality is inexhaustible.

**MANUFACTURING.** The State has shown a steady advancement in manufacturing enterprises the past two decades. This is accounted for by the abundant coal supply and the presence of other raw materials, which includes large quantities derived from agricultural sources. It takes third rank in the manufacture of dairy products, including cheese, butter, and condensed milk. The slaughtering and meat-packing industry produces about one-fifth in value of the manufactured products of the State. Flour and grist mill products are considerable, including principally wheat flour, corn meal, and oatmeal. The manufacture of pearl buttons is an important enterprise at Muscatine and other cities on the Mississippi, in which is obtained a freshwater mussel valuable for its shell. Other manufactures include machinery, cement, brick and tile, earthenware, pottery, canned goods, vehicles, clothing, cigars, and farming implements.

**AGRICULTURE.** Iowa is one of the leading agricultural states, and at present exceeds all others in the value of farm products. It contains practically no waste land unfit for farming, the only exception being the rugged margin of its larger streams, but these are valuable for pasturage. There has been a noticeable decrease in the size of farms, which average about 150 acres. Over 86 per cent. of the area included in farms is improved, and the soil is sufficiently fertile to produce abundantly without artificial fertilizers. Though formerly almost exclusively prairie land, the State is now well dotted with fine groves planted artificially, and belts of hard timber extend along the streams. A fine growth of native grasses furnishes a supply of hay or serve for pasturage, but the larger part of the hay grown is now obtained by cultivating clover, timothy, and alfalfa. Cherries, grapes, apples, and small fruits thrive in all parts of the State. Peaches are grown successfully in the southern section.

Corn is the chief crop and in value is about equal to all the other crops. The State usually holds first place in the production of both corn and oats, but in the yield of corn it is some-



times exceeded by Illinois. Wheat is grown most extensively in the northern part. In the production of barley the State takes second rank. Other important crops are rye, buckwheat, flax, potatoes, vegetables, and sorghum. The abundance of land suitable for pasturage and the growing of hay places Iowa among the leading stock-growing states. It usually takes first rank in rearing swine and second rank in the number of cattle, being exceeded in the latter only by Texas. Cattle are grown for meat and for dairying purposes. In the number of milch cows it exceeds the State of New York, which long held first place. Other farm animals include horses, mules, sheep, Angora goats, and poultry. The grade of stock raised has been highly improved by careful breeding, this being true especially of milch cows and draft horses. Large quantities of fatted swine and beef cattle are exported to the markets of Chicago, Kansas City, and Omaha.

**TRANSPORTATION.** The navigation is confined to the two border streams, the Mississippi and the Missouri, both of which are navigable the entire distance. However, the construction of railroads and electric railways has made the navigation of these streams less important than formerly. Texas is the only State west of the Mississippi River that exceeds Iowa in railroad mileage, the lines of the latter comprising 9,500 miles. Trunk railway lines extend across the State from north to south and from east to west, and the latter include a number of the important links in the transcontinental avenues of transportation, such as the Chicago, Milwaukee and Saint Paul, the Chicago and Northwestern, the Chicago, Rock Island, and Pacific, the Illinois Central, and the Chicago, Burlington and Quincy. Every county has one or more railway lines. Interurban electric railways are operated in many sections of the State. The commerce has shown a steady growth during every decade since the Civil War. Among the chief articles of trade are manufactures, live stock, hay, grain, dairy products, meat, buttons, coal, and food-stuffs.

**GOVERNMENT.** The present constitution dates from 1857. It vests the chief executive power in the governor, lieutenant governor, auditor, secretary of state, treasurer, attorney-general, railroad commission, board of control, and superintendent of public instruction, the election to these positions being by popular vote for two years. The legislative branch consists of fifty senators elected for four years and 107 representatives selected for two years. The senators are divided numerically into two classes, hence the senate is a continuous body, the term of one-

half of its members expiring every two years. A supreme court of six judges, elected for six years, constitutes the highest judicial tribunal. Subordinate to it are the district courts, which have jurisdiction in districts that are composed of several contiguous counties and are presided over by two to four judges, who are elected for four years. Superior courts may be established in the cities by a vote of the people. The county and township officers are elected by popular vote and administer local government.

**EDUCATION.** Iowa has long occupied a foremost position in educational affairs, its per cent. of illiteracy being among the lowest. Only 2.3 per cent. of the population over ten years of age are unable to read and write, as compared with 10.7 for the whole country. This condition has been brought about in part by compulsory school attendance laws, which require attendance from seven to fourteen years of age. The schools are supervised by a State and by county and city superintendents. Adequate and articulated courses of study are pursued in all the schools, making it possible to assign studies in consecutive order as pupils are promoted from the lower to the higher departments and institutions. The State University of Iowa, at Iowa City, is at the head of the educational system and is supported partly by contingent fees and partly by state appropriations. Iowa has a larger school fund, obtained chiefly from the sale of school lands, and the income together with local taxation furnish adequate support. Candidates to become teachers are examined either by the county superintendent or the state board of examiners, but all the licenses, or certificates, to teach are issued under the direction of the state department. A large and well equipped State normal school is maintained at Cedar Falls and the Iowa College of Agriculture and Mechanical Arts is at Ames. Among the many private institutions of higher learning are the Drake University, Des Moines; the Iowa College, Grinnell; the Cornell College, Mount Vernon; the Central University, Pella; the University of the Northwest, Sioux City; the Luther College, Decorah; the Highland Park College, Des Moines; the Des Moines College, Des Moines; the Simpson College, Indianola; the German-English College, Charles City; the Wartburg College, Clinton; and the Tabor College, Tabor.

Ample provisions have been made for the unfortunate and to provide punishment for the incorrigible. Asylums for the insane are located at Cherokee, Clarinda, Independence, and Mount Pleasant. Two state prisons are maintained, at Anamosa and Fort Madison. Eldora



has an industrial school for boys and Mitchellville has a similar institution for girls. The school for the deaf is at Council Bluffs, the home for feeble-minded children is at Glenwood, the college for the blind is at Vinton, and the inebriate hospital is at Knoxville. Marshalltown is the seat of the State Soldiers' Home.

**INHABITANTS.** Iowa takes tenth rank in the number of inhabitants. In 1900 it had 305,920 persons of foreign birth, two-thirds of whom were Germans and Scandinavians. In the same year the colored population was 13,186, of which number 382 were Indians and 12,693 were Negroes. All of the Protestant denominations are well represented, but the Roman Catholics are more numerous than any other body of Christians. The Protestant denominations which have the largest number of communicants include the Methodists, Lutherans, Presbyterians, Baptists, Christians, and Congregationalists. Des Moines, located in the central part of the State, is the capital and largest city. Other cities include Dubuque, Davenport, Sioux City, Council Bluffs, Cedar Rapids, Burlington, Clinton, Ottumwa, Keokuk, Muscatine, Fort Dodge, Marshalltown, Fort Madison, and Boone. In 1905 the State had a population of 2,210,050; in 1910, 2,224,771.

**HISTORY.** Iowa was named from an Indian word which means "the beautiful land." It was included in the region inhabited by the Iowa, Illinois, and Sac and Fox Indians. Marquette and Joliet visited the region in 1673, but no attempt to found a settlement was made until about a century later. Julien Dubuque, a French Canadian, in 1788 obtained a grant of land near the present city of Dubuque, where he operated lead mines and carried on trade with the Indians. The first permanent settlements were made in 1833 near Burlington. It was organized as a part of Michigan Territory in 1834, became a part of Wisconsin Territory in 1836, and was organized as the Territory of Iowa in 1838. Flourishing settlements had in the meantime grown up in the eastern part of the State and along the Des Moines River. Iowa City was made the capital in 1839 and a constitution was formed in 1844, but the State was not admitted into the Union until Dec. 28, 1846. Ten years later the capital was removed to Des Moines. The Sioux Indians perpetrated a massacre upon the whites at Spirit Lake in 1857, but this did not check the rapid immigration from states farther east and from Europe. Railroad building was promoted rapidly, and as early as 1885 there was not a locality within the State farther than fifteen miles from a railway. A consti-

titutional amendment to prohibit the manufacture and sale of spirituous liquors was adopted in 1882, but it was declared unconstitutional by the courts. For more than fifty years the State has enjoyed an unbroken era of growth in population, industrial enterprise, and intellectual development.

**IOWA, State University of,** an institution of higher learning for both sexes, located at Iowa City, Iowa. It was founded in 1855 with an endowment by Congress of two townships of land, and it was reorganized in 1860. It comprises the colleges of medicine, law, engineering, homeopathic medicine, dentistry and pharmacy, natural sciences, and liberal arts, and the Iowa School of Political and Social Science. A summer school for library training and a summer session for teachers are maintained by the college of liberal arts. The system of accredited high schools in the State brings the university in close touch with various educational institutions, and it maintains university extension and lecture courses. It has a library of 100,000 volumes, one of the finest in the State. The university includes eighteen buildings, valued at about \$1,550,000, and has an annual income of \$450,000. The faculty of instructors numbers 170 members and the enrollment of students is about 2,150.

**IOWA CITY,** a city in Iowa, county seat of Johnson County, on the Iowa River, 54 miles west of Davenport. It is on the Chicago, Rock Island and Pacific Railroad and on several electric lines. The surrounding country is fertile and has large interests in dairying and farming. The noteworthy buildings include the county courthouse, the State University of Iowa, the Mercy Hospital, the opera house, and the Iowa City Academy. Among the manufactures are paper, flour, gloves, vehicles, packed pork, ironware, and machinery. It has electric lighting, street railways, waterworks, pavements, and other improvements. Iowa City was founded in 1839, was the capital from 1839 until 1856, and was incorporated in 1853. Population, 1910, 10,091.

**IOWA COLLEGE,** a coeducational institution of higher learning at Grinnell, Iowa, the oldest college in the State. It was founded at Davenport in 1847 by Congregationalists, but was removed to Grinnell in 1860. It includes three departments, the academy, the college, and the school of music. The buildings and grounds are valued at \$250,000. It has a library of 35,000 volumes, an income of \$50,000, and an endowment of \$500,000. The faculty consists of 45 instructors. In 1908 it had an attendance of 653 students.

**IOWA INDIANS,** an Indian tribe of the



Dakota family that formerly lived in the vicinity of the Mankato River, Minnesota. In 1700 the tribe numbered about 1,500, but at present there is a remnant of only about 125, who are colonized on reservations in Oklahoma and Kansas. This tribe led several destructive wars against the Osage Indians. The Iowas have taken kindly to the industries.

**IOWA RIVER**, an important river of Iowa, rises near the Minnesota boundary, and after a course of 300 miles discharges into the Mississippi. It flows through a fertile agricultural country, is skirted by a belt of valuable timber, and contains many varieties of fish. Among the cities on its banks are Eldora, Marshalltown, and Iowa City.

**IOWA STATE COLLEGE OF AGRICULTURE AND MECHANIC ARTS**, an educational institution for both sexes, situated at Ames, Iowa. It was established by an act of the State Legislature in 1858, and four years later came into possession of certain lands granted by Congress to promote agricultural and mechanic education. In 1869 it was formally opened. The departments include those of engineering, agriculture, veterinary medicine, science, and domestic economy. In connection with it is the Iowa Experiment Station, which affords facilities for investigating agricultural problems. A campus of 120 acres has been set apart from the college domain, which embraces about 800 acres. Free tuition is granted to all residents of the State, while others pay a very nominal fee. Students are admitted from accredited schools or upon examination. It has been proven by experiments that this institution has been of much value in developing the industrial and intellectual forces of Iowa and other states. The endowment is \$750,000, the value of all college property is \$1,550,000, and the annual income is about \$200,000. It has an excellent supply of apparatus and a library of nearly 20,000 volumes. About 2,350 students comprise the average enrollment.

**IPECACUANHA** (ip-ĕ-kāk-ŭ-ăn'ă), the name of a plant of South America, found chiefly in the damp and shady woods. It is a shrub, has a few leaves near the ends of the branches, and bears small white flowers. The fruit is a dark purple berry. It is valuable for the root, from which a medical substance known as *ipecacuanha* is obtained. This product has a bitter taste, is mildly irritant, and is commonly known as *ipe-cac*. As a medicine it is used as a stomachic tonic, as an expectorant, and in disorders of the skin.

**IPSWICH** (ips'wich), a town and river port of Suffolk County, England, on the Orwell

River, about 68 miles northeast of London and twelve miles from the North Sea. The streets are tortuous and narrow. Within recent years it has made material development on account of its navigation and railroad commerce. It has several fine schools, hospitals, and churches. The manufactures include flour, soap, beverages, machinery, agricultural implements, and fabrics. Shipbuilding is an extensive enterprise. It has electric lights and street railways. Ipswich has remains which date from the Roman occupation of England, but no mention is made of it until 991. It received a charter from King John in 1199. Population, 1907, 72,825.

**IPSWICH**, a town of Massachusetts, in Essex County, on the Ipswich River, 26 miles northeast of Boston. It is on the Boston and Maine Railroad and has communication by electric railways. The noteworthy buildings include the public library, the town hall, and the Manning High School. It has manufactures of soap, hosiery, isinglass, and machinery. The municipality maintains systems of waterworks and sanitary sewerage. Ipswich was settled by John Winthrop in 1633, when it was known as Agawam, but the name was changed to Ipswich the following year. It was the home of Anne Bradstreet and other pioneers of colonial times. Population, 1905, 5,205; in 1910, 5,777.

**IQUIQUE** (ĕ-kĕ'kă), a city and seaport of Chile, capital of the province of Tarapacá, on the Pacific coast. It is connected by railways with other trade centers. In its vicinity are extensive mining interests, including those of silver, iron, borax, iodine, saltpeter, and nitrate of soda. It has a large trade in live stock, fruit, lumber, and minerals. The climate is quite hot, but healthful, and earthquakes are not infrequent. Prior to 1881 it belonged to Peru, but in that year it became a possession of Chile. Population, 1906, 43,502.

**IRAN** (ĕ-răn'), the name used by the natives of Persia to designate their country. It is of ancient origin and has been applied to a region much larger than is included in that country at the present time, usually to the portion of Asia lying between the Tigris and the Indus. In history it is frequently applied to the region bounded by the Caucasus, the Caspian Sea, and Russian Turkistan on the north; by the Tigris, the Persian Gulf, and the Arabian Sea on the west and south; and by the Indus on the east. Within it was embraced the territory now included in Afghanistan. See **Persia**.

**IRANIANS** (ĭ-ră'nĭ-anz), or **Persians**, a people belonging to the Aryan or Indo-European family. They are so named from Iran, the ancient name of Persia. The Medes, who are men-



tioned as early as 2400 B. C., are the first of these people of whom we have historic record. Both the Medes and the Persians were highly advanced in civilization at an early date. The Iranian language may be divided into three general groups, which include the Old Persian cuneiform inscriptions; the Zend or Old Bactrian, the language in which the sacred writings of the Parsees is committed; and the Middle Iranian or Pehlevi languages, in which the Zend-Avesta commentaries are preserved. The modern Persian is Iranian, but it contains many Arabic words. In this language many celebrated masterpieces of literature were produced. The modern Iranians inhabit regions west of the Indus River. Among them are the Kurds, the Ossetians, the Baluchis, the Afghans, the Tajkis, and the Persians.

**IRAWADI** (ir-ä-wä'di). See **Irrawaddy**.

**IRELAND** (ir'land), popularly called the Emerald Isle, an island located 60 miles west of England, from which it is separated by Saint George's Channel and the Irish Sea. It is the smaller of the two principal islands included in the United Kingdom of Great Britain and Ireland. It is bounded on the south, west, and north by the Atlantic Ocean, and on the northeast by North Channel, which separates it from Scotland. The greatest length, measured from Fair Head in the northeast to Mizen Head in the southwest, is 304 miles. Its breadth varies considerably, being about 110 miles through the central part, between the bays of Galway and Dublin, and 210 miles from Benwee Head in the northwest to Carnsore Point in the southeast. The area is 32,583 square miles, including a water surface of 52 square miles.

**DESCRIPTION.** The surface is diversified, including large tracts of undulating districts and elevated ranges with hills and mountains, the greatest height being about 3,500 feet. Mount Carrantual, a peak of the Macgillicuddy's Reeks, in the southwestern part, has an elevation of 3,414 feet. In the southeastern part are the mountains of Wicklow, rising about 2,750 feet above the sea. The coast varies from gradual elevations to precipitous heights, but the general surface may be described as basin-shaped, the interior being a vast plain with extensive tracts of bogs and lakes. A number of islands abound along the west shore, of which Clare and Achill are the most important. Many excellent harbors are furnished by numerous coast indentations, and the entire coast line, including the inlets, has a length of 3,000 miles. The principal inlets are the bays of Donegal, Galway, Dingle, Bantry, and Dundalk. Lough Foyle is an important inlet on the north coast.

An irregular line drawn from Lough Foyle in the north to Mizen Head in the southwest marks the dividing line from which the rivers radiate, but the divide is not distinguished by striking surface features. Many of the streams widen into long lakes or loughs, owing to the fact that rainfall is abundant and the slopes are gradual. The Shannon, in the west, about 250 miles long, is the largest river in the United Kingdom. About half of it above the estuary is made up of the three lakes Derg, Ree, and Allen. In the north is the Erne River, which drains a part of the central plain and flows into Donegal Bay. The Boyne, rising in the central plain, is not made up of lakes. In the south is Waterford Harbor, into which flow the Suir and Barrow rivers. Other streams having a southward course include the Lee, the Bandon, and the Blackwater. The inland lakes include Lough Derg, Lough Ree, Lough Mass, Lough Neagh, and Lough Erne.

The climate of Ireland is greatly modified by the westerly winds blowing from the Atlantic Ocean, where they are tempered by passing over its comparatively warm surface. From this circumstance the climate is milder and more equable than that of England, and the mean winter temperature is 25° higher than that of the same latitude as the Atlantic region of America. While it has the advantage of a moderate temperature and ample rainfall, the disadvantages of damp winds and heavy fogs are felt in nearly all parts of the island, but particularly along the west and south coasts. In the interior the atmosphere is somewhat drier, the rainfall being about 35 inches, while the wetter districts have a rainfall of 42 inches. Owing to favorable climatic conditions, Ireland is clothed with the verdure of numerous plants, many of which are native to the island and winter in the open air.

**MINING.** Though Ireland has valuable deposits of iron ore, this mineral is not worked extensively, owing to the absence of large deposits of coal. Most of this product is obtained in Antrim County. A limited supply of anthracite coal exists, but the coal measures consist chiefly of an inferior grade of bituminous coal. About 125,000 tons are produced annually. Copper mining, though formerly extensive, is not important at present. Sandstone, limestone, and granite suitable for building purposes are abundant. Other minerals found in various quantities include alum, slate, salt, and lead ore.

**AGRICULTURE.** Though the arable surface is rich in having a productive soil, large districts are made up of moorland. The land titles are vested in large owners, who lease the estates to



peasants, and much of the land is sublet in small tracts. This condition arose from the English occupation of the island, when much of the land was confiscated and granted to English citizens. In the latter part of the 19th century the government adopted a policy to enable the peasants to purchase land, under which money was advanced for that purpose, and the peasants were permitted to repay by remitting annual installments. This resulted in dividing many of the larger estates, though much of the land is still held under conditions that require the payment of excessive rents. However, the methods of farming are improving, and much of the land has been redeemed by drainage and enriched by fertilizers.

A large per cent. of the land is in meadows and pastures. This condition has been augmented through the live-stock industry and as a means of improving the soil. The area cultivated in clover and other grasses for hay comprises nearly one-half of the cultivated lands. The acreage of oats is about one-half that devoted to the production of hay. Other crops grown extensively include potatoes, turnips, barley, beet roots, and wheat. Flax is grown chiefly in the northern part. Vegetables and small fruits are abundant in all sections of the island. Cattle raising is the principal live-stock industry, and the interests in dairying and for meat production are about equal. Sheep are grown chiefly in the highlands, where the grasses and climatic conditions are peculiarly favorable. Poultry raising is carried on almost universally among the peasants. Other domestic animals include horses, mules, swine, and goats. Forests of commercial value are abundant on the larger estates.

**MANUFACTURES.** The manufacturing industries are not important, when compared to the resources. A large proportion of the live-stock marketing is shipped to Great Britain, and many commodities that could be manufactured profitably are imported. Linen, silk, and woolen textiles are the principal manufactures. Belfast has been noted as a center of the linen textile enterprise for several centuries. Ulster is a center of manufacture of woolen and worsted goods. Large shipyards are located at Belfast, where the *Celtic* and the *Oceanic* of the White Star Line were constructed, and shipbuilding is well established at Dublin and Londonderry. Other manufactures include machinery, clothing, embroidery, lace, leather, and spirituous liquors. Considerable material for the manufacturing industry is supplied by the fisheries, which yield large catches of cod, herring, pilchard, and salmon.

**TRANSPORTATION.** Railways are operated in all parts of Ireland, thus connecting the coast with the productive interior points. The total lines aggregate 3,500 miles. Many of the streams are navigable in their lower courses for small boats, but the Shannon supplies the most important river transportation, and ocean steamers ascend it as far as Limerick. A number of the rivers have been canalized and connected by systems of canals. The highways are in a well-improved condition, affording means for transportation by wagon from the railway and canal centers. England has most of the Irish trade, which consists in large parts of the exportation of raw products and the importation of manufactured articles. The chief exports are live stock, grain, fish, whisky, and dairy products, while the imports include wheat, corn, flax, tea, tobacco, and machinery. The trade with foreign countries is principally with the United States, Germany, Belgium, and Russia.

**GOVERNMENT.** Ireland has been an integral part of the United Kingdom since 1801. Chief executive authority is vested in the Lord Lieutenant, who is assisted by a privy council, and is the representative of the crown of Great Britain. The government is conducted by the Chief Secretary for Ireland, who is president of the local government board and a member of the Cabinet. While Ireland has no Parliament of its own, it is represented in the British House of Lords by 28 peers and in the House of Commons by 103 commoners. The judicial system is modeled upon that of England and culminates in the supreme court of judicature. For the purpose of local government, Ireland is divided into four provinces and 32 counties, the provinces being Leinster, Munster, Ulster, and Connaught.

**RELIGION AND EDUCATION.** The prevailing religion is Roman Catholic, the clergy of which is supported by voluntary contributions. Nearly one-third of the people are Protestants, the sects being Anglicans, Presbyterians, Methodists, Independents, Baptists, and Quakers, in the order named. The Anglican, or Episcopal Church, was the established church until 1869 and has 620,500 adherents, while the Presbyterian Church has 454,500 communicants. Elementary schools are under the management of the commissioners of national education and are maintained in all the districts. Besides the common and high schools, several colleges, seminaries, and universities are supported. Of the higher institutions the most important are the University of Dublin; Queen's colleges of Belfast, Cork, and Galway; University College, Dublin; Saint Patrick's College, Maynooth; and the Royal College of Science.



**INHABITANTS.** The majority of the inhabitants belong to the Celtic race, and the earlier immigrants from England have completely amalgamated themselves with the native people. Settlements of English and Scotch are numerous in the northeastern part. This element is Protestant and furnishes a large part of the Orange population. The native inhabitants are descendants of the ancient Celts, by whom the island was inhabited during the Roman occupation of England, but they are now called *Irish*. Large numbers of the Irish people have come to Canada and the United States, where they comprise a large and influential element, and have taken a prominent part in the social and industrial development. They are noted for their wit and industry.

Dublin, on Dublin Bay, an inlet of the Irish Sea, is the largest city and seat of government. Other cities include Cork, Belfast, Limerick, Queenstown, Waterford, Rathmines, Galway, Kingstown, Newry, and Wexford. The population of Ireland has decreased materially the past fifty years. At present it is 140 per square mile, or less than one-fourth that of England. This decrease is due chiefly to emigration, especially from the rural districts. In 1841 the island had a population of 8,196,000. In 1901, fifty years later, it was only 4,458,775. Population, 1907, 4,378,568.

**LANGUAGE.** The Irish language is a branch of the Celtic and belongs to the Gaelic, being allied to the Manx and Scotch Gaelic, and to the British dialects known as the Cornish, Welsh, and Armoric. About 65,000 people of Ireland speak only Irish, while 890,000 speak both the English and the Irish. A widespread movement is now in progress by which it is designed to preserve the language and extend its use, a plan projected both in Ireland and the United States. At the head of this movement is the Society for the Preservation of the Irish Language, which has maintained headquarters at Dublin since 1877. The literature of the Irish is extensive, including legendry, history, poetry, and many works of value in theology and romance, some of the earlier dating from the 5th century. Many of the most eminent men classed with the English scholars and authors are more properly Irish. These writers include Thomas Moore, Justin McCarthy, Geoffrey Keating, and Douglas Hyde (b. 1860). The Irish scholars have given to the English language some of the most beautiful poems, searching historical writings, and eloquent orations.

**HISTORY.** The early history of Ireland is wrapped in fable. It is thought that the Iberians, or a branch of the Mediterranean race, were

the earliest inhabitants. Later the Celts settled in Ireland, coming there at different times, and still later came large numbers of Scots. The controlling influence seems to have been vested in various tribes until the Scoti, which was the most powerful, subdued the others. Subsequently they made incursions into Gaul and Britain, which was then a Roman colony. In the middle of the 5th century Christianity was introduced by Saint Patrick, a man of Scottish birth, who was taken a slave to Ireland while still young. Later he escaped to Rome and returned to Ireland with the avowed intention of introducing Christianity. His work was attended by much success and Ireland became a seat of learning, while its monasteries supplied many noted missionaries to operate in continental Europe. However, the various political elements continued to be hostile toward each other, which had a depressing influence upon the national feeling, and the prosperity was more or less affected by the incursions of the Danes and other invaders from the north.

In 1167, while Henry II. was King of England, the Norman invasion occurred. At that time the island was districted into counties, the lands were divided among Norman barons, and English courts were established at Dublin. Then likewise originated the feudal titles to lands, which are still a hindrance to the prosperity and success of the common people. A heroic defense was made against the invaders, and at the beginning of the 16th century the English were still unable to conquer the larger part of Ireland. An act of the Irish Parliament granted Henry VIII. the title of King of Ireland, instead of lord, as was the case in the reign of Henry VII. This sovereign confiscated the lands of the church and attempted to force the people away from the Catholic religion, a measure bitterly opposed by the Irish. Elizabeth instituted a Protestant clergy, but the movement occasioned numerous uprisings under the Earl of Tyrone.

At the time of the Civil War in England, in the reign of Charles I., the Irish rose in rebellion and attempted to become free from the English dominion, but they were subdued by Cromwell in 1649. Many atrocities were perpetrated on both sides during this contest for supremacy in Ireland, and after the Irish and Loyalists were defeated they were generally banished to Connaught, while the English and Scotch settlers occupied the other portions. The struggle for independence continued during the reigns of Charles II. and James II., but, when the Irish preferred James to William III., the latter invaded Ireland in 1690, and in the Battle of the Boyne defeated the forces of James. In 1691 the



Irish were defeated at Galway and Limerick, but a treaty was concluded by which the Catholic Irish were given religious liberty. This treaty was violated by Parliament granting about one million acres of land to the Protestants, and severe penal laws were passed against the Catholics, by which it was aimed to exterminate that faith. The enactment of these laws excited bitter opposition.

When the war for American independence began, it gave the Irish an apparent opportunity to become free. Some of the penal laws were modified to appease the people, privileges to erect schools were extended, and some of the restrictions previously placed on the Catholics were withdrawn. However, a declaration of independence was made by the Irish Parliament in 1782 under the leadership of Grattan and Flood. The uprising was supported by both Protestants and Catholics in Ireland, who were alike anxious to secure more wholesome legislation for the common people, as well as to obtain complete liberty of conscience. When the French Revolution began, in 1798, the Society of United Irishmen was instrumental in making another desperate effort for independence, but the movement was crushed after much loss of life. The government at London now resolved to unite the Irish and English parliaments into one body. This was done by the Act of Union, which was adopted by the Irish Parliament in 1800. On Jan. 1, 1801, Ireland was united by proclamation with England in the same manner that Scotland had been assimilated, except that it was not permitted to have as large a measure of local government, and the English Parliament became the supreme legislative authority. This measure was universally unpopular in Ireland from the beginning, causing several rebellions, and continues to be the source of much contention.

In 1829 the Catholic emancipation act went into effect, a measure making Catholics eligible to most public offices and to membership in Parliament. Since then many strenuous efforts have been made to secure the independence of Ireland, particularly in 1848 and 1865. The movement of the latter year is known as that of the Fenians, being promoted by the Fenian Society, and it received financial support from many Irishmen who were citizens of the United States and other countries. Several attacks were made on the Canadian frontier in 1866, but the American government interceded to maintain neutrality. This was followed by the disestablishment of the Irish Episcopal church in 1869 and slight modification of the land tenure laws. Subsequently agitation for Home Rule became the leading question, a movement designed

to give Ireland a local Parliament and local self-government under English sovereignty, similar to that of Canada and Australia. Among the distinguished leaders in favor of this movement may be named Parnell and Isaac Butt (1813-1879), while the cause was ably defended by such Englishmen as Gladstone and Bryce. The National Land League was organized in 1883, which succeeded the Land League. This organization had for its object the acquisition of title to land by Irish tenants and was generally supported by the people of Ireland irrespective of political affiliations. In 1903, after an extended discussion, Parliament finally passed the Land Purchase Bill, under which the tenants or subtenants may purchase tracts of land from the landlords and pay for it in annual installments.

The principal issue which now engages the public men of Ireland is that of Home Rule. Augustine Birrell (b. 1850), who was for some time chief secretary to the Lord Lieutenant of Ireland, introduced a measure of this kind in the Parliament in 1907. The discussion turned largely on the point of establishing an administrative council in Ireland, but up to the present no definite action has been taken. In the meantime the people of Ireland continue to advocate industrial emancipation along with some measure of political independence.

**IRIDIUM** (i-rid'i-ŭm), a metal discovered in 1803, so named from the colors exhibited by its solutions. It occurs native with platinum, osmium, and rhodium, in alloys of various proportions of these metals. Iridium is insoluble in mineral acid, and may be readily alloyed with copper, lead, gold, and other metals. It is used in the manufacture of standard weights, the fine edges of balances, and many articles that are to be preserved for a long time from the influence of the atmosphere. It is found in the Ural Mountains and the Pacific coast of North America. See **Chemistry**.

**IRIS**, the name of a genus of beautiful plants, sometimes called *flag* and *fleur-de-lis*, and native to the temperate climates. It includes many species, some of which are noted for their medicinal properties and others on account of their beautiful flowers. Most species grow in wet and marshy places and bear a variety of flowers, of which the most common tint is blue. The best known species of North America include the *blue flag* and the *common iris*, the former growing in marshy places and the latter being distinguished on account of its grassy leaves. The common iris has ornamental flowers of a violet-blue color, but they are variegated with veins of white-green or yellow. Its stems are about three feet high. Among the naturalized



species grown in gardens are the beautiful *Spanish*, *Chalcedonian*, *Persian*, and *snake's-head*. Many are cultivated as border plants.



COMMON IRIS.

**IRIS**, the colored portion of the eye that surrounds the black central pupil, which is an aperture in the iris. It consists of a muscular curtain of three layers, the anterior, posterior, and middle fibrous. The surface is variously pigmented, giving the eye its color. *Iritis* is an inflammation of the iris, due to a prolonged use of the eye, to injury or accident, or to rheumatism or some other constitutional disease.

**IRISH LANGUAGE.** See *Ireland*.

**IRISH MOSS**, or *Carrageen*, the name of several species of seaweed common to the coast of Ireland and other countries of Europe. They are not mosses, but are algae, and thrive on rocky and stony coasts. The common *carrageen* yields the greater part of the Irish moss of commerce. It is used as medicine and as an article of food. The plant is branched, grows to a length of from two to twelve inches, and is reddish brown in color. It is prepared in the form of jelly and blancmange by boiling in water or milk, then adding some sugar and spices. Iceland moss, although used in a similar way, is a different plant, being a lichen.

**IRISH SEA**, a body of water located between Ireland and Great Britain, connected with the Atlantic Ocean on the north by North Channel and on the south by Saint George's Channel. Its length is about 135 miles and the width varies from 60 to 120 miles. Several islands are located within it, including Anglesey and the Isle of Man.

**IRITIS** (ī-rī'tis). See *Iris*.

**IRKUTSK** (īr-kōōtsk'), a city of Siberia, capital of a government of the same name, and the residence of the governor general of Eastern Siberia. It is located near Lake Baikal, on the Trans-Siberian Railway, 3,385 miles from Moscow. It is well built, has broad and substantially paved streets, and maintains public waterworks and electric street railways. Among the noteworthy buildings are the museum, the public library, and several public schools. It has a number of fine hospitals, churches, and seminaries. The manufactures include linen goods, leather, machinery, furniture, and woolens. The trade in tea, furs, and cereals is very extensive. Irkutsk was founded in 1652, but its prosperity dates from the railroad development and the growth of Russian influence on the Chinese boundary. Population, 1906, 60,382.

**IRON** (ī'ūrñ), the most important of all metals. It is found in nearly all forms of clay, earth, and rock, though rarely in a pure state. When pure, it is silvery-white, very tenacious, malleable, and ductile. The commercial product is derived from ores, which are abundant and widely distributed, and are known as magnetite, hematite, siderite, and limonite. Ores classed as *magnetite*, when pure, contain 72 per cent. of iron and are so named because the iron in them occurs as magnetic oxide. *Hematite* may be red, blue, or specular. *Limonite* consists of hydrated oxides and includes the bog and other ores. *Siderite* contains carbon dioxide. Iron is found in varying proportions in both sea water and mineral water, and forms an essential constituent of plants and animals. The sun and stars contain iron, and it constitutes a large portion of meteorites that fall from space to the earth.

Pure iron burns before reaching the melting point. For this reason it must be combined with other substances to make it of the greatest utility, such as sulphur, copper, silicon, carbon, arsenic, phosphorus, and other metals with which it forms important alloys. Absolutely pure iron is seldom seen, except in laboratories, where it is used for experimental purposes. *Cast iron* is a commercial iron produced in a blast furnace and contains a large proportion of carbon, is neither ductile nor malleable, and may be easily cast in molds. *Pig iron* is the form in which cast iron is made at the furnace, being run into molds, called *pigs*. *Wrought iron* is usually fibrous, ductile, and malleable, is produced in a puddling furnace or a forge, and contains very little carbon or other impurities. *Weld iron*, *bar iron*, and *steel* are different compounds of iron. They contain less carbon than cast iron and more than wrought iron, and can be forged, tempered, cast,



and materially hardened by heating to redness and cooling suddenly. The several varieties of iron manufactured differ in the degree of their properties as well as in the proportions of their constituents, and by different applications serve man in an unlimited field of useful purposes. Salts of iron are used largely in medicine as tonics.

The iron deposits of North America are very extensive. In the production of pig iron the United States exceeds every other country in the world. Nearly all states of the Union and most of the provinces of the Dominion have iron deposits, though there are some districts in which they are especially abundant. The most productive iron fields operated at present are those of the Lake Superior region, from which about two-thirds of the iron ore is obtained. Other vast deposits are in Pennsylvania, Ohio, Alabama, Tennessee, Virginia, and Missouri. Pennsylvania leads in the manufacture of iron products, but Minnesota ranks first in the output of iron. The highly productive deposits of that State are chiefly in the Vermilion and Mesabi ranges, where mines were first opened in 1884. This district extends northward into Ontario and eastward by the Gogebic and Menominee ranges of Wisconsin and Michigan. In 1688 the first blast furnace of Pennsylvania was operated under the direction of William Penn, and in 1817 the first rolling mill was established at Plumstock, Pa. The iron industry of the Southern States is making rapid progress, owing to the vast iron ore and coal deposits in that region, while marked attention is also directed toward the industry in the states of the West, especially Colorado.

The world's production of pig iron, as reported in 1908, is 62,524,500 tons. Of this quantity 25,850,000 tons were produced in the United States, 12,850,500 tons in Germany, 10,340,250 tons in Great Britain, and 3,425,000 tons in France. In the same year Canada produced 562,450 tons. Other countries producing iron extensively are Austria, France, Russia, Belgium, Sweden, and Norway. The finest grade of iron produced in Europe is taken from the mines at Dannemora, Sweden, and is used extensively for horseshoe nails. These mines have been operated continuously since the 15th century and are inexhaustible. The manufacture of all forms of machinery and utensils and the construction of large buildings have increased remarkably the demand for iron and steel. There are few machines now produced that do not consist largely of these metals. The impetus of railroad building in Africa, Asia, South America, and Australia has greatly increased the foreign demand

for the American product. However, the growing markets abroad are tending to develop on a large scale the output of native products in many sections of the Old World.

**HISTORY.** Iron is one of the metals earliest known in history, being mentioned in the Bible as early as Genesis iv., 22, where Tubal-Cain is spoken of as "instructor of every artificer of brass and iron." Egyptian sepulchers represent butchers sharpening their knives on a round bar of metal. It is reasonably certain the discovery of iron at Mount Ida dates from 1406 B. C. The vast deposits of iron ore in India were known from remote times, and the Romans utilized products of iron at an early period. Iron mines were operated in Britain as early as 54 B. C., and much earlier in continental Europe, especially in Germany, Spain, and Italy. When the Egyptian obelisk was removed from Alexandria to New York, in 1880, a piece of pure iron was discovered under its base, which was estimated to have been situated there over 1,900 years. Tools made of iron and steel by the ancients more than 3,000 years ago are preserved in the museums at Rome, Berlin, London, Paris, and other cities of Europe.

After the decline of Rome, Spain became noted for the production of iron and steel, the most extensive furnaces being located in the province of Catalonia, in the north of Spain, whence the *Catalan furnace* was named. The Catalan furnaces are still used for low blast, and serve a useful purpose where iron ore is reasonably pure. With the discovery that all ores cannot be melted in Catalan furnaces, it became necessary to construct higher furnaces, with an opening at the top into which the ore is thrown. This is the form of structure utilized in modern blast furnaces, and their invention dates from the early part of the 14th century, when a native of Germany introduced this form and utilized it extensively for the production of iron from ore secured in the Rhine provinces. These furnaces were introduced into France in the middle of the 15th century and into England about the same time.

Coal did not come into general use in blast furnaces until 1713, charcoal being used previously, but the latter was displaced because it does not furnish sufficient heat. The imperfectly worked iron ore left in Britain by the Romans supplied materials for some of the high grade furnaces for nearly 300 years, being rendered of value because of the increased heat obtained from coal and coke. In 1585 iron deposits were discovered in North Carolina by an expedition sailing under Sir Walter Raleigh. The iron first used in America was smelted in Europe,



but the American products began to be used in manufacturing in Virginia as early as 1619. However, material progress was not made until 1643, when blast furnaces were built near Massachusetts Bay, at the present site of Lynn, where deposits of bog ore are found. Among the valuable improvements in the manufacture of iron may be mentioned those of Cort, who, in 1783, secured a patent on machinery used in rolling and the next year was granted a patent on devices employed in puddling. Dalton discovered the hot blast in 1827 and Bessemer, in 1856, discovered the method of converting crude iron into steel by the Bessemer process. See **Blast Furnace; Rolling Mill; Steel.**

**IRON AGE**, a term used to indicate the degree of civilization and culture of a people considered from the material of which their tools and weapons are made. The three prehistoric stages are known as the ages of stone, bronze, and iron. This succession in the use of tools and weapons was not followed universally in every part of the world. In some portions, as in America, Africa, and the islands of the South Pacific, the natives passed directly from the use of stone to iron. The age of iron began in Greece in the time of Homer, the Homeric poems alluding to the transition from bronze to iron. From the southern portion of Europe the age of iron moved northward. It reached Scandinavia about the period of the Christian era, and became fully established about the year 800 A. D., when the Scandinavians were converted to Christianity. In the stone age implements and weapons were cut from native rock, in the bronze age they were cast, and in the iron age they were hammered into shape and ornamented by curved lines. The iron age was characterized in most countries by the introduction of alphabetic characters, by which a basis was laid for history and literature. The present time is often spoken of as the *age of steel*, and sometimes as the *age of electricity*.

**IRONCLAD VESSELS**, the naval vessels that are protected from the fire of the heavy guns by iron or steel plates. Ironclad vessels are of comparatively modern invention, and were first tried on some of the French floating batteries at Kinburn in 1855. The experiments were not satisfactory until 1858, when the French vessel *La Gloire* was constructed, and the following year Great Britain began to introduce armor-clad vessels into the navy. Since then marked improvements have been made, and war vessels have taken on a powerful and secure form. The first test of a protected vessel in actual military contact occurred in the Civil War, when the Confederates covered the *Merri-*

*mac* with railroad rails and other heavy irons, naming it *Virginia*, and in this way succeeded in damaging the Union navy. This was followed by the invention of the *Monitor*, a protected turret ship, by Ericsson, and from it resulted an entire revolution in naval warfare.

The first ironclads were constructed of wood, with steel or iron plates protecting the entire exposed surface, but at present iron and steel enter extensively into the general construction, while the firing from them is done through port-holes, or from central turrets or citadels. The plate formerly used was from three to five inches thick, the thinner being near the bow and stern, but those of more recent manufacture have armor from six to fifteen inches in thickness on the sides, and a deck plate from two to four inches thick. The most important manufactories of armor plate are located at Essen, Germany, known as the Krupp works. All the powerful nations, such as the United States, Great Britain, Germany, France, Russia, and Italy, have ironclad vessels for offensive and defensive operations. The navy of Great Britain has more ironclad vessels than that of any other country. Such battleships as the *Oregon* and the *Minnesota*, of the United States navy, are representative types of first-class armored vessels. Italy long had two of the largest ironclads in the world, the *Lepanto* and *Italia*, each having a displacement of 13,840 tons. However, they are exceeded in size by the *Minnesota*, the *Connecticut*, and the *Louisiana*, each of which has a displacement of 16,000 tons.

**IRON CROSS**, a military decoration given for distinguished service by the German government. It was first given by Frederick William III. of Prussia in recognition of distinguished services in war. During the war with France, in 1870-71, it was revived. The decoration consists of a Maltese cross of iron bordered with silver, and is suspended from the neck by means of a cord. A similar decoration, known as the grand cross, is awarded to officers of high rank.

**IRON CROWN**, a crown used at the coronation of the kings of Lombardy and afterward by the German emperors, when the latter were sovereigns of that country. It is made of six pieces and is adorned with jewels, enamels, and golden roses. The cross was so named from an iron circle, which, according to tradition, was forged from a nail used in the crucifixion of Christ. Charlemagne, when he united Italy with Germany to form the Holy Roman Empire, wore this crown. Subsequently it was worn by Charles V., by Napoleon I., and by two emperors of Austria. In 1866 it was placed in the



Church of Saint John the Baptist at Monza, Italy.

**IRON GATE**, a narrow place in the Danube River, near Gladova, a short distance below the point where the river crosses the boundary of Hungary. It is formed by the Transylvanian Alps. Formerly it obstructed navigation. In 1890 vast excavations were begun to widen and deepen the river bed, which were completed in about ten years.

**IRON MOUNTAIN**, a city in Michigan, county seat of Dickinson County, near the Menominee River, fifty miles west of Escanaba. It is on the Chicago and Northwestern and the Chicago, Milwaukee and Saint Paul railroads. In the vicinity are productive iron mines. The chief buildings include the county courthouse, the high school, and a number of churches. It has manufactures of mining and agricultural machinery, clothing, and utensils. Sewerage, pavements, electric lighting, and waterworks are among the utilities. It was settled in 1873 and was incorporated in 1888. Population, 1904, 8,585; in 1910, 9,216.

**IRON MOUNTAIN**, or **Iron Mount**, a famous hill in Saint Francois County, Missouri, 81 miles south of Saint Louis. It has an area of 500 acres and rises to an altitude of 200 feet above the surrounding country. The deposits consist of specular or hematite iron ore and appear to be inexhaustible, constituting one of the richest and purest iron ores in the United States. Near it is Iron Mountain, a village having important railroad connections and containing blast furnaces and factories.

**IRONTON** (i'urn-tun), a city in Ohio, county seat of Lawrence County, on the Ohio River, about thirty miles above Portsmouth. It is on the Norfolk and Western, the Cincinnati, Hamilton and Dayton, and other railroads. On the opposite side of the river is the Baltimore and Ohio Railroad, which reaches the city by a free ferry. The surrounding country has deposits of bituminous coal, iron ore, and brick and fire clays. Among the chief buildings are the high school, the Masonic Temple, the county courthouse, the Odd Fellows Hall, and the Briggs Public Library. It has stove works, machine shops, brickyards, foundries, cement works, and rolling mills. Gas and electric lighting, street railways, pavements, and waterworks are among the public utilities. Ironton was settled in 1832 and incorporated in 1849. Population, 1900, 11,868; in 1910, 13,147.

**IRONWOOD**, the name of several species of hornbeam, a tree native to North America. This tree is rather small, rarely exceeding six inches in diameter, and the wood is hard and

tough. A similar forest tree is native to South America. The ironwood of commerce is obtained from a myrtle of the eastern part of Asia. This wood is extremely hard, dark colored, and so heavy and dense that it sinks in water. The natives of China and the East Indies use it for anchoring. From its hardness and density, ebony is sometimes called ironwood.

**IRONWOOD**, a city of Michigan, in Gogebic County, on Montreal River, 150 miles west of Marquette. It is on the Wisconsin Central and the Chicago and Northwestern railroads. The iron industry is the most important enterprise, its mines yielding large quantities of rich ore. Among the chief buildings are the city hall, the Carnegie Library, the high school, and a number of churches. It has manufactures of cigars, ironware, machinery, furniture, and utensils. The surrounding country is included in the rich Gogebic iron range of Michigan and Wisconsin. It has systems of public drainage, lighting, and waterworks. The place was settled in 1884 and incorporated three years later. Population, 1904, 10,019; in 1910, 12,821.

**IROQUOIAN INDIAN** (ir-ō-kwoi'an), one of the largest groups of American Indians, comprising the most important linguistic stock. Originally they appear to have occupied the region in the lower part of the Saint Lawrence, whence they spread up the river and to the section bordering on the Great Lakes. They comprise the Iroquois, the Eries, the Hurons, the Tuscaroras, and many others. Cartier first came in contact with them in 1535, when they were well established in the region now included in Quebec, Ontario, New York, and Pennsylvania. These Indians are closely related in language to the Cherokees, but the latter appear to have separated from the parent stock at a very early date. See **Iroquois**.

**IROQUOIS** (ir-ō-kwoi'), or **Six Nations**, a celebrated confederation of North American Indian tribes. They were first known as the Five Nations, which included the Mohawks, Onondagas, Senecas, Oneidas, and Cayugas. In 1712 they were joined by the Florida Tuscaroras, when the union became known as the Six Nations. They carried on extensive hostilities against the French in the 17th century, when they numbered about 15,000, but suffered severe losses. Subsequently they became allied to the Dutch, later to the English, and afterward joined Pontiac. A peace concluded was broken in 1774, but another treaty was made in 1784 with the United States, and the greater portion moved across the lakes into Ontario. In the War of 1812 the American and Canadian branches were pitted against each other, but at the close of that







can never be redeemed. In many portions of Arizona, Idaho, Colorado, California, Oregon, Utah, Washington, Montana, New Mexico, Nevada, Wyoming, and Alberta much value has been added to lands by irrigation. In some regions the water supply is drawn from rivers, while in others vast reservoirs are maintained to catch the water coming from melting snows, and this is distributed by means of canals at the proper season. In the western portion of North and South Dakota, Nebraska, Kansas, Oklahoma, and portions of Texas and Saskatchewan, the rainfall is sufficient at certain periods, and irrigation is provided when there is less than the usual amount of rainfall. In some states, particularly in South Dakota and California, irrigation is effected to a considerable extent from artesian wells. In portions of South Carolina, Georgia, Texas, Louisiana, and other states irrigation takes on the form of inundation, which is an essential in the cultivation of rice.

The United States has an arid region estimated at 175,000,000 acres, of which about 10,000,000 have been reclaimed by irrigation. California reports the largest area of reclaimed land, about 2,100,000 acres, while Colorado has 1,500,000 acres, Montana 700,000 acres, Idaho 500,000 acres, and Utah 400,000 acres under successful cultivation. The largest irrigated area is in India, where 25,000,000 acres have been reclaimed. Egypt has 6,500,000 acres of reclaimed land, and this region will be greatly increased as the benefits of the Assouan dam are utilized more fully under projected extensions of the canal district. Italy has the largest irrigated area of Europe, about 3,000,100 acres, while Spain has 500,000 acres, and France has 410,000 acres.

Congress passed the Reclamation Act on June 17, 1902, which is greatly facilitating progress in reclaiming arid regions. Under this law 50,000 acres of land in Nevada were supplied with water in 1905 by the great Truckee-Carson system. It is so named from the Truckee and Carson rivers, which rise on the eastern slopes of the forest-clad Sierra Nevada Mountains in California, and flow in a general northeasterly direction into Nevada. The drainage basin of the former contains a number of beautiful lakes, including Lake Tahoe, all of which are to be utilized for flood storage. In Nevada these rivers flow for some distance parallel to each other, and at one point not more than twenty miles apart. The Truckee River then flows northward from Wadsworth, passing into Pyramid and Winnemucca lakes, and the Carson River, dividing into three channels, ultimately disap-

pears into Carson Sink. The illustration shows the Diversion Works on the Truckee River, where its water is turned into a large canal 31 miles in length and carried into the Dam Site on the Carson River, where the combined flow is directed into two large canals, one on each side of the river, which are the feeders for a distributing system of ditches hundreds of miles in length. It is estimated that 350,000 acres will be reclaimed eventually at an expenditure of \$9,000,000. Similar projects have been carried out or are under way in Colorado and other states.

**IRTISH** (ir'tish), or **Irtysch**, a river of Asia, the most important tributary of the Obi. It rises in the Altai Mountains, in China, and after a northwesterly course of 1,625 miles joins the Obi near Samarova. The valleys of the upper Irtish and its tributaries are among the best cultivated and well populated districts of Siberia, and through the region passes the Trans-Siberian Railroad. Tara, Omsk, and Tobolsk are among the ports on the Irtish.

**IRVINGTON**, a town of New Jersey, in Essex County, adjoining the city of Newark. It is noted as a residential center and has well-platted and improved thoroughfares. It has a public library and several fine schools and churches. The manufactures include clothing, wall paper, brushes, and machinery. Electric lights, street railways, and a system of sewerage are among the public utilities. The first settlement on its site was made in 1666. It was incorporated in 1898. Population, 1910, 11,877.

**ISCHIA** (ês'kê-ä), an island in the Mediterranean, situated about six miles west of Italy, near the Bay of Naples. The area is eighteen square miles. It is of volcanic origin, contains many thermal springs, and is noted for its healthful climate and production of excellent wine and fruits. Monte Epomeo, the highest point, is 2,617 feet above the sea. Among the chief industries are fruit culture, fisheries, and the entertainment of many tourists who visit it annually. Ischia is the capital and most important city, having a population of 7,008, and other towns are Forio and Casamicciola. Earthquakes are not infrequent, the most important of recent date occurring in 1883, when about 5,000 persons were killed. In the city of Ischia is a picturesque castle built by Alfonso I. of Aragon, in the 12th century. Population, 1908, 27,034.

**ISHPEMING** (ish'pê-ming), a city of Michigan, in Marquette County, fifteen miles west of Marquette. It is on the Duluth, South Shore and Atlantic and the Chicago and Northwestern railroads. The city is noted because large quan-



ties of red hematite iron ore are mined in the surrounding country. Among the manufactures are ironware, clothing, carriages, cigars, machinery, steam boilers, and utensils. The public school system carries a fine course of study. Among the municipal facilities are electric lights, pavements, a public library, and an extensive system of street railways. It was settled about 1857 and was incorporated in 1873. Population, 1904, 11,623; in 1910, 12,448.

**ISINGLASS** (ī'zīŋ-glās), the popular name of mica, a mineral of a metallic luster found in large deposits, remarkable for its tendency to split easily into thin, transparent, elastic plates. It is used as a substitute for glass in windows in Mexico, Siberia, and some countries in South America, and for lanterns, having the property of bearing sudden and marked changes in temperature without breaking. In the manufacture of stoves it is used for ornamental portions. It constitutes a valuable substitute for glass on war vessels, since it is not easily broken by the jar from the discharge of guns.

**ISINGLASS**, a gelatinous substance made from the air bladder of various kinds of fish. The best quality is secured from the bladder of the sturgeon, but the American product is made from the cod, hake, and other fishes. The purposes for which it is used include the manufacture of glue, court-plaster, a cement for glass and porcelain, and for refining sherries and white wine. It likewise serves for stiffening silks, linens, gauzes, and other textiles.

**ISLAM** (iz'lām), a word used by the Mohammedans to signify full submission to God, hence to designate their religion. It is applied to the whole body of believers who accept the formula of faith: "There is no God but Allah, and Mohammed is his prophet." In this profession of faith is included the acknowledgment of the divine unity and of the submission of Mohammed, the observance of prayer, alms giving, keeping the fast of Ramadan, and the pilgrimage to Mecca. To this the Shiites, who are dominant in Persia, add: "Ali is the vicar of God." However, the orthodox Mohammedans, who comprise the majority of the Church of Islam, reject the position thus assigned to Ali.

**ISLAND** (ī'lānd), a small body of land surrounded by water. The islands differ from the continent in that they are smaller in size, and range from very small islets to large tracts of land, such as Cuba and Great Britain. They were formed by corals, by volcanic action, or by being separated from the mainland through the action of waves and currents. To the last mentioned class belongs Great Britain, which

was probably separated by the action of currents from the continent of Europe. *Oceanic* or *pelagic islands* are located in the ocean, while *continental islands* lie near the continents and resemble them in geological structure. Oceanic islands are either coral or volcanic, with few exceptions. An *archipelago* consists of a group of islands, such as the Hebrides and the West Indies. The action of waves causes many changes on the coasts of islands, as in the case of Helgoland, which has been greatly reduced in the historic period.

**ISLAND NUMBER TEN**, an island formerly in the Mississippi River, near the boundary between Kentucky and Tennessee, about forty miles below Columbus, Ky. It was so named from its position below Cairo, Ill., being the tenth of a series of islands. The Confederates under General Pope had fortified it, and after the fall of forts Henry and Donelson it was commanded by General Mackall with a part of Beauregard's army. Commodore Foote, commanding seven Federal gunboats, bombarded it three weeks. At the same time an army under Pope operated against it, and the Confederates were compelled to surrender on April 7, 1862. About 7,000 prisoners and an immense quantity of ammunition and supplies were captured by the Federals. The river gradually washed the island away, the last portion of it disappearing in 1866.

**ISLANDS OF THE BLESSED**, in Greek mythology, the name of certain islands of the western ocean, regarded the abode of departed spirits and of certain favored mortals who were rescued from death by the gods. The locality is referred to by Homer as the Elysian Plain. The inhabitants were thought to enjoy an abundance of everything and live eternally in ease and comfort.

**ISLAY** (ī'lā), one of the Hebrides Islands, included in Argyllshire, Scotland. It is a short distance southwest of the island of Jura, from which it is separated by the Sound of Islay. The area is 220 square miles. It is the richest and most productive of the Inner Hebrides, hence is often called "Queen of the Hebrides." Population, 1907, 6,982.

**ISLE OF PINES**. See *Pines, Isle of*.

**ISLE ROYALE**, an island in the northwestern part of Lake Superior, located a short distance south of Port Arthur, Canada, and forming a part of Houghton County, Michigan. The surface is rocky, but it is rich in copper mines and fisheries. Low spruce and fir trees cover a considerable part of the island. It is about ten miles broad and forty miles long, and near it are a number of small islets. Siskawit Bay



is on the southeastern shore, and is the principal inlet.

**ISLES OF SHOALS**, a group of eight small islands off the coast of New Hampshire, about ten miles southeast of Portsmouth. They are inhabited by fishermen and are noted as a favorite resort for bathing, fishing, and general recreation. On Star and Appledore islands, containing 150 and 400 acres respectively, are a number of hotels for summer visitors, and on White Island is a revolving light 87 feet above the sea. Steamers run regularly from Portsmouth to the principal landings on the islands. Champlain discovered these islands in 1605 and they were visited by Captain Smith in 1614. The permanent inhabitants consist mostly of fishermen.

**ISOBARS**, or **Isobarometric Lines**, the lines which join places that have an equal atmospheric pressure. They are employed in making weather maps and charts. Formerly they were used to show only the pressure at sea level, but now such maps indicate the variations of gravity at different places. Charts constructed in this way usually indicate the places that have the same monthly and annual atmospheric pressure, hence are of importance in forecasting the weather. The so called *gradient of pressure* is the rate of change of pressure in a unit of horizontal distance. It is greatly influenced by the movement of air, especially strong winds, the latter tending to lessen the difference of atmospheric pressure. The gradient of pressure is greatest around a storm center and is least in the strongest currents of wind.

**ISOTHERMAL LINES** (i-sō-thēr'mal), the lines on a globe or map passing through places in which the mean temperature is the same. The first observations and collection of facts bearing on isothermal lines were made by Humboldt. *Isocheimnal* lines are drawn over places in which the winter temperature is the same, and *isothermal* lines are used to designate places having the same mean summer temperature.

**ISPAHAN** (is-pā-hän'), an ancient city of Persia, capital of the province of Irak-Ajemi, on the Zendarud River, about 210 miles south of Teheran. For centuries it was the capital of Persia and is still an important commercial center of the interior. It is situated in a fertile valley. A wall about 23 miles long incloses the city. The noteworthy buildings include the palace, a royal mosque, and many bazaars. It is ornamented with a large number of parks and public gardens of shrubs and flowers. The trade, though large, is carried on principally by caravans. It has manufactures of cotton,

woolen, satin, and velvet goods, glass, firearms, earthenware, brassware, sword blades, pottery, and trinkets. The surrounding country produces large quantities of tobacco, opium, and cereals. Ispahan attained to much power during the reign of the caliphs of Bagdad. It was captured by Timour in 1387. In the 17th century it contained a population of about 900,000. The capital was removed to Teheran in 1722, after Ispahan had been ravaged by the Afghans. It is now the seat of the high priest and the religious center of Persia, containing many institutions of educational importance. Population, 88,581.

**ISRAELITES** (iz'rā-ēl-īts). See **Jews**.

**ISTHMIAN GAMES** (is'mi-ān), one of the four great national festivals of Greece, celebrated on the Isthmus of Corinth, the other games being the Nemean, Olympian, and Pythian. They were celebrated in April or May of every alternate year, and consisted of boxing, wrestling, foot and chariot racing, gymnastics, throwing the discus, and contests in music and poetry. These games were of very ancient origin and were established in honor of Neptune (Poseidon). With the spread of Christianity they began to decline, but they were still celebrated in the time of Constantine and Julian. Those who took a prize were originally awarded with a garland of pine leaves, and later cash awards were given to the victors.

**ISTHMUS** (is'müs), a narrow passage of land connecting two larger bodies, or uniting a peninsula with the mainland. The ancient Greeks applied the name Isthmus without any addition to designate the Isthmus of Corinth, which connects the Morea with northern Greece. The Isthmus of Suez, connecting Africa and Asia, and the Isthmus of Panama, connecting North and South America, are the most prominent isthmuses.

**ISTRIA** (is'tri-ā), a peninsula in the northeastern part of the Adriatic Sea, forming the crown land of Istria, a part of Austria. With it are included the islands of Cherso and Veglia, the whole possession including an area of 1,910 square miles. The surface is diversified, being mountainous in the north and quite level in the south. Monte Maggiore, the highest peak, is 4,600 feet above the sea. Valuable forests abound. The minerals include salt, alum, and lignite coal, and the cultivated lands yield fruit and cereals. Large quantities of wine, olive oil, and lumber products are manufactured. Parenzo is the capital. It became a possession of Austria in 1797. Population, 1906, 345,506.

**ITALY** (it'a-lī), a kingdom of Europe, com-



prising chiefly the middle peninsula of the three that project from the southern coast of the continent into the Mediterranean Sea. Besides this, it includes the islands of Sardinia, Sicily, Elba, and about 65 others of more or less importance. Its length from Sicily to the Alps is about 690 miles, and in width it varies from 90 to 350 miles. The boundary line is formed on the north by the Alps, which trend from east to west in irregular ranges, and the Mediterranean and Adriatic seas form the principal portion of the remainder of the boundary. It is separated from the Balkan Peninsula by the Strait of Otranto, 47 miles wide. On the east it is bounded partly by Austria, on the north by Austria and Switzerland, and on the west by France. The western shore is washed by the Ligurian and the Tyrrhenian seas and the southern by the Ionian Sea, all being portions of the Mediterranean. Sicily, which extends almost across the Mediterranean, is separated from the mainland by the Strait of Messina. The mainland has an area of 91,000 square miles and the islands equal 19,684, making a total of 110,684.

**DESCRIPTION.** The Apennine Mountains traverse centrally the entire peninsula and attain to heights of from 10,000 to nearly 14,000 feet above sea level. In the vicinity of Naples the Apennines are little less than 10,000 feet, and in the northern portion the greatest height is 13,650 feet. Many of the summits are volcanic, though Vesuvius, on the Bay of Naples, is the only active volcano in the continent of Europe. Mount Aetna, in Sicily, is the highest volcanic elevation of Europe. Others of historic interest include Mount Stromboli in the Lipari Isles. In the northern part of Italy is the valley of the Po, popularly called the Plain of Lombardy, which embraces an area of 37,000 square miles. Much of the Italian mountain scenery is picturesque, the vegetation is abundant, and the valleys are remarkable for beauty and fertility.

Though the drainage is carried by numerous streams, the only rivers of large size are the Po and the Adige, both of which flow into the Adriatic Sea. The former is navigable to Turin, and with its tributaries affords navigation a distance of 600 miles. It is fed by the snows of the Alps and the rains of the Apennines, and enters the sea by a large delta. Among the rivers of the peninsula are the Arno, the Brenta, and the Tiber, but these and others of their class flow swiftly and are subject to great changes between the dry season in summer and the seasons of heavy rains. Many beautiful lakes are located in the central

and northern parts, among them Como and Bolsena, while Garda and Maggiore extend partly beyond the northern border. A system of canals is maintained in the basin of the Po and several of the rivers have been canalized, both for transportation and for irrigation of rice lands.

The climate varies greatly on account of the extent in latitude and vast differences in elevation. In the northern part the climate is continental, similar to that of Central Europe, but in the southern part it resembles that of Africa, being affected by the dry atmosphere and the sirocco winds that blow across the Mediterranean. The mean annual temperature on the peninsula is about 57°, while in the extreme south and on the islands it varies from 60° to 64°. The largest rainfall occurs in autumn and winter, hence irrigation must be utilized during the growing season in many parts of the kingdom. The valley of the Po is particularly fertile and is one of the best agricultural regions in the world. Extensive swamps are located in different sections, such as the Pontine marshes, the Maremma in Tuscany, the Campagna of Rome, and the swampy lands of the lower Po. These marshy regions are subject to pestilence and fevers, but all other parts are singularly healthful. The clearness and beauty of the Italian sky is famous.

**MINING.** The mineral wealth of Italy is not extensive. Coal, though found in limited quantities, is not produced to the extent that the output supplies the demand, hence the manufacturing enterprises are necessarily abridged. Lignite coal is obtained in Tuscany and in Sardinia, and small quantities of anthracite are mined in Piedmont. Sulphur is the most important mineral, constituting about one-half of the mineral output. The most productive sulphur mines are worked in Sicily, and small quantities are obtained in the mainland. The Italian sulphur mines are the most important in the world. A good grade of iron ore is found in the island of Elba. The zinc mines are confined chiefly to Sardinia and Lombardy. Copper is obtained in Tuscany and Piedmont, rock salt in Calabria and Sicily, and quicksilver in Tuscany. The marble quarries of Carrara are famous, but marble is obtained in other localities, especially in Massa and Serarezza. Other minerals include small quantities of gold, silver, and antimony. The mineral waters in various localities of the Apennines and the volcanic regions are especially suited for bathing and medicinal purposes.

**AGRICULTURE.** About 72 per cent. of the land is productive; hence agriculture maintains its



position as the leading industry. The land is held under three classes: peasant proprietorship, a system of rent, and a form of coöperative partnership. An extensive arid region and large stretches of swamp land have interfered with farming to a considerable extent, but the government is promoting a system of irrigation and drainage, through which several millions of acres will be added to the agricultural area. Wheat is the most important product and it is grown in all parts of the kingdom, but the crop is not sufficient to supply the demand. Corn is likewise grown in all parts of the country, but most largely in the provinces of Milan and Caserta, though some importation of this cereal is necessary to supply home consumption. The production of rice holds third rank, and the quantity grown is sufficient to supply the demand and to furnish considerable for exportation. Other important crops include oats, rye, barley, potatoes, hay, turnips, and vegetables. Small quantities of flax, cotton, and hemp are produced.

The breeding of live stock has not been developed to the extent of that industry in England and Germany, neither in the quantity and in the rearing of improved grades. Horses, cattle, swine, and sheep are exported, and cattle and goats are grown largely for meat and dairying to supply the home demand. The sheep industry is confined largely to the elevated and poorer regions of the peninsula, while the most extensive interests in cattle are in the northern part. Poultry and eggs are exported in large quantities. In Italy, having a favorable climate, much of the land area is devoted to the cultivation of fruits and silk cocoons. Fine groves of lemons and oranges are met with in the southern part, especially in Sicily and Sardinia. Italy produces a larger quantity of olives than any country in the world, and has large interests in such fruits as figs, dates, apples, quinces, and melons. The mulberry tree is grown in connection with silk culture, and is cultivated most extensively in the central and northern sections. Tobacco is cultivated profitably. A large forest area is maintained, much of which belongs to the government, and practically all of the timber land is under government supervision. The trees include the olive, myrtle, mulberry, lemon, chestnut, and numerous others.

**MANUFACTURES.** The absence of extensive fuel resources has made it impossible for Italy to develop rapidly as a manufacturing country, much of its coal supply being imported. Raw silk is the most important manufactured product, and is produced extensively in Lombardy, Piedmont, and Venetia. Cotton and wool are

spun and woven to a considerable extent, but the output is not sufficient to supply the demand. Macaroni is produced in large quantities, both for home consumption and for exportation. Considerable progress has been made the last two decades in the iron and steel industry, but the enterprise is greatly abridged by the absence of a sufficient supply of fuel. Butter and cheese of a fine grade are produced. Other manufactures include pottery, glassware, alabaster, chemicals, leather, and straw-plaited goods. The government has a monopoly of the manufacture of tobacco and salt, and government supervision is exercised over the manufacture of powder, sugar, chicory, alcohol, and beer. Having a favorable soil and a genial climate, large quantities of grapes are grown, and the manufacture of wine is correspondingly important.

**TRANSPORTATION.** The railways include a total of 11,200 miles. This is a smaller mileage than is now operated in any of the leading countries of Europe, but it is compensated for to some extent by the large transportation facilities along the coast of the Mediterranean, from which Italy secures great trade advantages with the cities of Southern Europe and on the Atlantic. Most of the railroads were built by the government or with government support, but they are now operated by private companies with the condition that they will revert to the state after they have been operated sixty years, or either party may terminate the contract at the expiration of each period of twenty years. A fine system of highways is maintained, partly by the nation and partly by the provinces and communes. These means of transportation, connected with the facilities afforded by rivers, canals, and steam and electric railways, afford communication with all the principal cities and districts of the country. The postal and telegraph systems are conducted by the government, and lines of telephones under public and private ownership afford excellent facilities. Submarine cables extend from the principal ports to the leading commercial centers in the world.

The trade of Italy is not as extensive as that of the principal European countries. At present the exports are somewhat exceeded by the imports. The largest foreign trade is with Germany, Austria, Switzerland, France, Great Britain, and the United States. Silk, wine, sulphur, raw flax, eggs, fruit, and olive oil are the chief exports. Among the leading imports are coal, wheat, raw cotton, machinery, fish, and raw wool. A large and active merchant marine is maintained.

**EDUCATION.** The system of schools is main-



tained and regulated by the government, either entirely or in conjunction with the communes or provinces. Attendance is compulsory in most parts of the kingdom, but the law is not efficiently enforced and the per cent. of illiteracy is considerably larger than in the countries of Northern Europe. Within recent years education has made rapid progress among the people, but in the southern part of the kingdom illiteracy is practically general. However, the higher institutions are efficient. The country has 21 universities, some of which have been celebrated many centuries for efficient work, especially those at Pisa, Padua, Genoa, Naples, Rome, and Palermo. The kindergarten system is modeled after that of Germany and the common schools are known as *lower grade* and *higher grade* elementary schools. Religious instruction is given to those whose parents request it. In addition are maintained night schools, Sunday schools, normal schools, gymnasia, colleges, and an extensive system of private educational institutions. Roman Catholic is the dominant religion, the Pope residing at Rome. Protestants and Jews constitute only a small portion of the people, but the exercise of religion is free to all.

**GOVERNMENT.** The government is a constitutional monarchy, dating from 1848, and for government purposes the kingdom is divided into 69 provinces. Chief executive authority is vested in the king, who holds his office by heredity. At present the royal family is that of Savoy. The king has power to negotiate treaties and declare war, and is commander of the army and navy. Though clothed with large prerogatives, the sovereign is dependent upon a minister to have his official acts made valid, which minister assumes personal responsibility when countersigning imperial orders. The departments of government include those of the treasury, interior, foreign affairs, war, marine, finance, justice and religion, public works, commerce, industry and agriculture, public instruction, and posts and telegraphs. Legislative power is vested in the parliament, which consists of a senate and a chamber of deputies. The former is composed of princes of the royal blood and members of the latter are elected by citizens over 21 years of age who can read and write. The senate contains 320 members and the chamber of deputies is comprised of 508 members. Military service is obligatory from 21 to 39 years of age, the period of active service ranging from two to five years. At present the army consists of 250,000 men and officers, which is increased on a war footing to 3,200,000. It is divided into the three divi-

sions known as the territorial militia, the mobile militia, and the permanent army. Its navy, though not equal to the most powerful, is in a state of healthful growth and includes a number of modern vessels.

Italy has not been particularly successful in its scheme of colonial expansion, its policy of keeping abreast with the great powers being at least a partial failure. At present the colonies are limited to Africa, where it has Italian Somaliland and Eritera. The former has an area of 100,000 square miles and the latter, 95,000 square miles. These possessions are populated mostly by nomadic peoples and have a population of about 730,000. The metric system is used in all weights and measurements and the monetary system is the same as that of France, except that the method of issuing paper money is somewhat different.

**INHABITANTS.** The inhabitants of Italy are of small stature and quite dark in complexion. Only a small number of foreigners reside in the country. The foreign inhabitants include principally French, Albanians, Greeks, Slavs, Germans, and Spaniards. A heavy emigration has been going on the last quarter of a century, due chiefly to the unsatisfactory condition of public affairs. Those who leave the country seek homes principally in the United States, Brazil, Argentina, and other countries of North and South America, and a considerable number find new homes in France, Germany, Austria, and Switzerland. In 1906 the total emigrants numbered 787,977, of whom 10,032 came to Canada and 358,569 to the United States.

Rome, on the Tiber, is the capital and largest city. Other cities of importance include Naples, Milan, Turin, Palermo, Genoa, Florence, Bologna, Messina, Venice, and Ravenna. The population has increased about fourteen per cent. in the last twenty years, and the density at present is 285 people to the square mile. In density of population it ranks third among the countries of Europe, being exceeded only by Belgium and the Netherlands. Population, 1907, 33,640,710.

**LANGUAGE AND LITERATURE.** The language of Italy is the Italian, which descended from the Latin. From the same source sprang the Spanish and French, but they are allied with other local elements, which make them more distinct from the Latin than the language of Italy. The German emperor, Frederick II., who ruled in Italy from 1212 to 1250, established the University of Naples and made the Italian his court language in Sicily. This circumstance may be taken as the first step to place the Italian language among those to survive the general up-



heaval after the Middle Ages, and soon after writers and teachers began to multiply, especially in Tuscany. By the end of the 13th century Italian, owing to its accuracy and poetic beauty, began to take precedence as the language of literature. It was greatly extended in popularity by the writings of Dante (1265-1321), who gave it the form in which it has prevailed in an almost unchanged condition until the present. The "Divine Comedy" is Dante's masterpiece, and still continues a work of much popularity. Petrarch and Boccaccio, in the 14th century, wrote works in prose that greatly improved the language in grammatical accuracy. The best known work of Petrarch is his "Parallel Lives," while to Boccaccio we are indebted for his "Decameron," a work in prose from which Chaucer, Schiller, and other subsequent writers drew much inspiration.

Florence became the great center of classic learning after the Middle Ages, but other noted centers of education aided in extending a taste for literary work. Alberti (1406-1472), an eminent poet and prose writer, is best known by his "On the Family." The great political reformer, Savonarola, added valuable orations to the literature. Ariosto (1474-1533), an eminent poet, is the author of "Orlando Furioso," an epic of chivalry which is still popular. Among the historians of this period is Machiavelli (1469-1527), who is the writer of "Prince," a work translated into many languages. Benevenuto Cellini (1500-1571) gave tone and tendency to literature by fine, artistic work, while Torquato Tasso wrote many dramas and poems, the latter including "Jerusalem Delivered," and to the same period belong the painters Titian and Raphael. Galileo, in the 17th century, produced numerous scientific writings which for clearness and purity of prose, linked with his discoveries in astronomy, gave immortality to his name. At the end of the 18th century we note the tragic writings of Alfieri, including "Agamemnon," "Philip II.," "Antigone," and "Marie Stuart." Vincenzo Monti (1754-1828) made an excellent translation of the "Iliad" and "Odyssey," while Carlo Goldoni (1707-1793) ranks as a famous comedian, and Silvio Pellico (1788-1854) produced numerous patriotic and historical writings. Among the writers of the 19th century are Gabriele Rossetti (1783-1854), a poet of considerable renown, and the novelists Manzoni and Rosini. The historians of this period include Capponi and Balbo, the political writers, Joseph Mazzini, and the satirists, Giusto.

Italian literature, though quite extensive in scope and character, has hardly touched the people with as marked an impression as that of

France, Germany, and England, largely because education has not been so widely disseminated within the regions where the Italian language prevails. However, with the larger encouragement of schools and higher institutions of learning there came a notable increase in interest, and the 20th century opened with prospects that before its close additions of wide scope will be made and general interest will become greatly extended. Among the recent writers of Italy may be named the historians Giovanni Monticcolo and Vittorio Fiorini; the poets, Arturo Graf, Giosuè Carducci, and Gabriele d'Annunzio; the novelists, Matilde Serao; the dramatist, Roberto Bracco; and the general writers, Eugenio Rossi and Nicola Zingarelli.

**HISTORY.** The history of Rome (q. v.) includes the early history of Italy. Prior to Roman supremacy Italy was peopled by various Italian tribes, including the Etruscans, Oscans, Latins, Umbrians, and Sabines. Of these the Latins attained to the greatest power and gave their language and name to the people. At present there are few traces of the first inhabitants. In the northern part the Germanic element is mingled with the native peoples, especially in Lombardy, while in the southern section are many descendants of former Greek colonists. At present the people of Italy partake of the characteristics of the early Romans, Gauls, and Germanic peoples.

The history of Italy proper begins with 476, when Rome fell under the invading Heruli, who comprised the barbarian tribes that proclaimed Odoacer King of Italy. Theodoric the Great, King of the Ostrogoths, obtained possession in 493, and by wise administration gave Italy a more wholesome government than had been experienced since the first decline of Roman prosperity. However, the Eastern emperor, Justinian, vanquished the Ostrogoths in 552, and Italy was governed from Constantinople, where the Eastern Empire had held sway since 395. The Germanic Lombards secured dominion in 568, and in 800 Charlemagne became the recognized ruler of Italy.

The Carlovingian dynasty gave eight kings to Italy, and in 951 Otto, King of Germany, reduced Berengarius II. to vassalage and ten years later was crowned King of Italy and Emperor of Rome. For more than two centuries German kings governed Italy. However, numerous wars for supremacy took place periodically between the popes, emperors, and the independent cities, and at that time rose the famous contest between the Guelphs and Ghibellines. Frederick Barbarossa, the emperor, stipulated a six years' peace at Venice in 1177,





VICTOR EMMANUEL III.

The King of Italy, Victor Emmanuel III., was born November 11, 1869. He studied at Rome and received a command in the national division of troops stationed at Naples. In 1896 he married Princess Helene of Montenegro. He succeeded his father, Humbert I., in 1900.







and concluded a treaty with the Lombard towns in 1183. The municipalities of Genoa, Venice, Milan, and Pisa flourished during this period, and Venice became the supreme power in the Levant, after the capture of Constantinople. The popes became temporal sovereigns of Rome in 1278, and an effort made by Henry VII. to restore German supremacy was defeated in 1312 by the Guelphs. Three years prior to this, in 1309, the papal seat was established at Avignon, and from there the papal power was exercised for seventy years. The history of Italy as an integral political body ceases in the 14th century, when five powers controlled the country and continued to hold supremacy until about the end of the 15th century. These five powers include the former republics of Venice and Florence, the duchy of Milan, the kingdom of Naples, and the Papacy.

In Florence arose the Medici family, which by its wealth and sagacity had almost absolute sway, but the Battle of Pavia, in 1525, gave the German emperors appointive power over several of the states. With the rising power of Florence was exemplified the influence of Savonarola, under whose activities political opinion was influenced largely. Within the 16th century the rival armies of different claimants struggled for supremacy, particularly those of Charles V. of Germany and Francis I. of France, by which the papal influence gained in strength. Francis I. was expelled from Italy shortly after the Battle of Pavia, after which Rome was captured and Pope Clement VII. became the prisoner of Charles V., in 1527. Two years later Charles V. attained supremacy by the Peace of Cambrai, and his son Philip was recognized undisputed sovereign by the Treaty of Cateau-Cambresis, giving the Hapsburgs undisputed control. The establishment of the order of the Jesuits and the Inquisition strengthened the Papacy, and in 1684 Venice conquered the Peloponnesus. However, the Peace of Utrecht, in 1713, gave Austria supremacy in Milan, Naples, and Sardinia. After prolonged wars the condition of Italy was one of apathy, its spirit of nationalism remaining crushed until the rise of the French Revolution, when it began to take on new life.

In 1796 Napoleon invaded Italy, was successful against the Austrians in the Battle of Marengo, in 1800, and five years later was crowned king. Soon after several districts were annexed to France and the following year, in 1806, Joseph Bonaparte became King of Naples, who, two years later, was succeeded by Murat. Napoleon held undisturbed sway in Italy until 1814, when Murat and Austria coöperated

against Napoleon, but Murat was dethroned and by court-martial was sentenced to death. In 1815 the Congress of Vienna restored Italy to its former state. At the same time the house of Savoy received Sardinia, the Hapsburg-Este family secured several principalities, and the wife of Napoleon, Maria Louise, received Parma. Lucca was given to the Duke of Parma, the Austro-Lorraine dynasty received Tuscany, the Pope was restored in the papal states, the Bourbons received Naples, and Monaco and San Marino secured independence.

These conditions existed more or less undisturbed until the Revolution of 1848, which broke out in Milan and Sicily, and the Italian people again became involved in a war for national union against foreigners. The movement received the support of the Pope in the beginning, but later it was withdrawn, whereby the national cause was weakened materially. In 1849 the Pope fled from Rome, a republic was proclaimed, and Mazzini became president. A French army of occupation restored the Pope in 1850 and other sovereigns were restored also, making the revolution fruitless. Victor Emmanuel II., King of Piedmont, gave aid to the national cause and was supported by Cavour of Sardinia and by Garibaldi. The Austrian army was defeated on June 14, 1859, at the Battle of Magenta and on June 24 at Solferino, after which the Peace of Villafranca was concluded. Victor Emmanuel was declared King of Italy in February, 1861, by the Italian parliament in session at Turin.

In the War of 1866 between Prussia and Austria, Italy was allied with the former, and, after the victory at Sadowa, Venetia was annexed by treaty to Italy and about the same time the capital was removed from Turin to Florence. In 1867 the national party under Garibaldi made an attack upon Rome, but was opposed by the papal army. However, on Sept. 20, 1870, Victor Emmanuel entered Rome, this being made possible by Napoleon III. withdrawing his troops to participate in the Franco-German War, and the emancipation of Italy was assured. The Pope was given a yearly donation of \$622,500. He retained possession of the Lateran Palace, the Vatican, the Church of Saint Maria Maggiore, and the villa of Castel Gandolfo. Reunited Italy entered with enthusiasm upon an era of nationalism, developed internal improvements, and regained its place as one of the great powers of Europe. In 1872 destructive eruptions of Vesuvius occurred, when much property and many lives were destroyed. Victor Emmanuel died in 1878. He was succeeded by his son, Humbert I., who



ruled with success until 1900, when he was assassinated, being succeeded by his son, Victor Eminent III. Italy became a member of the Triple Alliance with Germany and Austria in 1883. Though financially embarrassed at various times on account of protracted wars, the finances are assuming greater stability under continued national development. An earthquake destroyed the cities of Messina and Reggio in 1908 and changed the contour of the Strait of Messina. See **Earthquake**.

**ITCH**, a contagious disease of the skin, characterized by the appearance of small pustules, irritation, and uneasiness, by which the patient is inclined to rub the affected parts. It is caused by the itch mite, a microscopic insect that burrows within the epidermis. The eggs are laid in the skin by the female, hatch in about ten days, and give rise to the disease. An application of lard and sulphur to the affected parts is a common remedy.

**ITHACA** (ith'â-kâ), a city in New York, county seat of Tompkins County, at the southern end of Cayuga Lake, .36 miles south of Auburn. It is on the Lehigh Valley, the Delaware, Lackawanna and Western, and other railroads. The surrounding country is agricultural and dairying. The noteworthy buildings include the county courthouse, the Ithaca Conservatory of Music, the high school, and many fine churches. Cornell University occupies a fine site near the lake. It has electric lights, a public library, waterworks, pavements, and street railways. Among the manufactures are vehicles, paper, farming machinery, flour, clocks, musical instruments, typewriters, leather, glass, and firearms. The vicinity was settled in 1789. Ithaca was incorporated as a village in 1821 and became a city in 1888. Population, 1910, 14,802.

**ITHACA**, now called *Ithaki*, an island of the Ionian group, situated west of Greece. It is sixteen miles long and four wide. The area is 38 square miles. It has a mountainous surface, some of the elevations rising to a height of 2,600 feet. The inhabitants engage largely in agriculture, fruit growing, and marine life. Ithaca is mentioned by Homer in the "Odyssey" and contains many interesting relics. Vathi is the present capital, has a population of 6,010, and engages in commercial enterprises. The island has a population of 11,508.

**IVORY** (iv'ô-rÿ), the hard substance that constitutes the greater part of the tusks of certain animals, as the elephant, narwhal, hippopotamus, mammoth, and walrus. The value of ivory is in its elasticity, hardness, whiteness of color, fine grain, and capability of taking a high polish. Elephant ivory obtained in equa-

torial Africa is considered the most valuable on account of its exquisite fineness, close arrangement, and frequent curvature of the tubules. The tusks of elephants commonly weigh about 60 pounds each, but some reach 180 and even 200 pounds. Ivory is useful in making ornaments, handles for knives and forks, billiard balls, pianoforte keys, and many other useful articles. Ivory taken from the hippopotamus is much harder and of a clearer white than elephant ivory, and is preferred by dentists. Mammoth ivory is secured from Siberia, where it is found as a fossil of that extinct animal. Ivory black is a black powder used in painting, and is made from sawdust and shavings of ivory by burning. Different colors, such as green, red, and black, can be given to ivory by staining or dyeing. In ancient times ivory was quite as valuable as at the present, ranging in price from \$200 to \$350 per hundredweight, the value depending upon its purity. Solomon brought ivory from Tarshish and used it in making a throne of ivory and gold. Ivory is mentioned by Homer. In the year 400 B. C. Phidias made statues from it, plating them with gold. Specimens of ivory used in manufacture in the times of Moses are still preserved as Egyptian relics, while in many European museums are carvings in ivory made in Nineveh and other ancient Asiatic cities. The annual ivory trade of Africa is considerable, on account of which the elephant is gradually decreasing in numbers.

**IVORY, Vegetable.** See **Ivory Palm**.

**IVORY COAST**, a colony of France in West Africa. It is bounded on the north by Senegal and the French Military Territories, east by the British Gold Coast, south by the Gulf of Guinea, and west by Liberia. The possession has a coast line of 400 miles, along which the surface is flat, and in the southwestern part is Cape Palmas. The area is 125,250 square miles. As a whole the climate is hot and unhealthful to Europeans. Large tracts of forest characterize the interior, interspersed with extensive savannas. The western boundary is formed by the Cavalry River. Other streams include the Songan, Bandama, and Tanno. Toward the north the country gradually rises, but all of the vegetation is luxuriant. The forests yield large quantities of mahogany, palm oil, rubber, and resinous plants.

All parts of the gold coast have an abundance of rainfall, but the greatest precipitation occurs between February and July. In the months of August and September is a short dry season, but copious rains begin to fall in October. Considerable trade is carried in vari-



ous products, especially in coffee, bananas, maize, pineapples, rubber, and cocoanuts. The larger portion of the trade is with France. Grand Bassam and Grand Lahou are the chief seats of trade, and gold deposits occur near the former. Bingerville is the seat of administration. Ivory Coast has been a French possession since 1842, when several forts were established, and the extensive explorations of the interior date from 1885, under Captain Binger. The period of development began in 1887. Subsequently a railway line and telephone and telegraph communication were established. The colony is profitable territory, since it has great wealth in natural resources, especially in its extensive forests. It is administered by a lieutenant governor, who is subject to the governor general of French West Africa. Population, 1908, 2,054,000.

**IVORY PALM**, a plant native to South America, found in the Peruvian Andes and on the Magdalena River, valuable in commerce on account of yielding the vegetable ivory. It is palmlike, rather low growing, and occurs principally in damp localities. Its leaves are very large, different plants bear male and female flowers, and the fruit forms in clusters or drupes, often the size of a man's head. The drupes are massed together, having from five to nine nuts about as large as hens' eggs, and contain a close-grained and very hard albumen, resembling in color and texture the finest ivory. Ivory-palm albumen is used extensively in the manufacture of ornaments, buttons, umbrella handles, knobs for doors, and small trinkets, and is known as *vegetable ivory*. The seeds, called *corozo nuts*, are exported in large quantities from the northern part of South America to foreign markets.

**IVY**, a climbing plant of the ginseng or ivy family. It is native to Europe and Asia and is cultivated extensively as a climbing shrub for the walls of churches and dwellings, the stems becoming attached by means of radiating fibers. In the wild state the lower branches spread on the ground, and the main stems climb upon trees and other supports by means of aerial rootlets. The leaves are evergreen, have a smooth and shining surface, and are from three to five lobed. Many species of these plants are widely distributed, most of which bear greenish flowers and deep green or blackish berries. They include the *common ivy*, the *Japanese ivy*, and the *Virginia creeper*. Some of these plants attain a great age, growing to the top of high buildings, and developing stems several inches in diameter. Both the roots and leaves have medicinal properties, but

they are not important. In some countries the plant serves in the manufacture of baskets and other useful articles. The *American ivy* found commonly in the woods is a species of woodbine.

**IXGAQUIXTLA** (ēks-kä-kēks'tlä), a town of Mexico, in the state of Puebla, southeast of the City of Mexico. It was the scene of an important battle between the Mexican revolutionists under General Mier of Teran and



IVY.

1. Ivy with aerial rootlets; 2, Five-lobed leaves.

the Spanish forces under La Madrid. The town is occupied at present by native Mexicans and Indians. In its vicinity are numerous remains of antiquity. Population, 1906, 5,105.

**IXTAPALAPA** (ē-stā-pā-lā'pā), a town of Mexico, ten miles southeast of the capital, celebrated in early history for its splendid gardens of the Aztec emperors. It contains remains of ancient temples and altars of Aztec priests, but few traces of the ancient city now remain. At the time of the conquest by Cortes it was an important place. Population, 1906, 5,046.

**IZALCO** (ē-säl'kō), **Mount**, a volcano of Central America, in Salvador, 35 miles northwest of the city of San Salvador. It belongs to a group of extinct volcanoes, but itself is almost constantly in action, giving to the earth a trembling and rocking motion. This volcano was formed in 1770 and since then has been destructive at various times. The height is about 2,000 feet, but it is becoming higher gradually. It is one of the few incidents known to recent geographers where a mountain was formed in an open plain, thereby changing several streams and drainage basins.

**IZTACCIHUATL** (ēs-tāk-sē'whät'l), an extinct volcano of Mexico, situated near Popoca-

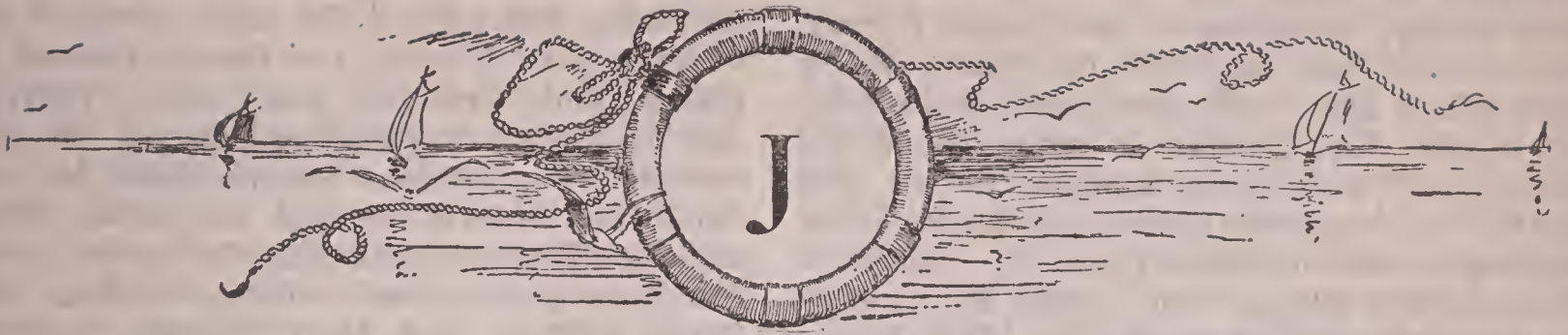


tapetl, forty miles southeast of the City of Mexico. It is covered with snow perpetually, whence the name, which means *White Lady*. The height is 16,705 feet above sea level.

**IZÚCAR** (ē-sōō'kär), a city of Mexico, in the state of Puebla, situated in a sugar district near the volcano Popocatapetl. The name Mat-

amoras Izúcar is sometimes applied to it in honor of the Mexican patriot of that name. It has good railroad connections and is noted for its sugar market. The chief buildings include the cathedral and several parochial schools. It has considerable trade and divers manufactures. Population, 1906, 12,985.





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JACKAL

**J**, the seventh consonant and tenth letter of the English alphabet. It is classed as a palatal, its sound being that of *g* in *gem*, or of *dg* in *ridge*. Formerly it was interchangeable with *i*, the same character being used for both, and the separation of the two letters in English lexicons is comparatively recent. The sound does not occur in the Anglo-Saxon and was introduced from the French. It is used as a symbol in medical prescriptions at the end of a series of numbers, as *vij*=seven, *viiij*=eight.

**JABIRU** (jäb'î-rōō), the name of several birds of the stork family, native to Africa, Australia, and the tropical parts of South America. An American species is sometimes seen as far north as Florida. The body is about four feet long, with a wing extension of seven feet, and the plumage is white. The head and neck are black with reddish markings and are destitute of feathers. It is the only true American stork.

**JACANA** (jäk'ä-nä), the name of several species of small wading birds native to the warmer parts of the continents. They are related to the plovers, but quite closely resemble the rails. The toes and claws are remarkably long and slender, enabling them to walk on the floating leaves of water lilies and other aquatic plants while in search of food. The common jacana of South America is about ten inches long, has a black color marked with bright chestnut, and is abundant in Brazil and Guiana. The purple jacana is met with in Mexico and Texas and is peculiar in having a strong spur at the bend of each wing, which it uses in fighting its enemies. Several species are native to Australia and Africa, including the so-called lotus bird, named from its habit of frequenting places where the lotus grows.

**JACK**, a mechanical or hydraulic apparatus for lifting heavy weights. The simplest form

is the screw jack, which serves to apply much lifting power, while with a hydraulic jack a single man is able to raise ten tons one foot in a minute and a half. Jack is a nickname for John. It is the name of a flag used in the navy of the United States and Great Britain, which is displayed nearest the staff or on the end of the bowsprit. Jack is likewise the name of a species of the breadfruit tree found in the South Sea islands, which bears a large fruit, often weighing thirty pounds. The fruit is eaten extensively by the natives.

**JACKAL** (jäk'al), an animal which is similar to the dog, native to many parts of Asia and Africa. It somewhat resembles the fox and



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wolf, but is smaller than any of the wolves. The pupil of the eye is circular, as in the dog and wolf, but the tail is more nearly like that of the fox. Jackals live in holes in the ground, have a dirty color, and eat any kind of flesh. They come out of their places of hiding to search for food during the night, often in large packs, running down the animals on which they feed. In some countries they skulk around



the camps of armies where they devour the refuse matter or dig up the hastily buried dead. The jackal is easily domesticated and interbreeds with the dog.

**JACKDAW** (jăk'dă), a common bird of the crow family, belonging to the genus *Corvus*. It is smaller than the rook, has white eyes, a short bill, a gray neck, and glossy black back and wings. The jackdaw is native to all the continents, but is more common in the Old World. It frequents towns and cities, often building its nest in chimneys, spires, towers, or other elevated places. The female lays five or six greenish eggs, covered with dark brown spots. Its food consists of larvae, insects, and worms. Jackdaws, like the crows, are very social birds, being easily domesticated, and learn to imitate the human voice.

**JACK-IN-THE-PULPIT**, or **Indian Turnip**, a flowering plant common in moist and shady woods. It is a perennial herb, has a turnip-shaped root, and usually bears two leaves made up of three leaflets. The root is acrid, or biting, and is used to some extent in medicine. It has small flowers grouped together and surrounded by a greenish leaf, which falls away and the red berries become exposed. About the middle of the summer all parts wither, except the stem and the berries. This plant thrives in gardens when planted in a cool and moist place.

**JACK RABBIT**, the name of a very large rabbit which is found on the plains of North America, but is seldom seen east of the Mississippi River. It has large ears and is noted for its long leaps and great speed. Though gray in summer, it becomes white in winter. The jack rabbit is sometimes confounded with the Norwegian hare, which has been introduced into the United States, but has a much heavier body.

**JACKSON** (jăk'sŭn), a city of Michigan, county seat of Jackson County, on the Grand River, 35 miles south of Lansing. It is on the Grand Trunk, the Lake Shore and Michigan Southern, the Michigan Central, and other railroads. Large quantities of fruit and agricultural products are grown in the vicinity. The noteworthy buildings include the county courthouse, the public library, the Federal building, the State prison, and the high school. It has extensive car and machine shops of the Michigan Central Railway. The manufactured products include machinery, vehicles, pumps, cigars, agricultural implements, beverages, and woodenware. Near the city are extensive coal mines, which supply a large portion of the fuel required in manufacturing. It has an extensive jobbing

trade. The vicinity was settled in 1829 and the city was incorporated in 1857. Population, 1904, 25,300; in 1910, 31,433.

**JACKSON**, a city of Mississippi, the capital of the State and the county seat of Hinds County, on the Pearl River, 180 miles north of New Orleans, La. It is on the Illinois Central, the Queen and Crescent, and other railroads. Among the noteworthy buildings are the State capitol, the institutions for the blind, deaf, and dumb, the Federal building, the public library, and the Governor's mansion. It is the seat of the State penitentiary, Millsaps College, Bellhaven College, and Mary Holmes Industrial Seminary for colored girls. The municipal facilities include paved streets, waterworks, electric lighting, and a system of sewerage. Among the manufactures are cotton goods, farming implements, and tobacco products. It has a large trade in merchandise, cotton, and farm products. The region was settled about 1828 and the place was incorporated in 1840. General Grant occupied it with a Union force in 1863 and the next year it was partly destroyed by General Sherman. Population, 1910, 21,262.

**JACKSON**, a city of Ohio, county seat of Jackson County, 45 miles northeast of Portsmouth, on the Baltimore and Ohio Southwestern, the Detroit Southern, and other railroads. It has a county courthouse and several fine schools. Extensive coal and iron mines are worked in the vicinity. The manufactures include leather, woolen goods, ironware, flour, and machinery. Electric lights, waterworks, and sewerage are among the public utilities. It was settled in 1795 and incorporated in 1847. Population, 1900, 4,672; in 1910, 5,468.

**JACKSON**, a city in Tennessee, county seat of Madison County, on the south fork of the Forked Deer River, 85 miles northeast of Memphis. It is on the Mobile and Ohio, the Illinois Central, and other railroads. Among the noteworthy buildings are the county courthouse, the public library, the Memphis Conference Female Institute, the Southwestern Baptist University, a colored female seminary, and numerous fine business blocks and private residences. Highland Park is a fine public resort. The manufactures include flour, woolen goods, ironware, ice, cigars, furniture, pottery, cotton-seed oil, and farming implements. The surrounding country is agricultural and produces large quantities of cotton, cereals, and live stock. It is the seat of a large and important jobbing trade. The city has street railways, electric lights, pavements, waterworks, and other conveniences. It was settled in 1810 and incorporated in 1854. Population, 1900, 14,511; in 1910, 15,779.



**JACKSONVILLE**, a city of Florida, county seat of Duval County, on the Saint John's River, 150 miles southwest of Savannah, Ga. It is on the Southern, the Seaboard Air Line, the Florida East Coast, and other railroads. Steamship lines connect it with the leading ports of Cuba and the Atlantic coast. The noteworthy buildings include the county courthouse, the Union Depot, the Federal building, the Windsor Hotel, the Confederate Soldiers' Home, the Masonic Temple, the Duval high school, the Church of the Good Shepherd, and many charitable institutions. It has a fine beach and many hotels for the accommodation of invalids and visitors. Among the manufactures are cigars, clothing, packed fruit, spices, ice, and machinery. Large quantities of cotton, fruits, and lumber are exported.

Jacksonville is the largest city of Florida. It has long been a popular resort. Many of the streets are well paved with macadam and vitrified brick. The waterworks and electric light plant are owned by the city. It was founded in 1822 and named in honor of Andrew Jackson. A fire destroyed many blocks of the city in 1901. Population, 1900, 28,429; in 1910, 57,699.

**JACKSONVILLE**, a city of Illinois, county seat of Morgan County, 34 miles west of Springfield. It is on the Wabash, the Chicago and Alton, the Chicago, Burlington, and Quincy, and other railroads. The city is noted for its numerous educational institutions, among them the Illinois Woman's College, the Jacksonville College for Young Women, and the Illinois College, which includes Whipple Academy. It is the seat of the State institutions for the blind and the deaf and dumb. Other noteworthy features are the Carnegie public library, the county courthouse, the high school, and the Morgan County fair grounds. The leading industries include flouring mills, machine shops, and a woolen mill. It has manufactures of ice, vehicles, draining tile, railroad cars, candy, boilers, paper, and soap. The city is beautified by paved streets, public parks, waterworks, and an extensive street car system. It was platted in 1825 and incorporated in 1867. Population, 1900, 15,078; in 1910, 15,326.

**JACKSTONES**, a game played with small marbles or with pieces of iron. It is a popular amusement among children and is played in a variety of ways. Anciently it is said to have been played with the knuckle bones of sheep. Usually it is played with five stones, which are thrown in the air and caught on the back of the hand. Another way is to hold the five stones in the hand, then toss one of them into the air, the test being to lay the remaining four

stones on the ground and catch the one that has been tossed up before it can land.

**JACOBINS** (jäk'ô-binz), the most celebrated political club maintained during the French Revolution. It was organized at Versailles in 1789, when it was called the Club Breton. When the national assembly was removed to Paris, it increased rapidly in numbers and importance. Gradually it grew to greater controlling power than the national assembly, and by the year 1791 had 1,200 subordinate societies. Its height of power was reached in 1792, when it was foremost in the insurrectionary movements. The Commune of Paris was originated by the Jacobins, and through Robespierre they ruled supreme until his overthrow in 1794. After the execution of Robespierre, the club was prohibited by law and its halls were closed. Extreme revolutionists and those holding radical views in politics are often designated Jacobins.

**JACOBITES** (jäk'ô-bitz), the name of a Christian sect of Western Asia, confined chiefly to Syria and Mesopotamia. They were so named from Jacobus Barbadæus, Bishop of Edessa, who united them into a distinct religious sect. They are Monophysites in belief; that is, they maintain that the divine and human natures in Christ were so united as to form only one nature. The patriarch of Antioch is the head of the present Jacobites, and his appointment is subject to confirmation by the Sultan of Turkey. Three bishops and eight metropolitans are under the patriarch, who has his seat at the monastery of Zaphran, near Mardin. The Copts of Egypt originated from the Jacobites and like them hold to the doctrine of the single nature of Christ. They use the Syriac language in their church service, practice circumcision before baptism, and in most other respects they resemble the orthodox Greek Church.

**JACOBITES**, a party in Great Britain, who adhered to the male line of the house of Stuart after the revolution of 1688. They were numerous and powerful in Scotland, and for more than half a century continued to advocate the restoration of the dethroned James II. and his descendants. They rose in revolt in 1715 and in 1745, but the party became extinct after the death of the Pretender, Charles Edward, in 1788. In Ireland the Jacobites were supported by the Celts against the Saxons and by the Roman Catholics against the Protestants.

**JACOB TOME INSTITUTE**, an educational institution at Port Deposit, Md., established in 1894 by Jacob Tome. It was founded to promote secondary education, hence serves as a preparatory school for entrance into col-



lege or technical and professional schools. The departments include the kindergarten, a junior school for boys and girls, a high school for girls, a boarding school, and a high school for boys. The annual tuition is \$100, except for residents of Maryland, who are admitted free. The endowment is \$2,125,000, the library has 10,000 volumes, and the value of the property is \$850,000. About 600 students are in attendance.

**JACQUERIE** (zhák-rě'), **Insurrection of the**, the name of a war conducted by the peasants against the nobles of France. It began in 1358, at the time John II. of France was a prisoner in England. The insurrection was caused by the tyranny of the nobles and had its beginning near Paris, whence it extended rapidly to the valley of the Marne and elsewhere. At first the peasants were successful and committed many atrocities, but they were defeated near Meaux by Charles the Bad of Navarre. The nobles retaliated by killing many peasants and burning their villages. The name *Jacquerie* signifies clowns, or *Jaques*, and is derived from *Jacques Bonhomme*, a name frequently applied to French peasants.

**JADE**, the name of a species of hornblende. It is composed chiefly of silica, calcium, magnesium, and alumina, and is valued for its hardness and toughness. The primitive peoples used it for making ornaments and utensils, and it is still employed as material for carved objects by the Chinese. Jadeite implements are found among the prehistoric ruins of Mexico, Peru, France, Spain, and Central America. Axes and adzes made of jade are seen frequently in museums, such as the famous adze found at Oaxaca, Mexico, which is now in the American Museum of Natural History in New York City.

**JAFFA.** See *Joppa*.

**JAGANNATH** (jüg-ü-nät'), or **Juggernaut**, meaning "Lord of the World," the name applied to the Indian god Krishna. The term likewise has reference to the eighth incarnation of Vishnu and to numerous images of this deity, the most celebrated being at Puri, a city near the Bay of Bengal. The first mention of this god occurred in 318 B. C., and numerous temples and statues were erected to him at various times since. The image is wooden and has a black face, red body, and gilt arms. The mouth is usually extended and the eyes are formed of brilliant stones. It is worshiped on festal occasions by assemblages of pilgrims who give offerings in money. Formerly they dedicated

themselves in sacrifice by throwing themselves on the ground for the purpose of having the car on which the idol is mounted pass over their bodies. The deluded and confiding worshipers thought that this form of death was instrumental in conveying them into heaven. Since European occupation the practice has gone gradually into disuse, deaths occurring at the festivals now being rather accidental than designed.

**JAGUAR** (jä-gwär'), the American tiger, the largest representative of the cat family in America. It abounds chiefly in South America, though it is found in the region south of a line drawn due west from the boundary between North and South Carolina. It has a soft, rich fur, usually yellow, with large black spots, and within them are rings with smaller black spots.



JAGUAR.

In strength it is little inferior to the tiger, being nearly three feet high. The limbs are large, the body is thick, and the tail is long and of nearly equal thickness throughout. The jaguar is the largest carnivorous animal native to America. Its favorite abode is in the timber, where it lives chiefly on birds, monkeys, peccaries, and other animals. It can readily climb trees and often springs upon its prey. The hide of the jaguar is valuable for footwear and gloves.

**JAIPUR** (jī'pōor), or **Jeypore**, a city of India, capital of a native state of the same name, situated 850 miles northwest of Calcutta. It is important as a railway center, is inclosed by fortified walls, and has a large trade in produce and merchandise. The chief buildings include the palace of the Maharaja, the Mayo Hospital, the Sanskrit College, a school of art, and a meteorological observatory. It is lighted



by gas and electricity, has wide and substantially paved streets, and supports a well-constructed system of waterworks. The public park has a fine zoölogical section. Among the manufactures are muslins, jewelry, clothing, and carpets. The city was founded in 1728. Population, 1906, 168,109.

**JALANDHAR** (jä'lün-dür), or **Jullundur**, a city of India, capital of a district of the same name, 75 miles east of Lahore. It is located in the Punjab, in a fertile agricultural region, and is important as a railway and commercial center. The streets are regularly platted and well paved. It dates from an early period in the history of Asia. In the 4th century B. C. it was the capital of the kingdom of Rajput Katoch. Population, 1906, 69,235.

**JALAP** (jä'lap), a well-known purgative medicine obtained from the tuberous root of several plants found near Jalapa, Mexico, hence



JALAP.

its name. It grows on a tableland 6,000 feet above sea level, and is a twining plant with large white flowers and a turniplike root. Jalap is a valuable cathartic, but, being disagreeable and nau-

seous, is seldom given alone. It is very useful in some forms of dropsy, diseases of the brain, and febrile affections of children associated with constipation.

**JALAPA** (hä-lä'pä), or **Xalapa**, a city of Mexico, capital of the state of Vera Cruz, 54 miles northwest of the city of Vera Cruz. It is situated on an elevated slope and is surrounded by a fine farming and fruit-growing region. The healthful and genial climate causes it to be favored as a health resort. Among the principal buildings are those erected by the government, a large cathedral, a Franciscan convent, and a commodious railway depot. The snow-capped summit of Orizaba may be seen from Jalapa. The city was founded at an early date in the Spanish occupation of Mexico. In 1847 it was occupied by the United States troops. Population, 1905, 20,275.

**JAMAICA** (jä-mä'ká), the largest island of the British West Indies, one of the Greater Antilles, situated 90 miles south of Cuba and 100 miles west of Hayti. The greatest length from east to west is 145 miles; greatest width, fifty miles; total area, 4,225 square miles. A number of islands which are politically attached to

Jamaica have an area of 224 square miles. The western part is made up chiefly of lowlands, whence the surface rises toward the east, culminating in peaks with an altitude of 7,000 feet. The Blue Mountains, which occupy the eastern part, comprise the most important and highest chain. Most of the highlands are covered with forests of logwood, mahogany, braziletto, lignum-vitae, and other species of trees. Many indentations characterize the coast and furnish good harbors, such as Old Harbor and Port Royal, the harbor at Kingston. The rivers are short and unimportant, except for irrigation, and include the Salt, the Black, and the Garden rivers. The coast has a hot climate, but in the higher regions it is delightful. Rainfall is abundant in most sections. The year is divided into four seasons—two wet and two dry periods.

The government is administered by a Governor, who is appointed by the crown and assisted by a privy council. The legislative council consists of thirty members, half of which are appointed by the Governor and half are elected by popular suffrage. Kingston is the capital and seat of government. Other cities of importance are Spanish Town, Montego Bay, Savannah-la-Mar, and Falmouth. Schools are maintained by government grants and local taxation. Several normal schools, academies, and industrial schools are similarly supported. The interior commerce is facilitated by a number of railways, the total including about 245 miles. The principal exports include coffee, rum, sugar, vegetables, tobacco, and a large variety of tropical fruits. Among the imports are principally fish, rice, cotton goods, and flour.

Columbus discovered Jamaica in 1494, while on his second expedition to America. Several



settlements were made by the Spaniards in 1509. The island was taken by Cromwell in 1655, and by the Treaty of Madrid was ceded to England in 1670. The abolition of slavery, while proving beneficial to the moral aspect, caused a decline in its prosperity, owing to the fact that a large portion of the mongrel races are destitute of thrift. Signs of discontent on account of



British occupation manifested themselves at various times, a serious revolt occurring in 1865 and another in 1899, due largely to the prevailing system of taxation. For the purpose of relieving the laboring classes at least to some extent, the British government imposed an income tax, increased the land revenue, enlarged the stamp duties, and placed the colony under control of the colonial office. The islands politically dependent on Jamaica include the Turks, the Cayman, and the Caicos islands. The inhabitants consist chiefly of halfbreeds, Indians, and Chinese, only about 15,000 being whites. Population, 1906, 803,906.

**JAMAICA**, a town of New York, county seat of Queens County, twelve miles east of Brooklyn. It is located on Long Island and has direct connection with Brooklyn by railway and electric railroad lines. In 1898 it was included in the Borough of Queens of Greater New York.

**JAMES**, a river formed in Alleghany County, Virginia, by the union of the Cowpasture and Jackson rivers. The length is 450 miles, the course is largely toward the southeast, and it is navigable for large steamers to its confluence with the Appomattox, at City Point. Its largest northern tributary is the Chickahominy. The sixty miles nearest its mouth is an important estuary which articulates with Chesapeake Bay, while the James River and Kanawha Canal extends from Richmond to White Sulphur Springs. At Richmond it is obstructed for navigation by rapids which fall 100 feet in six miles. Lynchburg and Richmond are the most important cities on its banks, while Jamestown, the site of the first English settlement in America, is 32 miles from its mouth.

**JAMES**, or **Dakota**, a river of the northwestern states, rises in the east central part of North Dakota, flows south through South Dakota, and joins the Missouri about eight miles below Yankton. The James flows through a fertile prairie country and is about 400 miles long. It is popularly called the Jim River.

**JAMES BAY**, the southern part of Hudson Bay. It is 300 miles long from north to south and about 160 miles wide. Near the central part is Agomska Island, which is about 70 miles long. Moose Factory, an important station of the Hudson's Bay Company, is located near its southwestern extremity. Thomas James wintered near the bay in 1631-32, while in search of the northwest passage, hence the name.

**JAMESTOWN**, a city of Chautauqua County, New York, on the navigable outlet of Chautauqua Lake, about 68 miles southwest of Buffalo. It is on the Erie and the Jamestown and Chautauqua Lake railroads. The noteworthy

buildings include the high school, the Erie depot, and the James Prendergast Free Library of about 20,000 volumes. The popular resort of Celoron, on Lake Chautauqua, is similar to Coney Island (q. v.). It has well-paved streets, a system of public waterworks, and gas and electric lighting. The manufactures include flour, pianos, cotton goods, ironware, furniture, bicycles, boots and shoes, and worsted goods. The surrounding country is dairying and agricultural. Jamestown was platted in 1815 and incorporated in 1827. Population, 1910, 31,297.

**JAMESTOWN**, a city of North Dakota, county seat of Stutsman County, eighty miles west of Fargo. It is located on the James River and on several branches of the Northern Pacific Railroad, and is surrounded by a fertile farming country. In the vicinity are numerous artesian wells. Among the chief buildings are the county courthouse, the high school, the State hospital for the insane, and several large business blocks. The industries include grain elevators, machine shops, flouring mills, stockyards, and railway shops. Electric lights, telephones, and waterworks are among the public utilities. Population, 1905, 5,093.

**JAMESTOWN**, the locality in James City County, Virginia, where, in 1607, the first English settlement was made in America. It is about 32 miles from the mouth of the James River, on an island, which was formerly a peninsula, having been partly destroyed by the fluctuations of the river. The town was almost totally destroyed by Nathaniel Bacon in 1676 and was never rebuilt. It contains the ruins of a church and the fort.

**JAMESTOWN TER-CENTENNIAL EXPOSITION**, an international exhibition on the south shore of Hampton Roads, five miles from Norfolk, Va., to commemorate the 300th anniversary of the first permanent English settlement in America. The exposition was open from April 26 to November 30, 1907. The total appropriations, including those of the several states and the Federal government, aggregated \$5,444,500. About 2,500 classified exhibits were on the grounds and in the buildings, including those of the arts and sciences, agriculture and horticulture, machinery and transportation, forestry and game, manufactures and liberal arts, education and social economy, mines and metallurgy, etc. Considering the splendid location, few American exhibits have been more interesting to tourists. The total admission was 2,800,000, of which about 1,500,000 were paid.

**JANESVILLE**, a city in Wisconsin, county seat of Rock County, on the Rock River, seventy miles southwest of Milwaukee. It is on



the Chicago and Northwestern and the Chicago, Milwaukee and Saint Paul railroads. The chief buildings include the county courthouse, the high school, the public library, the Y. M. C. A. building, and the State school for the blind. Among the public utilities are electric lights, paved streets, waterworks, and electric street railways. The manufacturing enterprises include iron foundries, machine shops, a cotton mill, woolen factories, and flouring mills. It has manufactures of vehicles, boots and shoes, and farming implements. The surrounding country is agricultural and noted for the breeding of high-grade horses and cattle. Janesville was settled in 1837 and incorporated in 1853. Population, 1905, 13,770; in 1910, 13,894.

**JANIZARIES** (jăn'î-zâ-rÿz), a corps of Turkish infantry organized by Sultan Orkhan in 1330. It was the first regular standing army organized by the Turks, was comprised largely of children captured from Christian parents and brought up as Mussulmans, and used principally for garrison duty. According to an edict, they were provided with no habitation but their quarters, were forbidden to marry, enjoyed numerous special privileges, and took the field only when the Sultan was in command. The army of Janizaries numbered 10,000 in 1362, but later developed a strength of 100,000 men, while the irregular militia included 350,000. Their remarkable bravery and daring won Ottoman victories for more than two centuries, but later they degenerated into lawless and insubordinate bands, and planned several successful plots to assassinate Turkish nobles and sultans. In the War of 1826 with Russia they revolted, which led Mahmud II. to determine upon their destruction. Large numbers were banished by proclamation and others were executed, but those remaining made a desperate resistance. They lost 16,000 in killed and 7,000 were burned in barracks. In the organized military forces of Turkey they were succeeded by the *nizam*, the regular Turkish army, organized and disciplined on the general plan adopted by European powers.

**JANUARY** (jăn'û-â-rÿ), the first month of the year in the Gregorian calendar. It is named from Janus. According to Roman tradition it was first added to the calendar, together with February, by Numa. Originally it had 29 days, to which Julius Caesar added two more. The Roman year originally consisted of only ten months and began with March. It was known by the Scandinavians as the month of Thor. The Parliament of England, in 1751, made January the first month of the year.

**JAPAN** (jâ-păn'), an island empire of East-

ern Asia, situated in the Pacific Ocean, east of Corea. It consists of a chain of islands located north of the Philippines, from which it is separated by the Bashi Channel, and its western shore is washed by the Sea of Japan. The entire Archipelago consists of an immense number of islands, about 4,000, all of which appear to be the more elevated portions of a partially submerged mountain system. These islands, which embrace Japan proper, include 500 that are inhabited. In addition the empire includes 20 islands of the Bonin group and 55 islands of the Loo-choo group, and the colonial possessions of Yezo, Pescadores, Formosa, Corea, the Kurile Islands, and the southern half of Sakhalin. From north to south it has a length of nearly 2,400 miles, but the greatest width does not exceed 250 miles. The total area, including Corea, is about 244,000 square miles. The following table contains a list of the principal islands and possessions, together with the area:

NAMES.	Sq. MI.
Iki .....	51
Oki .....	131
Awaji .....	219
Tsushima .....	266
Sado .....	336
Shikoku .....	7,031
Sakhalin .....	12,250
Formosa .....	13,418
Kiushiu .....	15,588
Yezo .....	36,299
Corea .....	82,000
Hondo .....	87,771

**DESCRIPTION.** It may be said that the main group of islands is crescent-shaped, with the convexity toward the Pacific Ocean, the several portions being separated by narrow channels in which numerous islets abound. The coasts are indented by many gulfs and bays, but possess few good harbors. In most of the islands the coasts rise abruptly from the sea in rocky precipices, which continue in the form of mountain chains and diversify the surface with marked elevations, alternated with beautiful and fertile valleys. The dormant volcanic mountain Fusiyama, situated on Yezo, 60 miles southwest of Tokyo, rises 12,365 feet above sea level and is the culminating point of the Japanese group of islands. However, Mount Morrison, in Formosa, is somewhat higher, rising to an elevation of 14,360 feet. Lofty ridges extend in a general direction from north to south through the central part of Hondo and Kiushiu. Numerous active volcanoes occur in different localities, while earthquake action is frequent, the most damaging disturbances on record occurring in 1707, 1783, and 1792. In the earthquake of 1792 fully 53,000 people were killed by the eruptions of Wauzendake, on Kiushiu. Along the streams and near the coast are level tracts of



land. Tall grasses and forests occur in the mountains and where the land is not cultivated. The geological formations are largely igneous.

The islands being narrow and mountainous, Japan has no long rivers, though all parts of the country are well watered. Streams or streamlets furnish drainage in all of the valleys, which are beautified by many cataracts and waterfalls. The Ishikari, in Yezo, is the longest stream. It drains most of the central part, has a course of 407 miles, and discharges into the Sea of Japan. The Shinanogawa, in Hondo, flows northwest into the Sea of Japan, after a course of 320 miles. Few of the other streams exceed a length of 100 miles, and most of them are rapid and furnish navigation for only short distances. Numerous lakes are located in the larger islands, but only few are of any great extent. Lake Omi, in the south central part of Hondo, is 37 miles long and 10 miles wide. It is famed for its beauty, and is much visited by tourists in the summer season.

**CLIMATE.** Owing to the vast extent in latitude, the physical features are variously marked by climatic influences. The Kurile Islands have an extremely cold climate, where the sea freezes over in winter and the snow and ice never entirely disappear. On the other hand, snow and ice are never seen in the Loo-choo group, where the heat is great and the conditions are subtropical. In Hondo and the central part of the country, the climate is equable and moderately temperate, this being due in part to the warm currents in the Pacific Ocean. Although snow falls in Kiushiu and the southern part of Hondo, it remains only a short time, but in Yezo and the northern part of Hondo the winters are quite severe. While the country has an abundance of rainfall, precipitation depends largely upon the winds, hence some parts of the year are quite dry. The heaviest rains occur in June and September, and in some parts of the year it is necessary to resort to irrigation. At Hakodate the annual fall is 57 inches; at Yokohama, 70; and at Tokyo, 65. In general the climate is healthful, though the temperature frequently rises to 96° in the summer.

**FLORA AND FAUNA.** Japan is rich in the variety and luxuriant growth of its plants. Many of the species known to us as garden plants grow wild in different sections. These include the bluebell, violet, gladiolus, iris, and lily of the valley. The ferns are well represented and about 150 species of evergreen trees abound. Among the forest trees are the holly, cypress, yew, box, myrtle, camphor tree, mulberry, maple, birch, banyan, wax tree, lacquer tree, and many species of bamboo. Flowering plants are

very numerous, both wild and cultivated, and the Japanese are noted for their festivals in which flowers play a leading part. Many shell and fin fishes abound in the streams and coastal waters, including numerous species that are important in the industries. Among the mammals are the fox, wolf, black bear, weasel, flying squirrel, hare, and deer. The birds of song and plumage are abundant, including about 360 species. Flies, cicadas, crickets, and other insects are numerous. Many species of monkeys are met with in the southern part of the country. The reptiles are represented by 300 species, including numerous snakes, frogs, and lizards.

**MINING.** Though not especially rich in minerals, Japan has mining interests of considerable extent. Coal is mined extensively in Kiushiu and Yezo and is found in various other parts of the country, especially in Formosa. Iron ore occurs in nearly all the islands and copper is likewise well distributed. Silver mines are worked in Hondo and gold is obtained chiefly from the alluvial sands and gravels, though auriferous quartz exists in Sado and various parts of Hondo. Petroleum has been obtained in small quantities since the year 668 A. D. Other mineral products include lead, manganese, antimony, sulphur, graphite, tin, salt, and mercury. Granite and other building stones occur in many sections of the country, but they are not used extensively at present in general building, aside from the construction of bridges and aqueducts.

**FISHERIES.** The Japanese depend in a large measure upon the fisheries for their supply of food, since rice and fish are quite indispensable. Many species abound in the fresh and salt waters, and the abundance and variety seen in the markets are not surpassed in any country of the world. Fishes of the mackerel family are most numerous, and the golden bream is the most prized as a food fish. Many salmon-curing establishments are maintained, but they are most abundant in Yezo. Several large plants for the hatching and rearing of fish are operated under the supervision of the government as a means to replenish and maintain the supply. Sperm whales infest the waters of the northern section, yielding an abundance of ambergris. Other classes of fish include the shad, trout, flounder, halibut, sturgeon, haddock, sole, perch, and turbot.

**AGRICULTURE.** Farming ranks as the chief industry, nearly half of the inhabitants being engaged in agricultural pursuits. Rice is the staple food and the principal crop, fully 215 species being cultivated, and rice land is worth about three times as much as any other arable land.



The annual production of rice is about 215,000,000 bushels. Much of the product is used in the manufacture of saki, the beverage consumed most extensively. An area of 120,500 acres is utilized in the cultivation of the tea plant, and the production averages about 63,500,000 pounds of tea per annum. Other products include corn, pulse, millet, buckwheat, tobacco, rye, wheat, barley, and vegetables. Large interests are vested in the production of cotton, sugar, indigo, hemp, and silk cocoons. It must be noted that the variety of crops is very great, owing to the extent of the country in latitude, but the productions of any one section are not so greatly varied as would seem from the list of crops assigned to the entire country. To the list of productions enumerated above must be added a large number of fruits, such as the orange, persimmon, plum, banana, apple, cocoanut, grape, and strawberry. Sugar cane is an important product in the southern section.

Formerly little attention was paid to the rearing of herds and flocks, owing to the fact that the religious teaching of the Buddhists forbids the taking of life. However, the government more recently began to give much attention to the live-stock enterprise, and experimental farms are maintained to breed cattle, horses, and sheep. Butter, cheese, and milk were formerly unknown, but dairying has been introduced, and much attention is given to the rearing of cattle for milk and meat. Horses have likewise come into extensive use. Sheep rearing is promoted profitably in the elevated regions where farming is otherwise unprofitable. As a whole it may be said that the tillage of the soil is conducted with much care. The animals reared, especially poultry and sheep, are of a superior grade and receive marked attention.

**MANUFACTURES.** The manufactures of all kinds have grown extensively within recent years. Japan, like China, continues to hold a high place in the production of fine ceramics, wood, stone, and bone carving, lacquer work, and inlaid articles. Pottery and porcelain products are made at 4,750 establishments. Paper, silk, and cotton textiles, machinery, and clothing are manufactured on a large scale. Shipbuilding is an important enterprise at Nagasaki, a port of Kiushiu. Saki and soy brewing, salt making, and the manufacture of sugar and tobacco are important industries. Other manufactures include gunpowder, earthenware, matches, fireworks, chemicals, and cotton and silk textiles.

As a general rule the factories are comparatively small and employ an average of from forty to fifty men, though the aggregate capital

invested is extensive. Until recently the large machinery used in manufacturing and in agriculture was imported from America and Europe, but the rapid strides made in education and the industrial arts have led to a utilization of the native resources, the government encouraging the same by grants and efficient supervision. The Mikado has not only recommended appropriations for this purpose, but skilled laborers have been invited to Japan to teach and direct in utilizing its wealth of natural resources in the modern arts of manufacture. Perhaps no people in history have made more marked changes than the Japanese in the last half century, particularly in the use of machinery, modes of living, and educational arts. Since they have in large quantities all the essential substances for manufactures, such as timber, coal, iron, and stone, and possess the necessary intellectual and physical capacity, it is but natural that their cities should rise, factories develop, canals and railways extend, and all the institutions of civilization thrive.

**TRANSPORTATION.** Railways were not built in Japan until in 1872, when a line was constructed from Tokyo to Yokohama. At present the empire, exclusive of Formosa and Corea, has in operation 5,250 miles, of which about two-fifths belong to the government. Canals have been constructed to connect a number of the streams and to provide means for reaching several of the interior lakes. Extensive transportation facilities are provided by its long coast line, which accounts for the maintenance of a large merchant marine, including about 1,375 steamships and 4,150 sailing vessels. Ocean steamers ply regularly between the leading ports of Japan and those of the principal countries of the world, including Canada, the United States, Australia, Germany, England, India, and Italy. A system of highways is maintained jointly under government and local supervision, and much attention is given to carriage by the jinrikisha, of which 225,500 are in use. The telephone and telegraph are used extensively, and submarine cables supply communication with the leading nations of the world. The American postal system was adopted almost as an entirety in 1871, and much of the mail is delivered by free carriage.

Japan has an extensive commerce, both domestic and foreign. The former has been greatly augmented by the construction of steam railroads and electric railways, as well as by the establishment of larger manufacturing enterprises than were maintained formerly. The imports somewhat exceed the exports, and the total foreign trade aggregates annually about \$425,-



000,000. Among the chief exports are matches, textiles, copper, rice, tea, coal, cotton yarn, and raw and manufactured silk, and the imports include petroleum, tobacco, sugar, iron and steel, machinery, and cotton and woolen goods. The leading nations to participate in the foreign trade are Great Britain, the United States, Germany, China, France, Italy, and Belgium.

**GOVERNMENT.** The government is a limited monarchy, modeled after the constitution of the German Empire. In 1889 the present constitution was adopted, a representative government having been promised by Metusu Hito, who ascended the throne in 1868. The chief executive is known as Emperor, or Mikado, and is assisted by the imperial cabinet, the privy council, and the nine ministers of finance, foreign affairs, navy, war, justice, home affairs, communications, education, and agriculture and commerce. Legislative authority is vested in the diet or parliament, which meets annually and is constituted of an upper and a lower house. The upper house is composed of princes and titled classes who are members for life, while the lower house is constituted of representatives elected by direct vote of the people. The right to vote is based upon residence, one year in the voting district, the payment of direct taxes amounting to at least \$7.50, and male citizens who have attained the age of 25 years. At present the lower house has 300 members, chosen in 258 electoral districts. Each parliament continues for a term of four years, unless previously dissolved. Government is administered locally in districts, each having an assembly elected by the people and a governor. The system of courts extends from the local and district courts to the supreme judiciary, which is the tribunal of final appeal.

The financial system is based upon the gold standard, which was adopted in 1897, though silver and subsidiary coins are circulated extensively. For the purpose of providing an adequate volume of money, paper currency redeemable in coin is in general circulation. The unit of value in the monetary system is the *yen*, which is worth in United States currency about fifty-two cents, while silver coins in circulation have a value of fifty, twenty, and ten cents. The coins which have a value of five are of nickel, and two, one, and one-half cents are of copper. The resources of the government consist of the collection of revenues accruing from imposts, excises, registrations, customs, income taxes, state services, and the telegraph and telephone systems. The standing army numbers 167,650, which, on a war footing, is increased to 675,000 men and officers. Japan has a modern navy

made up of serviceable and powerful ships, and as a naval influence takes rank as the fifth among the nations of the world.

**EDUCATION.** The public school system is under the superintendence of the general government. Attendance is free and compulsory at specified ages. Equal care is exercised in the education of both sexes. All grades of work with suitable courses of study from the kindergarten to the university are maintained. Elementary schools are located in all the communities and culminate in a high school. The higher institutions include normal training schools for teachers, industrial schools to disseminate knowledge in the industries, and colleges and universities. The Imperial University at Tokio is the culminating institution of higher learning. Its courses of study articulate with those of other higher institutions maintained in college centers. This noted central institution was reorganized in 1886 and maintains departments of science, literature, law, economics, medicine, engineering, and civics. Its faculty of instructors includes ten German professors, nine English, two American, and two French. About 3,125 students receive instruction at this center of learning, at which they have access to a large library and utilize the most modern apparatus. Another noted university is maintained at Kyoto. Newspapers, magazines, and books are being produced extensively and read widely, while liberal translations have been made from the productions of other countries. In 1908 the country had 115 public libraries with a total of 1,448,950 books. The public library belonging to the government contains more than 200,000 volumes and numerous manuscripts. A strict newspaper censorship is maintained, while imprisonment for publishing matter derogatory to the government is not infrequent.

**RELIGION.** The religion of Japan is largely Shintoism, a form of worship according to whose tenets the Mikado is held to have descended from the sun goddess. It was introduced before the historical period as the ancient nonidolatrour religion. Later Buddhism and Confucianism were brought over, from China. Religious worship is free to all and state support is not given to any sect. The country has about 96,500 Shinto temples, many of them beautiful structures and quite similar in design. Those in the large cities are magnificent and costly buildings, the most celebrated being the Temple of Asava at Yeddo. Worship is observed at the temples, where a profound spirit of reverence and piety is displayed, while ancestral worship also prevails. Respect for the gods and the living parents is held to be the



source of all virtues. Mission stations and churches are maintained by all the leading Christian denominations and Christianity is making rapid progress.

**CHARACTERISTICS.** The Japanese speak various dialects of the same tongue, the only exception being the Ainos of Yezo, who number about 15,000. It is thought that the race is a mixture of the Malays of the islands situated toward the south and the Tartars who emigrated from Corea, and that their marrying and intermarrying finally resulted in the present marked Japanese type. The Aino race probably constituted the early population, which, after many centuries of wars, has become isolated to the island of Yezo. Among the characteristics of the Japanese type are an oval head and face, a well-shaped and curved nose, slightly oblique eyes, and somewhat rounded frontal bones. The expression inclines to the sordid, the complexion is rather pallid and yellowish, and the male face is almost hairless, but quite often is marked by a short and narrow mustache. They are several shades darker than the Chinese. The limbs are short in proportion to the trunk, though the stature is undersize, and the hair is dark brown, or black, and straight. The dress of both men and women has undergone marked changes within recent decades. The footwear consists of a small sock, called a *tobi*, which has a separate compartment for the great toe, is ankle high, and is covered by a sandal of straw or a wooden clog, but this covering is removed when treading on matted floors. Though the footwear of men and women is the same, there are marked differences in the headgear and dress. In 1886 a national law was enacted requiring the government officials to wear European dress when on duty, and women of the higher classes began to appear in public with European garments. Since then dress reform has been advancing rapidly even in the lower classes, and the former garments, somewhat allied to the Chinese, have either become modified or are fast disappearing.

As a people the Japanese are cleanly, courteous, frugal, kind, and pathetic. The children are admonished to parental obedience and are carefully disciplined, and all classes are required by law to secure at least an elementary education. Tobacco smoking is a common evil among both men and women, the theater is a place of popular amusement, and flowers and foliage are favorite decorations for all public places and the home. The architecture, though ornamental, lacks solidity and proof against fire. While their builders are skilled as turners, joiners, and carvers of wood, they lack a knowledge

of the more substantial and serviceable in architecture. Most of the furniture is plain and simple and is kept unpainted. The interior furnishings of edifices are rather grotesque than beautiful. The employment of European and American engineers and architects in the construction of railroads and electric car lines has brought about revolutionary movements in the construction of public buildings, harbors, and aqueducts, and in shipbuilding. Modern forms of masonry and the use of steel are rapidly displacing the looser and less endurable Eastern style. The *jinrikisha*, a two-wheeled carriage with two shafts drawn by a man, is still the common vehicle for conveyance, this having displaced the larger *palanquin*, though street railways, carriages, bicycles, and automobiles are coming into use in the larger cities and gradually gaining favor among the higher classes. Buffaloes and zebus are used as beasts of burden, while the horse and ox serve mostly for agriculture and draft purposes.

**INHABITANTS.** Comparatively little is known of the population of Japan prior to 1872, when the first reliable census was taken. At that time the inhabitants numbered 33,110,825. Since then the country has not only become more populous by the extension of territory, but there has been an increase through the excess of births over deaths. Within the last quarter of a century the urban population has increased noticeably, owing chiefly to the larger developments of the factory system. Tokyo, in Hondo, is the capital and largest city. Other cities of importance include Yokohama, Nagasaki, Osaka, Hiroshima, Kobé, Sendai, Hakodate, and Kyoto. About eighty cities have a population of over 20,000. Japan, in 1908, exclusive of Corea, had a population of 49,674,460.

**HISTORY.** The history of Japan dates from 660 B. C., but the accounts published for the period of fully 1,000 years following this date are legendary. Authentic history begins in 500 A. D. Jimmu Tenno is the reputed founder of the present dynasty and, according to Japanese historians, ascended the throne in 660 B. C. Empress Jingo invaded Corea in 201 A. D., from which time the Corean civilization is said to date. The *Rongo* and *Senjimon*, two sacred Chinese books, were introduced into Japan in 285 by the Coreans. Buddhism gained a foothold in 552 and became the established religion in 595, and in 624 the government established a Buddhist hierarchy. Chinese civilization was assimilated largely through commercial relations, and after 646 great strides of advancement were made in government, science, and educational arts.



The Fujiwara family established a superior form of civil service several centuries before 792, but by that time the military classes rose, and Yoritomo became shogun or generalissimo. This ruler is known generally to Europeans as Tycoon, the name applied by the Chinese. While he was not recognized as the person in whom the reigning power was vested, he really governed, but paid homage to the Mikado, who was regarded as the spiritual emperor. At that time the spirit of militarism spread to all parts of the dominion. In many cases the Buddhist monasteries even became military centers, which continued until 1603, when Tokugawa Iyeyasu instituted an era of peace by reason of his superior statesmanship. He made Yeddo the capital and center of power, from which his lineal descendants governed until 1868. This dynasty, known as the Tokugawa, repelled the Portuguese invasion in 1638, prevented the spread of Christianity, built great cities, and maintained a commerce and interior development distinctly Japanese, excluding entirely all classes of foreigners.

In 1853 Commodore Perry entered the harbor of Uraga with a United States squadron. He secured a treaty with the shogun, on March 31, 1854, which caused Japan to be opened to the commercial nations after its seclusion for 216 years. Since then modern civilization and arts have overwhelmed the Japanese like a contagion. The feudal system that rose under military fiefs was overcome largely. In 1867-68 the shogun was overthrown and replaced by a powerful empire under the Mikado. Yeddo was renamed Tokyo, or Tokio, a constitution was granted, and modern arts were introduced in every branch of the government and the industries.

The effective strength of the Japanese military force was ably demonstrated in the Chinese-Japanese War in 1894-95. This war resulted from internal dissensions in Corea, in 1894, which were incited largely by the factions of Japanese and Chinese in that country. Each of these respectively appealed to Japan and China for aid to quell insurrections, and, as each complied, a formal war was declared in August. A Japanese army promptly invaded China, while its navy destroyed that of the Chinese within a period of three months. The loss of immense stores and 25,750 men prompted China to ask for peace early in February, 1895. The conditions of the treaty ratified a month later provided for a cash war indemnity of \$150,000,000, the independence of Corea, and the cession of Formosa to Japan. Among the important events occurring since are those in relation to commer-

cial treaties with other nations, the extension of vast internal improvements, and the prominent part taken in the Chinese War of 1900-01.

In 1904 Japan became involved in an extended war with Russia, because the latter country had occupied Manchuria. Important battles were fought early in May on the Yalu River, where General Kuroki with a large army defeated the Russians under General Sassulitch. Port Arthur fell in 1905. Japan won the great Battle of Mukden, and Admiral Togo destroyed the Baltic fleet, which events were followed by the peace treaty at Portsmouth, N. H. Subsequently Japan suppressed a rebellion in Formosa, absorbed Corea, and strengthened its position as a factor in Manchuria. In 1905 it concluded a treaty with Great Britain. An imbroglio was threatened with the United States in 1907, owing to an unfriendly attitude of a large faction in America against Japanese immigration, but the issues were adjusted by wise diplomacy in both countries. See Russo-Japanese War.

**JAPAN CURRENT.** See Kuro Sivo.

**JAPANESE-BRITISH ALLIANCE**, an agreement concluded between Great Britain and Japan. It was signed at London Aug. 12, 1905, by Lord Lansdowne, Foreign Secretary, on behalf of the former, and Baron Hayashi, envoy extraordinary of Japan, on behalf of the latter. The agreement has for its avowed object the maintenance of general peace in the region of Eastern Asia and India and the independence and integrity of the Chinese Empire. The treaty is as follows:

The governments of Great Britain and Japan, being desirous of replacing the agreement concluded between them on Jan. 30, 1902, have agreed upon the following articles:

ARTICLE I.

It is agreed that whenever, in the opinion of either Great Britain or Japan, any of the rights and interests referred to in the preamble of this agreement are in jeopardy, the two governments will communicate with one another fully and frankly, and will consider in common the measures which should be taken to safeguard those menaced rights or interests.

ARTICLE II.

If by reason of unprovoked attack or aggressive action, wherever arising, on the part of any other power or powers, either contracting party should be involved in war in defense of its territorial rights or special interests mentioned in the preamble of this agreement, the other contracting party will at once come to the assistance of its ally, and will conduct the war in common, and make peace in mutual agreement with it.



## ARTICLE III.

Japan possessing paramount political, military, and economic interests in Corea, Great Britain recognizes the right of Japan to take such measures of guidance, control, and protection in Corea as she may deem proper and necessary to safeguard and advance those interests, provided always that such measures are not contrary to the principle of equal opportunities for the commerce and industry of all nations.

## ARTICLE IV.

Great Britain having a special interest in all that concerns the security of the Indian frontier, Japan recognizes her right to take such measures in the proximity of that frontier as she may find necessary for safeguarding her Indian possessions.

## ARTICLE V.

The high contracting parties agree that neither of them will, without consulting the other, enter into separate arrangements with another power to the prejudice of the objects described in the preamble of this agreement.

## ARTICLE VI.

As regards the present war between Japan and Russia, Great Britain will continue to maintain strict neutrality unless some other power or powers should join in hostilities against Japan, in which case Great Britain will come to the assistance of Japan, and will conduct the war in common, and make peace in mutual agreement with Japan.

## ARTICLE VII.

The conditions under which armed assistance shall be afforded by either power to the other in the circumstances mentioned in the present agreement, and the means by which such assistance is to be made available, will be arranged by the naval and military authorities of the contracting parties, who will from time to time consult one another fully and freely upon all questions of mutual interest.

## ARTICLE VIII.

The present agreement shall, subject to the provisions of Article VI., come into effect immediately after the date of its signature, and remain in force for ten years from that date.

In case neither of the high contracting parties should have notified twelve months before the expiration of the said ten years the intention of terminating it, it shall remain binding until the expiration of one year from the day on which either of the high contracting parties shall have denounced it. But if, when the date fixed for its expiration arrives, either ally is actually engaged in war, the alliance shall, *ipso facto*, continue until peace is concluded.

**JAPANNING** (jā-pān'ning), the art of coat-

ing articles of wood, leather, metal, and papier-maché with a variety of varnishes, which are caused to adhere by means of a high temperature applied in hot chambers during the drying process. The first step is to dry the article to be japanned, after which several coats of varnish are applied to constitute the *priming*, and subsequently the ground tint is mixed with the varnish. Several designs are secured by painting with colors, after which additional coats of varnish are applied to insure permanence. The grades of varnish used are largely mastic and shellac, though copal, dissolved in alcohol, is used to add fineness and durability. As a general process japanning is immediately between painting and enameling, and is done largely in imitation of Japanese and Chinese lacquered work.

**JAPURÁ** (zhä-pōō-rä'), or **Yapurá**, a river of South America, rises in the Andes, where it is sometimes called the Caqueta River. It flows through the department of Cauca, in Colombia, and is the first great tributary of the Amazon above the Negro. In part of its course it forms the boundary between Ecuador and Colombia. It is navigable a distance of 620 miles, to the Cupaty Falls, and above the falls it is navigable for small vessels several hundred miles. The valley of the Japurá contains a luxuriant growth of forests, which yield rubber and sarsaparilla. The entire length is 1,350 miles.

**JARNAC** (zhär-näk'), **Battle of**, a military engagement at the town of Jarnac, department of Charente, France, between 15,000 Huguenots under Louis, Prince of Condé, and 26,000 Catholics under the Duke of Anjou. Owing to the superior numbers of the latter, they gained a decisive victory.

**JASMINE** (jäs'min), a group of flowering shrubs of the genus *Jasminum*, including about 100 species. They are native to Asia, but some species are found in Southern Europe and Central Africa. In temperate climates they are cultivated in gardens for their evergreen foliage and very fragrant white flowers. Oil of jasmine is prepared from the flowers. Many of the species are twining plants. The leaves are simple or compound, the corolla is tubular, the ovary is two-lobed, and the fruit is berrylike. A species known as *Carolina Jasmine* is common to South Carolina and other sections of the South.



JASMINE.



**JASPER** (jäs'pēr), an opaque mineral belonging to the quartz family. It is very abundant and is prized for ornamental purposes, being susceptible to a high polish. Many shades of color, according to the impurities present, are found in jasper, including dark green, reddish brown, and brownish black. The different varieties of jasper include the Egyptian jasper, with distinct stripes; agate jasper, found in layers with chalcedony; and porcelain jasper, a kind of natural porcelain formed by the action of fire. Heliotrope, or bloodstone, is a variety of quartz having blood-red particles of jasper embodied in its mass.

**JASSY** (yäs'sê), or **Yassy**, a city of Rumania, formerly the capital of the principality of Moldavia. It is situated near the Kopoberg Mountains, in a beautiful valley of the Bachlui, a tributary of the Pruth, about 200 miles north of Bucharest. The city contains numerous edifices that date from the 14th century. Many of its streets are tortuous. It is connected by railroads and rapid communication lines, and is important as a commercial and manufacturing center. The business of the city is conducted mainly by Jews. Among its public facilities are several libraries, electric street railways, an art gallery, and numerous parks. Population, 91,500.

**JÁSZBERÉNY** (yäs'bě-rân-ÿ), a town of Hungary, on the Jazyva River, forty miles east of Budapest. The surrounding country is agricultural. It has a brisk trade in wine, corn, and live stock. It is a railway center, has electric lights, and contains a monument that marks the burial place of Attila. The inhabitants are chiefly Magyars. Population, 1906, 26,506.

**JATS** (jats), the name of a native race of India, confined chiefly to the Punjab and in the Northwest Provinces. About 5,000,000 of the inhabitants of India are classed as Jats. It is probable that they descended from ancestors who immigrated from Afghanistan. The Jat language belongs to the Sanskrit. These people are chiefly Brahmans, but a considerable number adhere to the Sikh and the Mohammedan faiths. They are dark in complexion, wear long beards, and engage chiefly in agriculture and stock raising.

**JAUNDICE** (jän'dis), or **Icterus**, a morbid condition due to the presence in the blood of an abnormal quantity of the bile. It is an indication rather than a form of disease, though a malignant attack is often followed by fatal results. Jaundice is marked by a yellowish color of the skin and eyes, peculiar languidness and weakness, and constipation. It results frequently from a diseased condition of the liv-

er, or an obstruction of the bile duct that connects with the intestines.

**JAVA** (jä'vá), the principal island of the Dutch East Indies and the most important colonial possession of the Netherlands. It is separated from Sumatra by the Strait of Sunda, which bounds it on the west. The boundary on the north is formed by the Java Sea, on the east by the Strait of Bali, and on the south by the Indian Ocean. Its length from east to west is 600 miles; breadth, from 30 to 125 miles; and area, 50,554 square miles. The surface is rolling, being generally characterized by torrent-like streams and precipitous ravines. Several large marshy tracts occur in the northern part. The southern coast line rises abruptly in unbroken cliffs, several of which extend as ridges over the island. They attain their culminating peaks in Slamet, height 11,325 feet, and Semeru, height 12,240 feet above sea level. The Solo River, 175 miles long, is the largest stream. Coal, salt, sulphur, manganese, and marble are the principal minerals. The climate is genial, being moderated by sea breezes, and is favorable to the production of cereals, fruits, forage crops, and domestic animals. Birds of fine plumage and song abound. The tiger cat, snakes, wild hog, rhinoceros, panther, tiger, deer, several species of monkeys, and large bats are indigenous.

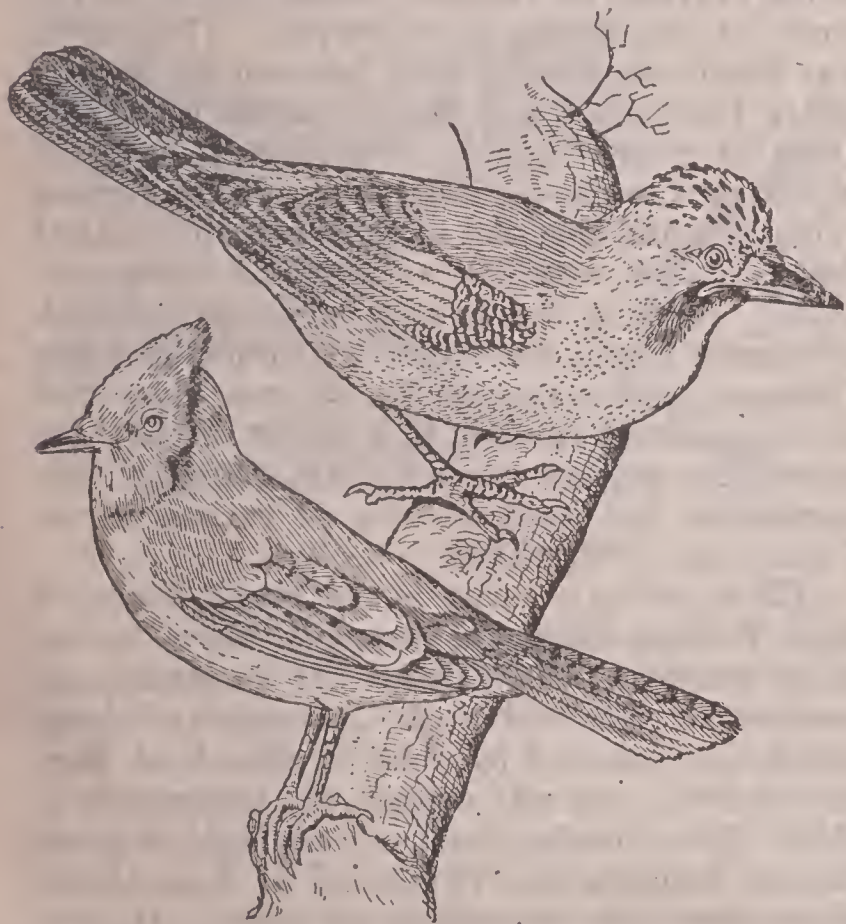
The soil is generally fertile and the valleys and slopes of the mountains are generally covered with fine forests. Among the native trees are the teak, sandalwood, mahogany, camphor, and many other tropical species. Bamboo, rattan, flowering shrubs, and vines are very numerous. The principal exports are tea, coffee, sugar, cinchona, tobacco, pepper, indigo, horses, buffaloes, and cattle. Manufactories have been established, producing textiles, toys, and earthenware. Machinery, metals, petroleum, spirits, and clothing are imported to a large extent. Cable lines connect Java with Australia and Europe, and several railroads, electric car lines, and canals are operated. At present the railroad lines aggregate 1,650 miles. The trade is chiefly with the Netherlands, Germany, Japan and the United States.

The ancient history of Java is clothed in legendry, the first authentic date being 412 A. D., when several records were made of Hindu colonies. Under the Hindu dynasties the natives were converted to Brahmanism, but this form of religion was succeeded by Mohammedanism in 1478. The island came under control of the Portuguese in 1511. In 1610 the Dutch made settlements, but they were suppressed by the English from 1811 to 1817, since which time the



Dutch have governed the island as a colony without interruption. The natives belong largely to the Malay race and in religious affiliations to the Moslems, though there is a small per cent. of Christians, Brahmans, and Parsees. Several thousands of the natives are Christians. Dutch occupation has brought signal prosperity, developed the material resources, built an important commerce, and disseminated education and industrial arts through schools and several institutions of higher learning. Batavia is the capital. Soerabaya is the largest city. Besides these are numerous important seaports, among them Samarang, a thriving city. The standing army numbers 41,500 men and officers, of whom about half are Europeans. Population, 1905, 30,098,008.

**JAY**, a genus of birds of the crow family, smaller than the magpie and common crow. They are distinguished from the crow by having



BLUE JAY.

EUROPEAN JAY.

a shorter bill and wings and a blue or brownish-red color instead of black. About twenty species are well known, nearly all of which have a tuft of feathers on the top of the head and a long rounded tail. The wings are considerably shorter than the tail, which in some species is about as long as the body. They are found in both hemispheres, and live on insects, seeds, fruits, eggs, and young birds. The *blue jay* is one of the best known and handsomest species. It, like all others, has a peculiarly harsh, grating note, but when tamed partially imitates the human voice. The *English jay* is somewhat

larger than the American blue jay and the general color is a light brown, inclining to red. Another familiar species, the *Canada jay*, is widely distributed in the northern part of North America.

**JAYHAWKER**, a name which originated in Kansas at the time of the contest over slavery. The name was derived from jayhawk, a vicious bird of prey, to which the irregular and free-booting soldiers who were first called jayhawkers were likened. Later the term was used generally in the states of the West and South throughout the Civil War.

**JAY TREATY**, the name of a treaty concluded between the United States and Great Britain in 1794. The former country was represented by John Jay and the latter by Lord Grenville. It provided for peace and friendship between the two countries, free commercial intercourse on the American continent, the evacuation of the British posts in the United States by June, 1796, a commission to determine the northeast boundary between Canada and the United States, unrestricted navigation of the Mississippi, and indemnity to citizens of the United States who suffered losses through the capture of American merchantmen after the close of the Revolution. The treaty was generally unpopular in the United States, since it made no reference to the impressment of seamen and restricted the trade of that country in the West Indies. After a hard struggle the treaty was ratified on June 24, 1795, by a vote of twenty to ten in the Senate. It was declared that both Jay and Washington had been corrupted by money, and the former was burned in effigy in many places. In 1796 the House of Representatives voted by a narrow margin that the treaty ought to be carried into effect.

**JEANNETTE** (jĕn-nĕt'), a borough of Pennsylvania, in Westmoreland County, 26 miles southeast of Pittsburg, on the Pennsylvania Railroad. It has well-graded streets, waterworks, and lighting by natural gas. The surrounding country is agricultural and contains rich deposits of coal. Among the manufactures are window glass, rubber goods, hardware, and machinery. It has several fine schools and municipal buildings. The borough was incorporated in 1889. Population, 1910, 8,077.

**JEFFERSON CITY**, the capital of Missouri and the county seat of Cole County, on the Missouri River, about 123 miles west of Saint Louis. It is on the Chicago and Alton, the Missouri Pacific, and the Missouri, Kansas and Texas railroads. The location is on a lofty site, about 600 feet, and is nearly in the geographical center of the State. Among the note-



worthy buildings are the State capitol, the Lincoln Institute, the county courthouse, the State prison, a female seminary, and numerous churches and public schools. It is the seat of Jefferson City College and a normal school for Negroes. The manufactures include brick, beverages, farming machinery, vehicles, and pottery. The surrounding country is agricultural and contains valuable deposits of limestone and bituminous coal. Among the general facilities are pavements, electric and gas lights, city waterworks, and street railways. The place was settled in 1826 and incorporated in 1839. Population, 1900, 9,664; in 1910, 11,850.

**JEFFERSONVILLE**, a city in Indiana, county seat of Clark County, on the Ohio River, opposite Louisville, Ky. It is on the Cleveland, Cincinnati, Chicago and Saint Louis and the Baltimore and Ohio railroads. The chief buildings include the high school, the county courthouse, the Indiana reformatory, the United States quartermaster's supply depot, and numerous churches. It has electric and gas lights, city waterworks, pavements, and a system of sewerage. Among the manufactories are machine shops, foundries, shipyards, railroad car works, shot factories, oil refineries, and flour and lumber mills. It has a considerable trade in manufactures, coal, and produce. Population, 1900, 10,774; in 1910, 10,412.

**JEHOVAH** (jê-hô'vâ), the most sacred of the name applied to the Supreme Being in the Old Testament, in which it is used especially to designate the God of the Jewish people. Its meaning is explained in Exodus to be, "I am that I am," thus predicating self-existence in a sense that it cannot be applied to any other being. To the Jews the meaning implied is the personality of the Creator and Ruler of the universe, their Theocratic Guide, the First and the Last, and the Being above all gods. The name is of Phoenician origin and was used in a limited sense among the Israelites up to the time of Samuel, when its use spread rapidly. As a name it was deemed so holy by the Jews that they were guarded in allowing it to escape their lips, and therefore took means intentionally to mispronounce it or apply less sacred names, such as *Adonai*, which signifies lord, and *Elohim*. The latter is a less sacred name employed in some portions of the Pentateuch. Some writers think the name arose from Iao, the Phoenician sun god in the several seasons, especially in autumn, while others think it originated from Iao, the Chaldaean intelligent light.

**JELLY**, the juices of fruits or meats boiled with sugar so as to form an elastic consistence. This product is made most commonly from the

juices of currants, grapes, raspberries, and plums, from which the liquid is pressed and afterward boiled with sugar to form the proper consistence when cold.

**JELLYFISH**, a bell-shaped fish, belonging to the radiated animals, so called because, when lying on the sea-sand, it looks like a mass of jelly. It is familiarly known as sea-blubber and sea-nettle, two names originating from its long, stinging tentacles. In the water it appears exceedingly beautiful, moving with much rapidity by alternately contracting and expanding its crystallinelike body. Many of the jellyfishes show a phosphorescent light at night. They live on crustaceans and small fish, which they seize with their tentacles. Several orders and many species have been described. They are devoured in immense numbers by the right whales and other animals of the sea.

**JEMAPPES** (zhê-mâp'), a town of Belgium, in the province of Hainault, noted chiefly as the scene of the Battle of Jemappes. This battle was fought on Nov. 6, 1792, between the French under Dumouriez and the Austrians under the Duke of Saxe-Teschen. The French army of 46,000 men consisted largely of inexperienced volunteers and was sent in three columns against the Austrians, who had an army of 26,000 veterans. At first the French were beaten back with great losses, but they were rallied by Louis Philippe, who subsequently became king, and the engagement resulted in a defeat of the Austrians. At present the town has railroad communication and manufactures of various kinds. Population, 1906, 12,983.

**JENA** (yâ'nâ), a city in the grand duchy of Saxe-Weimar-Eisenach, Germany, about twelve miles southeast of Weimar. It is famous on account of the celebrated University of Jena, which was founded by John Frederick of Saxony in 1547, and was opened for instruction in 1558. The founder intended to build a great seat of learning at Wittenberg as a means to disseminate the evangelical doctrines. It soon rose to eminence and now attracts, as it has for several centuries, students from all parts of the world. The work in biology, philosophy, and theology is especially noteworthy. It has an average attendance of 800 students. Among the eminent men who were associated with the institution are Fichte, Hegel, Schelling; Schlegel, and Schiller. The university is supported by public taxes from all the Saxon states, has a splendid museum, zoölogical gardens, fine works of art, and a library containing 250,000 volumes. The city is beautified by numerous statues and parks. Population, 1905, 26,360.

**JENA, Battles of**, two important engage-



ments between the Prussians and French, which occurred on Oct. 14, 1806, one near Auerstadt, Germany, and the other near Jena. In the former battle General Davout commanded 30,000 French and the Duke of Brunswick led 48,000 Prussians, while in the latter Napoleon I. commanded 90,000 French, and Prince Hohenlohe had the superior command of 65,000 Germans. The French were victorious in both battles, thereby securing advantage over the whole of Prussia.

**JERBOA** (jēr-bō'ā), or **Gerboa**, a genus of small rodents which are closely related to the rats and mice, remarkable for their long hind legs. These animals use their fore legs more like hands than as feet, and the prolonged hind legs cause their movements when running to appear as though they were flying. They burrow in the ground with the fore limbs, these being armed with powerful claws, and the long



EUROPEAN JERBOA.

tail aids in holding the body in position while standing upon the hind legs, forming a kind of triangular support. In the winter they hibernate, especially in the colder countries, instead of storing up a supply of food as is the habit of mice. A number of species are native to Africa and Asia, and a similar ratlike rodent is found in the northern part of Europe. The jumping mouse common to North America belongs to the same class of animals. It is known locally as deer mouse.

**JEREZ DE LA FRONTERA** (hā-rāth' dā lā frōn-tā'rā), or **Xerez**, a city of Spain, in the province of Cadiz, sixteen miles northeast of the city of Cadiz. It is situated on the Guadalete River, has railroad facilities, and is surrounded by a fertile country, which produces large quantities of fruits, especially grapes. The chief buildings include a Moorish castle, the public library, the high school, the Convent of La Cartuja, and several theaters. It is famous as a market for wine and as a place for

bullfights. The place is mentioned as a Roman colony. In 711 it was the scene of a great battle between the Saracens and the Visigoths, in which the latter were overwhelmed. Population, 1905, 64,743.

**JERICHO** (jēr'ī-kō), a famous city of ancient Palestine, on a plain eighteen miles northeast of Jerusalem and six miles west of the Jordan River, near where that stream discharges into the Dead Sea. In the time of Solomon it was a flourishing city, exporting spices and balsam. Joshua made it his headquarters after his first entry into Canaan. It was destroyed by the Israelites and rebuilt by Hiel, the Bethelite, in 918 B. C. Later it was the seat of a school of prophets and the home of Herod the Great. Mark Antony assigned a portion of it to Cleopatra, Queen of Egypt. Subsequently it was destroyed in Vespasian's reign and rebuilt under Hadrian. It was repeatedly captured by the Crusaders and finally completely destroyed. The village of Er-Riha, with less than 300 inhabitants, now occupies the site.

**JERICHO, Rose of**, the name of a small plant of the mustard family, native to Arabia. It is a climbing shrub, with a singularly shaped blossom of a greenish-yellow color. When dried, the leaves and blossoms fold together upward, but open again when placed in water, and this process can be repeated several times. The plant was brought from Palestine to Europe by the Crusaders.

**JERSEY** (jēr'zī), the largest of the Channel Islands, located in the English Channel, 16 miles west of the coast of France. It is about 12 miles long from east to west, has a width of six miles, and the area is 45 square miles. The surface is high and rocky, but many of the valleys are unusually fertile. It has a rainfall of 30 inches, a mean annual temperature of 50°, and an equable and healthful climate. Large quantities of apples, pears, grapes, peaches, and other fruits are exported. Shipbuilding and oyster fishing are productive industries. The Alderney and Jersey breeds of cattle are grown extensively for dairying and export purposes. Saint Helier is the principal town. Population, 1906, 52,986.

**JERSEY CITY**, a city in New Jersey, county seat of Hudson County, on the Erie, the Central of New Jersey, the Pennsylvania, the West Shore, and other railroads. It is situated on the Hudson River, opposite New York, with which it is connected by ferries and by the tunnel of the Pennsylvania Railway. Several transatlantic and other steamship lines sail regularly from this port. Communication is likewise furnished by the Morris Canal and many electric urban and



interurban railways. In population it ranks as the second city of New Jersey, being exceeded only by Newark.

Jersey City is well built, much of the architecture being of vitrified brick and stone. The chief buildings include the county courthouse, the Hasbrouck Institute, the city hall, the Fourth Regiment Armory, the Saint Peter's College, and the public library with more than 100,000 volumes. It has thirty substantial public school buildings. In the northern part of the city are the southern ridges of the Palisades, where many modern and costly residences have been built. Other features include the soldiers' and sailors' monument, the West Side Park, and the Hudson County Boulevard, which extends entirely through Hudson County and beyond.

The streets are platted at right angles, well paved, lighted by gas and electricity, and connected with Hoboken and suburban districts by electric street railway lines. Among the numerous manufacturing establishments are potteries, planing mills, and engine and car works. It has manufactures of jewelry, rubber goods, fire-works, copperware, castor and linseed oil, hydrants, oakum, tobacco, lead pencils, etc. The trade in crucibles, live stock, grain, and fruit is especially extensive. It has a growing jobbing trade in all classes of merchandise. The site on which Jersey City stands was formerly called Paulus Hook, but was named City of Jersey in 1820 and was chartered as Jersey City in 1838. In size it takes rank as the seventeenth city of the United States. Population, 1910, 267,779.

**JERUSALEM** (jê-ry'sâ-lêm), an ancient and interesting city of Palestine, in the Turkish province of Syria, noted as the holy city of the Jews. It is situated 15 miles west of the Dead Sea and 32 miles east of the Mediterranean, about 2,500 feet above sea level, on the slopes of two hills. Near it are two ravines, the valley of Hinnom being toward the south and the valley of Jehoshaphat toward the east. A third depression, the Tyropean Valley, extends through the city from north to south. Mount Zion, a celebrated eminence on the southwest, rises 300 feet above the surrounding surface. Other eminences include Mount Akra on the northwest, Mount Bezetha on the northeast, Mount Moriah on the east, and Mount of Olives east of the city.

Jerusalem is mentioned as early as 1500 B. C., when the Jebusites were in possession. Joshua conquered a portion of the city, but they maintained control of at least the upper part until the time of David, who made it his capital and strengthened the portion known as Zion. In the time of Solomon it attained its greatest prosperity, but began to decline shortly after his

death. Nebuchadnezzar took it from Zedekiah in 586 B. C. after a protracted siege, carried many of the Jews to Babylon in captivity, and left it in a desolate condition. Cyrus permitted the Jews to return from captivity. In 515 they rebuilt the temple, but the walls were not replaced until 455, in the time of Ezra and Nehemiah. Shortly after it was possessed by the Persians and passed consecutively to the Macedonians, Syrians, Egyptians, and Romans. It was sacked at various times, its temples were burned, and the city was razed.

Hadrian ordered Jerusalem rebuilt in 131 A. D., though it remained in a poor condition until Rome became Christianized, when it prospered for a time under the protection of Constantine the Great and his successors. With the Mohammedan conquest, in 636, it became a possession of Caliph Omar, an Arabian, and continued under Moslem rule until 1099, when the Crusaders planted the cross upon its domes and converted it into the seat of a Christian monarchy. A desperate war between European Christians and Moslems prevailed for 87 years, in which much life was spent and many institutions were ruined, but finally the city was taken by Saladin in 1187 and was never retaken by the armies of the Crusaders. Since 1244 it has been constantly under Moslem rule, being under the Turks since 1517, and still remains a part of the Ottoman Empire. The last seven centuries have been largely times of peace, Europeans being permitted to explore, settle, and build institutions within its confines.

The various parts of Jerusalem are of intense interest to the Jewish and Christian travelers as they explore the old portions of the city, visiting the various historic places, such as the site of Solomon's temple, the palace of Jewish kings, the localities frequented by Jesus Christ, and the place of the Holy Sepulcher. Many excavations have been made to study localities of interest, while the ruins and structures remaining intact have been scrutinized with a devoted reverence. Formerly three walls provided amply against invasions, though these are now largely among the ruins. It is remarkable that far more of the old city remains than is left of either Carthage, Corinth, Tyre, or even Rome, yet many of the buildings are illy constructed, almost windowless, and marked by low and dingy ceilings. A majority of the buildings are one-story and present a unique appearance as they skirt the numerous tortuous streets. The manufactures are not important, including chiefly jewelry, clothing, fabrics, crucifixes, and utensils. In 1893 a railroad was opened to Joppa. The railroad commerce, telegraphic



connections, and other modern facilities have since been enlarged and brought into extensive use.

Besides the beautiful Church of the Holy Sepulcher, there are numerous Christian edifices, convents, and institutions of learning. Several mosques are maintained in conspicuous places, the most important being the Mosque of Omar, which occupies the site of Solomon's temple. Fifty years ago the inhabitants all lived within the city walls. At present nearly one-third reside in the suburbs. The Jews are immigrating rapidly and have fully 70 synagogues. They occupy the southwestern part of the city; whereas, the Christians reside chiefly in the western, and the Mohammedans in the eastern, including the Haram, or temple area. Christians and Jews are vying with each other to secure the best sites. The different classes of people are Turks, Greeks, Armenians, Copts, Abyssinians, Syrians, Georgians, Jews, and others, the whole presenting a great mass of conglomerated humanity. The city has several fine hospitals, seminaries, and elementary schools. An extensive society known as Zionists, well organized in Europe and America, constituted of wealthy and representative Jews, is vigorously promulgating a plan whereby the city is to be reoccupied and invigorated by the Jewish people. At present the population is 61,348, two-thirds of whom are Jews, about 9,000 are Christians, and 5,500 are Mohammedans. See **Zionists**.

**JESTER** (jĕst'ĕr). See **Court Fool**.

**JESUITS** (jĕz'û-its), or **Society of Jesus**, a celebrated religious order of the Roman Catholic Church, founded in the 16th century under the leadership of Ignatius Loyola. It was sanctioned by a papal bull in 1540, when the first generalship was vested in the founder. He was supported with much zeal by Saint Francis Xavier, the so-called "Apostle of the Indies," who did much effective missionary work in India and Japan. The original design of the originator and his five associates was to make a pilgrimage to Palestine and convert infidels, but, as this was averted by a Turkish war, the organization turned its efforts to meet the new conditions that had arisen after the Reformation. The vows include those of chastity, poverty, implicit obedience to superior authority, and compliance with the mandates of the Pope in going to any country or under any conditions to convert heretics and infidels. Popes Paul III. and Julius III. recognized the influence that the Jesuits might wield and granted them extraordinary privileges, among them the power to absolve from all sins and ecclesiastical penalties, to exercise all priestly functions, and to

dispense themselves from the prohibitions of meat and observance of fasts, to which were added extraordinary privileges in the use of the breviary. Their efforts were directed with particular zeal against the rise of Protestantism. In their practices they carefully avoided the appearance of pride, seclusion, and superiority, rather mingling promiscuously with the common people and adapting themselves to various local circumstances.

Besides opposing Protestantism, the Jesuits labored against the claims of monarchs to counteract the establishment of papal power. Their influence spread rapidly, more or less affecting all European countries, even the new settlements of America, though the work was less effective in the United States than in Canada, Mexico, or the countries of South America. Their remarkable rise of power at European courts and among the people led many institutions of learning, professors, and the non-Jesuit clergy to fear them. It was largely for this reason that the parliament of France resisted the Jesuits in their attempts to obtain a foothold, though by the assistance of the Guises they succeeded in getting legal recognition in 1652, but were required to renounce some principles and assume the name of Father of the College of Clermont. Their power in Germany gave them marked prestige after 1549, when they secured chairs in a number of universities and exercised political influence, but they lost some power by the Jansenist controversy. Soon after the famous "Provincial Letters" from the pen of Pascal weakened their influence by pointing out doctrines and practices which he considered dangerous and vacillating, and called attention to their consecration to the policy that "the end justifies the means."

In 1773 Pope Clement XIV. suppressed the whole Jesuit order by a papal bull, but in 1814 it was restored by Pope Pius VII. During the suspension of the society the excellent institutions founded by the Jesuits in Canada were either confiscated by the government or destroyed, but since then they have been replaced and greatly enlarged. Among the more noted institutions in Canada are the Saint Mary's Academy in Montreal, which is unrivaled by any other Canadian institution of the kind, the church in Montreal, and the Saint Boniface in Manitoba. In the United States they possess a large number of educational institutions, the most noteworthy being in New York City; Washington and Georgetown, D. C.; Baltimore, M. D.; Buffalo, N. Y.; Saint Louis, Mo.; New Orleans, La.; Denver, Col.; Cincinnati and Cleveland, Ohio; Omaha, Nebr.; and San Fran-



cisco, Cal. The Jesuits have not had legal existence in Italy since 1861. They were expelled from Germany in 1872. These two countries are unfriendly to the order on account of the opposition of the Jesuits to the present governmental organizations, which they opposed during the formative period. France expelled them from their conventional establishments in 1880, which caused many Jesuits to settle in Great Britain. Within recent times they have taken unusual interest in ecumenical councils, labored earnestly among the American Indians, and exercised influence in shaping the higher policy of the Pope and the church.

**JET**, a black and compact variety of lignite. It is light, hard, and capable of being turned easily, or cut into articles for charms and ornaments. It takes a fine polish. Jet is found in many parts of Europe and Asia, particularly in Asia Minor, France, and at Whitby, in England. The jewelry and various articles of ornament used for mourning are made largely of jet, though excellent imitations are produced from tempered India rubber and glass. The products made of the former are more properly known as ebonite or vulcanite.

**JETTY** (jět'tý), a construction of masonry or wood which projects into the sea, or some other body of water, as a wharf or pier for landing and shipping, or as a mole to protect a harbor. Jetties of another kind are constructed in rivers for the purpose of increasing the current and depth by narrowing the channel. Among the most noteworthy in the United States are those at the mouth of the Mississippi, which have caused the depth of the river to be increased from seven to thirty feet. These were planned and constructed by Capt. James B. Eads (q. v.), in 1875, under an order of Congress to improve the South Pass of the Mississippi. He built two parallel jetties with a channel of 350 feet, the west jetty being 7,800 feet and the east jetty being 11,800 feet long. The longest jetty in the world, that at the mouth of the Columbia River, is nearly five miles long. Other American jetties are at Charleston, S. C., in the Saint John's River, Florida; and at the mouth of Sabine Pass, Texas. Among the many jetties of Europe those in the Danube are of greatest utility, since they have increased the depth of the main channel of its principal mouth twenty feet and made navigation by the largest steamships possible. In numerous places jetties are serviceable in retarding the advance of sand and gravel bars.

**JEW**, The Wandering. See Wandering Jew.

**JEWELRY** (jü'ěl-rý), the precious stones,

gems, and ornaments prepared by jewelers, also the art of mounting precious stones. Jewelry made of metals, amber, alloys, coral, and other materials were used as personal adornments from the earliest periods of history, and were commonly worn by peoples in all stages of savagery and civilization. Relics found in the tombs of ancient Egypt, Peru, and Mexico indicate that jewelry was highly prized. Many antiquities obtained in Egypt indicate that gold work of the highest quality was used extensively for ornaments about 3,000 years ago. In many of the European museums are splendid specimens of ancient Roman and Greek jewelry produced by Etruscan artists, these being secured from the tombs of Etruria. Most jewelers of Oriental countries still pursue the primitive methods of manufacture common many centuries ago, and by their dexterity and refined taste secure products that display rare taste, but their products are surpassed in finish by those made by workmen who employ modern methods. The jewelry trade of modern times is an important branch of industry. In America its greatest center is in New York, while Paris, Berlin, Vienna, and London are important European centers of the manufacture and trade in jewelry.

**JEWFISH**, the name of several large fishes found along the coast of California and in the Gulf of Mexico. The common jewfish, or *black grouper*, has a large head and mouth and at maturity weighs about 300 pounds. It is found off the coast of Florida and in the West Indies. The jewfish of California is much larger, frequently weighing 500 pounds. It frequents rocky islands, has a brownish color, and is commonly called *black sea bass*. This fish is prized for food and commands a high price in the market.

**JEWS**, a race of Semitic people which descended from Abraham, frequently called Hebrews and Israelites, but the last two names apply more properly to them prior to the Babylonian captivity. In their early period they were linked closely with Palestine.

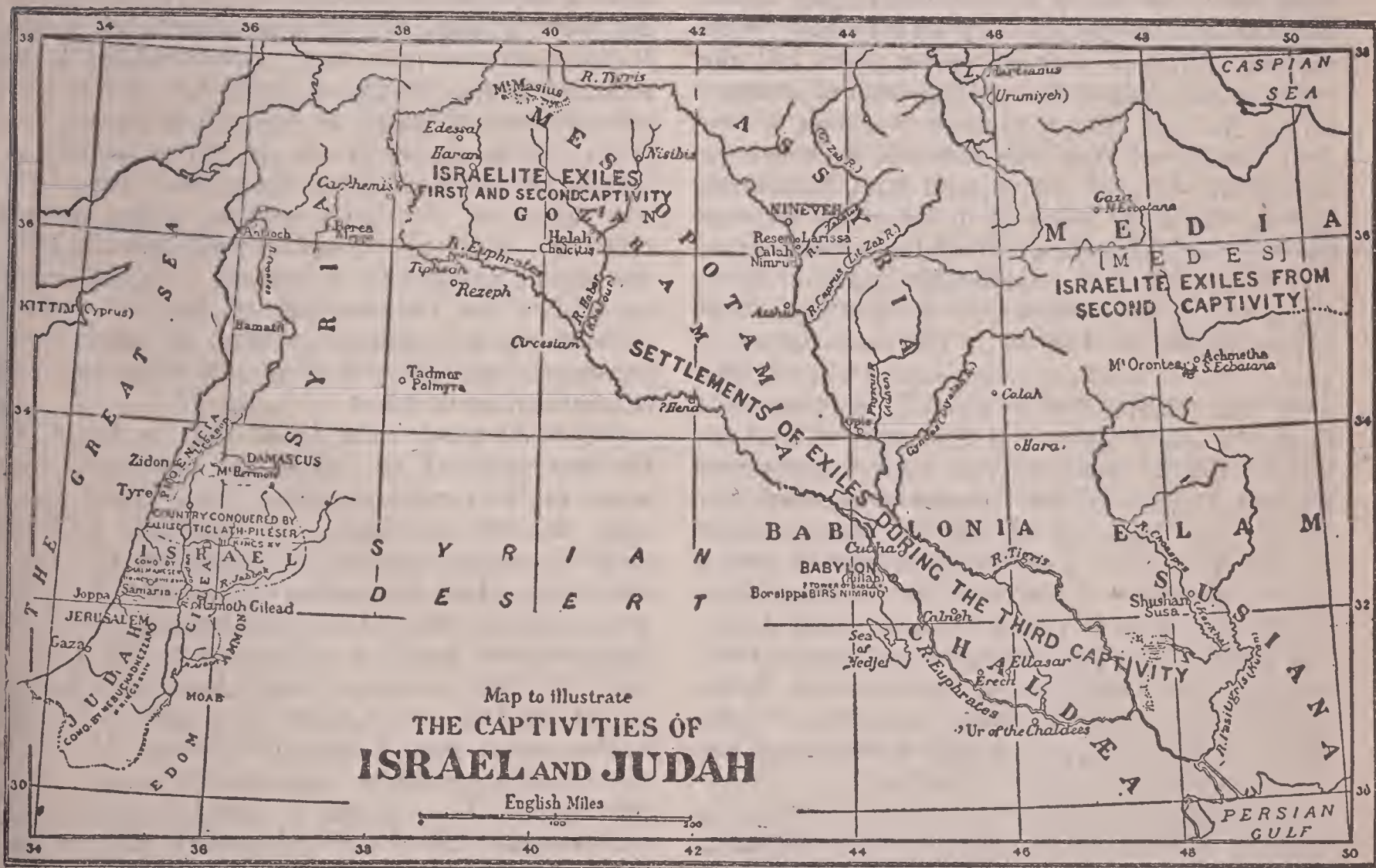
**ANCIENT HISTORY.** The Jewish history dates from the time when the patriarch Abraham left Ur of the Chaldees and settled in Canaan or Palestine. He and his descendants, the houses of Isaac and Jacob, flourished in the southeastern part of Palestine until Joseph, a son of Jacob, became a high official of Egypt. At the time of a widespread famine Jacob and his other eleven sons were induced to emigrate to Goshen, Egypt, where their descendants flourished with marked prosperity for 430 years, though during the latter part of the period they



were treated as bondsmen and held in abject slavery.

It is thought Rameses II. was the Pharaoh who first oppressed the Israelites, and that their deliverance was effected in the reign of his son. In 1320 B. C., or according to others in 1491, Moses became their deliverer and led them out of bondage, directing their famous exodus and wandering in the wilderness in the vicinity of Kadesh, near the boundary of Palestine. During this period they numbered several million. They were divided into twelve tribes according to their descent from the twelve sons of Jacob, receiving in the wilderness through Moses, direct from God, the ten commandments

the Jordan from the Canaanites in 1274 B. C. However, the native peoples were not entirely subjugated at that time, though the lands were divided among the twelve tribes, each receiving a district more or less separated from those of the others, and the whole was governed as a union of states under local chiefs. The grazing lands lying east of the Jordan were allotted to the tribes of Gad, Reuben, and the semitribe of Manasseh, and the others—Benjamin, Simeon, Dan, Judah, Ephraim, Zebulon, Asher, Naphtali, and the second semitribe of Manasseh—received lands west of the Jordan. The priestly tribe of Levi secured 48 cities, was allotted the tenth part of all agricultural products, and received



on Mount Sinai and a complete polity of government. All the laws imposed upon them in the Pentateuch were given as eternally binding. Their government was theocratic. The hereditary priesthood was vested in the tribe of Levi, originally under the direction of Aaron, the elder brother of Moses, and constituted the central idea of national unity.

At the close of the extended wanderings in the wilderness they marched northward to found settlements in Palestine, but Moses died before setting foot upon the land of promise and was succeeded by Joshua, who led the hosts of Israel and successfully conquered the regions west of

authority to frequent any portion of the territory.

Joshua died about 1220 B. C., after which period the bonds of unity between the tribes were less rigid, of which fact the Philistines, a people inhabiting the coast plains along the Mediterranean, took advantage and brought a portion of the Israelites under subjection. These wars were followed by the heroic age of the Jewish people, during which time they were governed by a succession of fifteen judges, of whom the most noted were Deborah, Gideon, Jephthah, Samson, and Samuel. Samuel was the most successful ruler since Moses, the last



of the judges, and, after popular entreaty by the people, inspired Saul, a Benjamite, to become king, he anointing him as ruler of all the Jews. Though a successful warrior, Saul lacked statesmanship, but succeeded in numerous battles against the Philistines until his final defeat and death at Mount Gilboa. He was succeeded by David, his son-in-law, who ruled from 1055 until 1015. The successful reign of David caused him to become known as the greatest king of the Jewish throne. The period including the reigns of David and Solomon is designated the golden age of Jewish history.

David rose from the tribe of Judah. He was a native of Bethlehem, came in conflict with Saul until the death of the latter, and established a separate principality with Hebron as its capital. After a war of seven years, all the tribes acknowledged David king, who now transferred the seat of government to Jebus, a fortress conquered from the Canaanites, which he named the City of David, and later Jerusalem. During the long reign of forty years he conquered the Edomites, Moabites, Ammonites, and Philistines, and extended his dominion from Damascus to the northeast of the Red Sea. Solomon reigned in 1015-977. He built the great temple in Jerusalem, negotiated treaties with Tyre and Egypt, and extended the commerce from Africa to Java and Sumatra. This sovereign effected many internal improvements and showed a wisdom that became proverbial, but in the later years of his life he was weakened greatly in influence by various causes which led to interior dissensions and insurrections. In 975 the Jewish people became divided into two nations, the kingdom of Israel under Jeroboam and the kingdom of Judah under Rehoboam. The latter kingdom consisted of the tribes of Benjamin and Judah, while Israel was constituted of the other ten tribes.

The capital of Israel was first established at Sichern, but later was transferred to Samaria. Rehoboam made a number of unsuccessful attempts to reconquer Israel, but was prevented by an Egyptian invasion under Shishak, and some time after Judah averted annihilation by Israel through an alliance with the Syrians. After varied successes in wars covering many generations, Shalmaneser, King of Assyria, subdued Israel in about 720 B. C., and carried many of the leading citizens away into captivity. The succeeding Assyrian king, Sargon, completely destroyed the government of Israel and settled the principal inhabitants in Media and Assyria, while Assyrian colonists occupied the different regions, intermarried, and largely formed the historic Samaritans. Among the most noted

kings that governed Israel during its prosperity are Jeroboam I., Jeroboam II., Ahab, Joram, and Pekah.

Judah was less powerful and prosperous than Israel. The kings of the house of David numbered twenty, the most successful being Jehoshaphat, Uzziah, Hezekiah, and Josiah. These kings were the most devoted to the laws of Moses and the worship of Jehovah. This kingdom was invaded by armies from Egypt and Assyria and later became tributary to Babylon. In 588 Nebuchadnezzar captured Jerusalem and carried away its riches, making the leading citizens captives. When Cyrus captured the throne of Babylon, in 538, he set the Jewish people free, after a captivity of about seventy years, restoring them to their former possessions, but made Judah a Persian province. About 42,000 Jews returned to the vicinity of Jerusalem in 538 and built the second temple in 516. In 458 Ezra, the priest, led a second return of exiles to Palestine in the reign of Artaxerxes, and Nehemiah was appointed Persian governor, under whose reign the walls of Jerusalem were rebuilt. In the period between the return of Nehemiah and the fall of the Persian Empire, the Jews were Persian subjects, but this formed an epoch during which they enjoyed their own religious and educational institutions.

When Alexander the Great led the hosts of Grecian warriors into Asia, he penetrated toward the east and conquered the Persian Empire. In 332 B. C. the Jews submitted to him under promise that they be permitted to exercise freely their religious rites. After the empire founded by Alexander became divided, Palestine was made a possession of the Ptolemies of Egypt. About 100,000 Jews were taken to Alexandria and Cyrene and settled chiefly in the region from Libya to Ethiopia. Under a system of equal rights with the Egyptians they prospered. They aided in building the great schools and libraries of Alexandria and translated the Old Testament, this translation being known as the Septuagint, or Greek version.

About 198 B. C. a Syrian and an Egyptian party rose among the Jews of Palestine. This resulted in civil strife and finally brought on an invasion by Antiochus IV., in 170, which led to great slaughter and an effort to compel the Jews to change their religion. About this time the Maccabees attained power, and, after struggling fourteen years, succeeded in driving the Syrians out and establishing the sanhedrim, a national council. The Jewish reign of this epoch is marked by the establishment of the Pharisees and Sadducees, two rival sects. A controversy between Hyrcanus II. and Aris-



tobulus over the title to the throne caused local disturbances and led the Pharisees, in 63 B. C., to ask aid of Pompey, who made Palestine a Roman province. The Roman senate recognized Herod the Great as King of Judea, who exercised sovereign prerogative in setting aside Jewish manners. Within his reign, in 4 B. C., Christ was born at Bethlehem, and in 6 A. D. Samaria and Judea became a united Roman province, being governed by a procurator from Caesarea. In 26 A. D. Pontius Pilate was made procurator, in whose reign Christ pursued his ministry and suffered death. Herod Agrippa was king in 41-44, persecuted the Christians, and caused the apostle James to suffer martyrdom. An insurrection occurred in 65, which resulted in the capture and destruction of Jerusalem five years later by Titus. Hadrian razed it to the ground about 135 A. D., and erected a gentile city in its place, called Aelia Capitolina. He forbade the Jews under penalty of death to enter it, and not until the time of Constantine was the name of Jerusalem revived.

After the destruction of Jerusalem by Titus, the Jewish people became scattered extensively to all countries. Since that time they have lived either as aliens or as citizens by adoption. In the time of Emperor Julian they made an unsuccessful attempt to build a new temple at Jerusalem. This movement resulted in a revival of the sanhedrim at Tiberias and the establishment of two presidencies of the sanhedrim, one at Tiberias and the other at Bagdad. From them the Jewish people attained a foothold among the learned and professional institutions suitable for the culture and higher education of the rabbis. Among the celebrated products of their scholars is the Talmud, completed in the year 500, which contains expositions of the Old Testament with additions and annotations. By reason of their superior business sagacity and continued application, the Jews became ruling spirits in the commerce of the world, established great banking centers, and rose to stations of business and political importance. They flourished alike in the countries of Christians and Moslems, though during the supremacy of the Moors in Spain their learning and prosperity were greatest. In the 11th century they were largely colonized on particular streets in the cities of Germany, Italy, and France, as a class of inferior or dishonored people, and often suffered by political and social oppression. In the 15th century Spain and Portugal required them to be baptized, to which they either consented, were put to death, or were banished from the peninsula.

MODERN HISTORY. At the beginning of the

19th century the different nations began to treat the Jews as other citizens. Shortly after the French Revolution they were placed on an equality in France. Russia followed the lead of France in 1811, and Denmark did likewise in 1814. Great Britain admitted them to Parliament in 1858 and Norway sanctioned their immigration in 1860. Other countries modified their laws more or less in harmony with France and Germany, though disturbances have prevailed periodically, the most noted of recent times occurring in Russia in 1892 and in France in connection with the Dreyfus affair in 1899. In the United States they have always had equal rights with other peoples. The tenacity with which the Jews of modern times retain their racial characteristics, and cleave to the religion of their fathers among alien nations and peoples, is remarkable. Some of the greatest names in modern history are those of Jews, among them Rothschild, Disraeli, Mendelssohn, Spinoza, Heine, Meyerbeer, etc. The greatest number of Jewish people are in Russia, where they aggregate 5,850,000; Austria-Hungary, 1,950,000; the United States, 1,145,000; Germany, 615,000; and Rumania, 450,000. The total Jewish population of the world is estimated at 11,800,000.

LANGUAGE. The Jewish language is a branch of the Semitic family of languages. Perhaps originally it was the language spoken by the Phoenicians, and was adopted from those people by Abraham and his family at the time that patriarch settled in Palestine. The religious and moral notions of all Hebrews caused many distinct characters to be impressed upon it, as also did the long residence in Egypt and the sojourn in the wilderness, thus making it a dialect distinct in many essentials. While the oldest sacred writings known to us are in the Hebrew, there are secular works and inscriptions coming to us from older sources. It is quite common to distinguish the language by two distinct periods, including the time up to the Babylonian exile, and from the exile up to the present. In the former period comparatively few foreign words were mixed with the language, while in the latter time many Arabian and Aramaic elements became incorporated. No material progress was made in securing a grammatical treatment of the language until about the 6th century A. D., when several technical texts were published. In the written language are many accents and marks of punctuation, but it has no capital letters. It has twenty-two consonants, five letters have a separate final form, and the vowels are designated by marks above or below the letters.



**LITERATURE.** The literature is of vast importance because of its wide influence on the Christian and Mohammedan nations. It surpasses the literature of all other ancient peoples on account of the vigorous style of its poetry and its religious characteristics, and at the same time is the most reliable source of the early history of the human race. The Bible (q. v.) is the greatest product of Jewish literature. No work of ancient or modern times has been read and studied with an equal interest and devotion, and its precepts have influenced human action more than any other works, either singly or collectively. The first period of Jewish literature extends to 143 B. C., and one of its greatest products is the "Midrash," a work making inquiry into the meaning of sacred writings. In the second period, extending from 143 B. C. to 135 A. D., the "Midrash" was divided into the "Halacha" and "Hagada," the former relating to common law, and the latter embracing the religious teachings. Josephus in this period wrote his "History of the Jewish Wars," Philo compiled various philosophical works, and divers writers produced the different books of the New Testament and the *Apocrypha*. The latter is now seldom published in the edition of the Bible which is commonly used by Protestants.

The third period is included between 135 and 475 A. D., in which time the schools of Palestine and Rome gave instruction from the "Halacha" and "Hagada." In this time the scholars versed in the "Mishna," the oral law, exercised a wide influence, and the "Talmud," a work containing the "Mishna," was written. From this time on the Jewish people became widely scattered in many countries, thus causing them to acquire the language of the lands of their adoption. Many writers of modern nations are of Jewish extraction, the products being in various languages, and including works in philosophy, law, science, poetry, music, medicine, mathematics, philology, and higher criticism.

**JEW'S-HARP** (jüz'härp), a metallic musical instrument. The sound is produced by inhaling and ejecting air from the lungs, while the instrument is held between the teeth, the metallic tongue, or spring, being struck by the finger. Instruments of this kind are made wholly of steel. The sizes vary from small toys to those used to produce musical tones of considerable volume and in rhythmic order.

**JEYPORE.** See Jaipur.

**JHELAM** (jē'lām), or **Jhelum**, a large river of India, in the Punjab, one of the affluents of the Chenab. It rises in Kashmir, passes through the Himalayas in the defile of Baram-

bula, and thence has a southward course. It discharges into the Chenab River after a course of 490 miles. The Jhelam is navigable for a distance of 300 miles, and is noted for its fisheries.

**JIGGER** (jīg'gēr), or **Chigoe**, a kind of small flea, native to the West Indies and South America. It resembles the common flea, but is somewhat smaller. Its bite is at first indicated by a slight itching, but later it becomes quite painful. Several species have been described, some of which attack the eyelids of poultry. The name is applied in the United States to a small scarlet insect that is troublesome to the skin of man. It is common to the grasses in the Southern States, where it subsists most of its life. When it attacks the skin, it burrows and deposits its eggs, causing quite an annoyance by producing an itching and tingling sensation. Salt-water bathing has a relieving effect.

**JINGOISM** (jīn'gō-iz'm), a term applied to an individual or party who advocates a warlike policy. The expression, by *jingo*, originated from a corruption of the Basque word *Jinkoa*, and from it the term jingoism was coined in 1877, when the political parties in England disagreed as to the policy of intervening in the war between Russia and Turkey. Gladstone and the Liberals advocated a neutral policy, while Beaconsfield and the Conservatives favored intervention to aid Turkey against Russia. Since then the term has been in popular use in Great Britain and the United States, and is usually applied to the advocates of an imperial policy. The doggerel sung at a musical hall in London at the time has been widely published:

"We don't want to fight;  
But by Jingo, if we do,  
We've got the ships,  
We've got the men,  
We've got the money, too!"

**JINRIKISHA** (jīn-rīk'ī-shà), a light carriage drawn by a man, who goes between the shafts. This vehicle has two wheels and is constructed to carry either one or two persons. Some are provided with a hood, which is attached to the upper part of the seat, and two springs make the vehicle quite easy. The man employed to pull this vehicle is called the *hiki*. Where long distances are to be made or a heavy load is to be drawn, he is assisted by one or more outrunners, who pull by cords attached to the crossbar. The jinrikisha was invented in 1868 and was shortly after introduced in China, Japan, and India, where a large number are in use. The rate charged is from one to five cents a mile, depending upon the speed and the character of the road to be covered.



**JITOMIR** (zhê-tô'mêr), or **Zhitomir**, a city in Russia, capital of the government of Vollandia, on the Teterev River, about eighty miles west of Kiev. It is a commercial center and contains numerous manufactories. The place has railway facilities, several schools, and a number of government buildings. Population, 1908, 82,084.

**JOB'S TEARS**, the name of a grass native to India, grown as a cereal in a manner similar to corn. It is so named from the seeds, which are tearlike, hard, shining globules. The seed is used in India for food. The plant has been naturalized in Canada and the United States as an ornamental grass.

**JOHANNESBURG** (yô-hän'nês-bürg), the largest city of South Africa, in the Transvaal Colony and in the center of the Witwatersrand gold fields, 35 miles south of Pretoria. It is regularly platted with wide streets, which intersect each other at right angles, and they are generally well improved by grading and pavements. The chief buildings include the stock exchange, the post office, the public library, the city hall, and many business blocks. Much of the architecture is of stone and vitrified brick laid in cement. It has a system of public waterworks, gas and electric lighting, and electric street railways. Among the manufactures are clothing, brick, pottery, tobacco, machinery, leather, soap, packed meat, and jewelry. It has a large trade in produce, merchandise, grain, and live stock.

Johannesburg was founded by the Boers in 1886. Three railways were opened to it in 1892, giving it communication facilities with Pretoria, Cape Town, Dunbar, Port Elizabeth, and Delagoa Bay. In 1895 the famous Jameson raid was made upon the city, which resulted in the capture of the insurgents, and four of the principal leaders were sentenced to death, but the sentence was afterward commuted to a cash payment of \$125,000 each. The fortifications constructed by the Boers long prevented British occupation, but it was captured by Lord Roberts in 1900. About half of the inhabitants are whites. Population, 1906, 174,284.

**JOHN**, the name of 23 popes, who reigned within the period from 523 to 1417, of whom John VIII. and John XXIII. are the most noteworthy. The former was Pope from 872 to 882. He succeeded Adrian II. and attained remarkable success in overcoming Saracen influences. John XXIII. reigned from 1410 to 1415. He was of noble descent, and became noted because of prolonged controversies regarding papal succession with Gregory XII. and Benedict XIII. See **Pope**.

**JOHN DORY**, the English name of a fish native to the warm seas of the Eastern Hemisphere. A species common to the Mediterranean is prized as a food fish. It is about twenty inches long and has bony jaws fitted for the passage of large objects taken in as food. It is rather sluggish and inactive, except when in pursuit of other fish, upon which it feeds. The body is covered with spinous scales and has an olive-brown tail, marked by a large circular brownish spot on each side. According to legends, this fish was caught by Saint Peter in the Lake of Gennesaret, the marks being the impression of his thumb and finger. Several other species occur in the tropical seas, all of which have a compressed body, with a protruding under jaw.

**JOHNS HOPKINS UNIVERSITY**, an institution of higher learning at Baltimore, Md., founded by Johns Hopkins, who bequeathed the sum of \$3,500,000 for this purpose. The university was incorporated in 1867, six years before the death of the founder, and the first president, Daniel C. Gilman, was inaugurated in 1876. Graduate and collegiate courses were first offered and in 1893 a medical department, to which only college graduates were admitted, was opened. President Gilman retired from office in 1901, when Ira Remsen, the professor of chemistry, was elected president.

The buildings of the department of philosophy and the arts are situated not far from the center of the city and include a central building; laboratories for zoölogy and botany, chemistry, geology and mineralogy, and physics; a gymnasium; and a Christian Association building. A beautiful site of 125 acres was given to the university in 1902, when the permanent endowment was increased by the sum of one million dollars contributed by friends and the alumni. The buildings of the medical department adjoin the Johns Hopkins Hospital, with which it is closely affiliated and upon which it is dependent for its clinical advantages. The funds of the university amount to about \$4,500,000, the grounds and buildings are valued at \$1,750,000, and the library and scientific apparatus have a value of \$390,000. About 135,000 bound volumes and many pamphlets are contained in the library.

Instruction is given in mathematics, physics and astronomy, chemistry, geology and mineralogy, zoölogy and botany, Greek, Latin, Sanskrit and comparative philology, Semitic language, English language and literature, German and Germanic philology, Romance languages, history, political economy, political sciences, philosophy and psychology. Instruction is given in all the branches of medicine and surgery. The



three degrees offered are Bachelor of Arts, Doctor of Philosophy, and Doctor of Medicine. Twenty-two fellowships and 91 scholarships are offered to students of ability and promise. About a dozen journals are issued regularly from the Johns Hopkins Press. The faculty consists of 196 instructors and the enrollment is about 700 students.

**JOHNSTOWN**, a city of New York, county seat of Fulton County, forty miles northwest of Albany. It is on Cayadutta Creek and the Fonda, Johnstown and Gloversville Railroad. The chief buildings include the Carnegie public library, the county courthouse, the public prison, and the high school. Among the manufactures are gloves, shoe leather, cigars, machinery, and knit goods. Gas and electric lighting, pavements, street railways, and waterworks are among the municipal facilities. It has a large and growing trade. The region was settled in 1760 under the direction of Sir William Johnson, after whom the place was named. It was chartered as a city in 1895. Population, 1905, 9,845; in 1910, 10,447.

**JOHNSTOWN**, a city of Cambria County, Pennsylvania, at the confluence of Stony Creek and the Conemaugh River, forty miles southwest of Altoona. It is on the Pennsylvania and the Baltimore and Ohio railroads, and is surrounded by a country rich in coal, fire clay, and iron deposits. Among the noteworthy buildings are the public library, the high school, the city hall, and the Conemaugh Valley Memorial Hospital. Grand View Cemetery is a fine burial ground. The manufactures include iron plate, brick, cement, furniture, pottery, and hardware. It has street railways, waterworks, pavements, gas and electric lights, and other improvements. Johnstown was settled about 1790. The city was almost totally destroyed May 31, 1889, by the bursting of a dam in the Conemaugh River, which formed Conemaugh Lake above. The total loss of life was 2,500 persons and 99 entire families were lost. Contributions sent for the relief of the sufferers amounted to \$4,116,801.58. However, the city soon recovered from this calamity and developed rapidly in trade and wealth. Population, 1900, 35,936; in 1910, 55,482.

**JOHORE** (jō-hōr'), an independent state in the southern part of the Malay Peninsula. It comprises an area of 8,980 square miles. The larger part is covered with a dense growth of primitive forests. Timber, gambier, rattans, fruits, and black pepper are the chief products. The soil is fertile and well adapted to the cultivation of cereals, sugar cane, tobacco, and the coffee tree, but comparatively little advancement has been made in agricultural arts. Johore Barhru, the capital, is a small town located a

short distance northeast of Singapore. In 1885 the British concluded a treaty to control the foreign affairs. The country is populated chiefly by Malays and Chinese. Population, 1906, 195,506.

**JOINT**, in anatomy, a connection between the bones and cartilagenous formations of the skeleton. The joints permit the movements of the animal frame, contribute to the strength of the skeleton, especially of the back and the lower limbs, and give form and shape to the body. They are either *movable* or *immovable*. The former embrace such as the joints of the hip, shoulder, and ankle, and the latter include the frontal and parietal bones. The end of one bone in a joint is usually convex, that of its companion bone is concave, and both ends are covered by a thin layer of elastic cartilage. This cartilage has a highly polished surface and serves to facilitate motion and to deaden shock. The moveable joints are usually divided into planiform, hinge, and ball and socket joints.

In the *planiform joints* the surfaces are more or less plane, permitting a gliding movement, as in the tarsal and metatarsal articulations of the foot. They permit only a limited motion, but impart elasticity and slight flexibility. The *hinge joints*, which permit motion in two directions, are provided with very strong ligaments on the sides, as in the elbow, ankle, and finger. In the joints of the ankle and the fingers the tendons of certain muscles replace the ligament. In the *ball and socket joint* there is a cuplike cavity in one of the bones, into which a headlike extremity of the other bone is fitted, the latter being held in place by a membranous capsule. This class of joints permits great freedom of motion in all directions, as in the joints of the hip and the shoulder. The socket in the latter is not as deep as that of the hip, hence there is greater freedom of motion, but the joint is more easily dislocated. A secretion called *synovia* is supplied by a thin membrane that surrounds the joints, serving to moisten and salubricate them.

**JOINT-FIRS**, the common name of several species of small trees and shrubs closely related to the coniferous plants. A number of these are native to the southwestern part of North America, and others are found in the warmer parts of Asia and Europe. They are so named from their jointed stems. The juices are not resinous, but are watery or somewhat gummy.

**JOINTS**, in geology, the fissures of a peculiar kind that divide rock masses. They usually occur in parallel lines of a system of clefts. Joints are due either to the passage of earthquake waves or faults resulting from strains by the forces that elevate the surface. They differ



from dividing surfaces of strata in that the texture is the same on both sides of the dividing line, and from cleavage by the fact that the blocks are thicker and that they have little or no tendency to split in the same direction. Joints are designated as *strike*, *dip*, and *diagonal joints*, depending upon whether they run parallel to the strike or to the dip, or extend diagonally across either of these.

**JOINT-STOCK COMPANY**, the name usually employed to designate a partnership in which the capital is distributed among a number of partners. They assume in certain respects a corporate form, but possess legally none of the peculiar attributes or powers of corporations. Joint-stock companies are either limited or unlimited, and they may become incorporated under the law by complying with its requirements. A *limited* company is one of two forms, in one of which each member is limited to the amount unpaid on the shares that he stipulated to purchase, and in the other the liability of each member is limited to the amount he agrees to contribute to the assets should the business of the company be discontinued. In an *unlimited* company the liability of the members has no legal limit. The word *limited* must be added to the name of the company, in case the liability is to be restricted, which serves to give notice to the public of the character of the organization. In addition there must be a record kept by the company to show the place of business, the amount of capital, the limit or the amount of guarantee, and the object for which the association of individuals is established.

**JOLIET** (jō'li-ět), a city in Illinois, county seat of Will County, on the Des Plaines River, forty miles southwest of Chicago. It is on the Atchison, Topeka and Santa Fé, the Chicago and Alton, the Michigan Central, the Chicago, Burlington and Quincy, and other railroads, and on the Illinois and Michigan Canal. The surrounding country is a fertile agricultural and dairying district, which also produces an excellent quality of Silurian limestone and bituminous coal. Among the noteworthy buildings are the post office, the county courthouse, the public library, the township high school, the State penitentiary, the workingmen's clubhouse, and Saint Francis and Saint Mary academies. It has manufactures of flour, lime, lumber products, pottery, farming utensils, tombstones, cigars, bridges, furniture, and Bessemer steel. Among the general facilities are electric street railways, sewerage, waterworks, and pavements. The place was settled in 1831 and incorporated in 1852. Population, 1900, 29,353; in 1910, 34,670.

**JOLIETTE** (zhō-lyět'), a city of Quebec,

capital of Joliette County, 42 miles east of Montreal. It is connected with the Saint Lawrence River by a railway of twelve miles and is on the Canadian Pacific Railroad. The manufactures include leather, lumber products, and machinery. It has a hospital, a college, waterworks, and electric lighting. Limestone quarries are worked near the L'Assomption River, on which the town is located. Population, 1901, 4,220.

**JOPLIN** (jöp'lin), a city and one of the county seats of Jasper County, Missouri, fifteen miles southwest of Carthage, on the Missouri, Kansas and Texas, the Missouri Pacific, the Saint Louis and San Francisco, and the Kansas City Southern. In the vicinity are extensive deposits of zinc and lead. The average annual output of the mines within the adjacent district is valued at \$9,500,000. Large quantities of fruits are produced in the vicinity. The noteworthy buildings include the Carnegie library, the high school, the Federal building, the opera house, and the Y. M. C. A. building. Among the manufactured products are machinery, ironware, cigars, steam boilers, soap, and flour. The smelting works and foundries give employment to a large number of laborers. It has a large trade in produce and merchandise. It was settled in 1870 and incorporated in 1873. Population, 1900, 26,023; in 1910, 32,073.

**JOPPA**, or **Jaffa**, a city in Palestine, 33 miles northwest of Jerusalem, on the seacoast of Syria. It is a very ancient city and in the time of Solomon was the port of entry to Jerusalem, being the place to which the cedars of Lebanon were floated from Tyre for the building of the temple. The Jewish prejudice concerning the Gentiles and the Christian religion was corrected after a vision seen by Peter at Joppa. In the time of the Crusades the city reached its highest prosperity, being the principal place of landing. The French under Bonaparte captured it in 1799. In 1832 Mehemet Ali reduced the city, but the Turks, with the assistance of the Austrians and British, took possession of it in 1840. At present Joppa is an export city for live stock, cereals, fruits, and various manufactures. In September, 1892, it was made the terminus of a railroad to Jerusalem. Population, 1906, 45,048.

**JORDAN** (jôr'dan), a celebrated river of Palestine, lying in a valley that stretches from north to south in the eastern part of Syria. It has several sources, rising in the southern declivities of the Libanus and Anti-Libanus, is 150 miles long, and its mouth is 1,312 feet below the surface of the Mediterranean. In its course from Mount Hermon and Mount Lebanon to the Dead Sea it passes through the lakes Huleh



(the waters of Merom) and Bahr Tubariyeh (Sea of Galilee or Tiberias). Its bed varies greatly in breadth, many places having rocky and precipitous banks, while others are flat and sandy. The average width of the Jordan is from thirty to fifty yards. It is spanned by very few bridges, the one most famous being Jacob's bridge, situated north of the Sea of Galilee. The total fall of the Jordan is 2,300 feet. Many Christians regard it a special privilege to be baptized in the Jordan, from the circumstance that Christ was baptized in the stream by John.

**JORULLO** (hō-rōōl'yō), a volcanic mountain about 150 miles west of the city of Mexico, thrown up by volcanic force on Sept. 29, 1759. It consists of numerous cones, some of which give out vapor. The highest elevation is 4,250 feet above sea level. Owing to the gradual loss of temperature, foliage and forest trees have slowly moved upward and now cover most of the region.

**JOTUNS** (yō'tunz), the name of immense giants and magicians, especially those spoken of in Scandinavian mythology. They are credited with living in dark caves in their kingdom known as Jotunheim. The Jotuns were thought to be destructive forces and the possessors of much cunning, but had an inferior intellect. They are represented as being skilled in the arts of witchcraft.

**JOURNALISM** (jūr'nāl-iz'm), the business of managing, editing, or writing for newspapers or other periodical publications. It has come to be one of the important occupations in the promulgation of knowledge and the diffusion of intelligence. Within recent years periodicals have been founded in practically all parts of the world inhabited by civilized and semi-civilized peoples. They have come to be regarded important avenues for the spread of news, and for instruction in politics, morals, arts, industries, theology, sport, and sociology. At the time of the operations of the Roman imperial armies accounts were published regarding their movements. These were under the direction of the generals, served as communications of intelligence to the officers of the different divisions, and are regarded the first systematic means of bearing tidings. Modern journalism dates from the 15th century and had its beginning in Germany, the first newspaper sheets being issued regularly in Saint Augsburg, Nuremberg, Ratisbon, and Vienna. However, the first publication resembling newspapers published at the present time was the *Notizie Scritte*, established at Venice in 1566. The name applied to this publication caused the word *gazette* to be coined, and shortly after gazettes were

issued regularly in many of the large European cities.

Nathaniel Butter founded the first newspaper in England, which appeared as the *Weekly News* in 1662, and in the same year the London *Weekly Courant* was established. The latter was published as a daily in 1702, but consisted only of a small sheet printed on one side. Advertisements did not appear in periodicals until the latter part of the 17th century, and came to be inserted on account of notices given of new books as they were published. These notices attracted the attention of the public and led to the conclusion that advertisements of merchandise and other matters kept for sale would prove remunerative. At present newspaper advertisements are among the most profitable departments of the business, and are thought to be fully as remunerative to the advertisers as to the publishers.

It was estimated in 1909 that the number of newspapers in the world was 93,500. The number credited to the United States is 23,806; Germany, 12,480; France, 5,600; Great Britain and Ireland, 5,500; Austria-Hungary, 4,950; Italy, 2,800; and Canada, 1,478. In the other countries of Europe and in the other grand divisions the periodicals are limited to a smaller number, though more or less appear in all countries. They are published in practically all the languages.

The first newspaper founded in America was *Publick Occurrences* in 1690. This was followed by the *Boston News Letter* in 1719, and immediately after many others were established in various parts of the colonies. They rapidly gained circulation among the people in towns and later among those residing in districts remote from common centers. Benjamin Franklin was one of the early publishers to gain influence. He established the *Pennsylvania Gazette* in 1729, which was merged into the *North American* in 1745. Other noted journalists of America include James Gordon Bennett, founder of the *Herald*, and Horace Greeley, founder of the *Tribune*. Since then many great newspapers and other journalistic enterprises have developed in all the large cities of Canada and the United States.

Many of the leading publishers have been induced by the rapid growth and phenomenal success in newspaper enterprises to invest their surplus capital in substantial fireproof buildings, which are used for publishing and general office purposes. These buildings are fine specimens of modern architecture, and add convenience to the management as well as serve to beautify the cities where located. Among the most



prominent are those of the *New York World*, *New York Times*, *Washington Post*, *Omaha Bee*, *Chicago Tribune*, *Seattle Post-Intelligencer*, *San Francisco Chronicle*, *Portland Oregonian*, and *Saint Louis Globe-Democrat*.

Each newspaper has a business manager, whose business it is to make contracts with advertisers, keep the office records, purchase the necessary supplies, and attend to the payment of employees. The business manager works to the same end as the editor, both striving to make the publication successful and to keep its tendency in accord with the views of the owner. The editor has charge of the editorial work and supervises the reading matter that goes into the newspaper. Much of the general news is gathered and furnished by organizations known as *press associations*. The first association established to gather news was in New York City, though a number of newspapers prior to that furnished each other news under a local agreement, and this is quite commonly the case with newspapers at present. Intelligence syndicates have successful news gatherers in all sections of the world, and usually make arrangements with authors and special contributors at certain times for signed articles. These contributions are generally sold to one newspaper in a city, and are published by the different newspapers simultaneously.

The leading newspapers have branch offices in many large cities for the purpose of both gathering news and distributing their daily papers to the public. These offices are managed by American companies, not only in the United States, but in Paris, London, Berlin, and other foreign cities, though more particularly for the purpose of gathering the news. The larger organizations send special correspondents to legislatures, congresses, and the seat of war for the purpose of having the news gathered and promptly telegraphed to the central office. Readers residing out of the city of publication receive their papers through the mails or news vendors, or buy them on the trains, while within the city of publication they are delivered largely by special carriers. The press is free in Canada and the United States to publish all matters of news, but may be held liable for damages or be subject to an action in libel. In most European states a strict censorship is maintained over newspapers, while during the time of war the military authorities of all countries guard carefully the transmission of intelligence regarding military movements.

The American people are the most extensive readers of newspapers, largely because of the high state of literacy, rapid means of transpor-

tation, and remarkable business activity. It is estimated that the total number of separate newspapers published in the United States in 1896 was 4,681,113,530, but in 1908 the number reached the marvelous total of 10,500,000,000. The great daily newspapers are wonderfully productive in the amount of published matter of various kinds, covering all branches of knowledge and relating to all the countries of the world. This is true especially in the Sunday edition, which usually includes sufficient subject-matter to constitute a book of fair size.

**JOURNALISM, School of**, an institution founded by Joseph Pulitzer (q. v.) in 1903, forming a college of Columbia University, in New York City. He endowed it with a grant of \$2,000,000. The purpose is to train men in the art of journalism with the view of maintaining a high standard in the newspaper profession, and to increase the power and prestige of the press as an agency in promoting the cause of government and good citizenship. Students have access not only to a course of study in the law and ethics of journalism, but pursue advanced courses in literature, rhetoric and composition, commercial law, sociology, economics, political science, and United States and contemporary European history. Though the course of study covers a wide range, the instruction is designed particularly to supply the requirements for practical newspaper work.

**JUAN FERNANDEZ** (hōō-än' fēr-nän'-dēth), an island about 400 miles off the coast of Chile, to which country it belongs. The island was discovered in 1574 by a Spaniard whose name it bears. It is about thirteen miles long and four broad, rocky, mostly high, but with some parts fertile. The chief products include cereals, cherries, peaches, figs, apples, grapes, melons, etc. It is famous on account of the story of Robinson Crusoe written by Daniel Defoe (q. v.), which is thought to be founded upon the solitary confinement and residence of Alexander Selkirk (1676-1723), a Scotch pirate, on the island of Juan Fernandez. He quarreled with the captain and at his own request was put off on the island, where he lived on fruit and wild goats for four years. The island is at present occupied by a number of Chilean settlements.

**JUBILEE** (jū'bī-lē), a festival celebrated by the Jews every fiftieth year, the year succeeding every seventh sabbatical year. During this year all slaves were set at liberty, all lands lay fallow, and all estates that had been sold reverted to the heirs of the original owner, to whom the land had been parceled out in the time of Joshua. The design of this institution was



to check the rise of any great inequality of social conditions, and to prevent the rich from oppressing and enslaving the poor. It strengthened the bonds of families and bound the people to their country, by leading them to cherish an affection for estates derived from their ancestors and to be transmitted to their posterity. It was observed both prior and subsequent to the Babylonian captivity, but ultimately fell into disuse.

**JUDE**, *Epistle of*, the last of the 21 epistles of the New Testament. It was probably written in Palestine about the year 62, and is directed against heretics and false teachers. In early times of the Christian church its authority was contested on the ground that it contains citations of apocryphal writings, though belief in its divine inspiration was general in the church. Most commentators maintain that it was written by Judas Thaddeus (q. v.).

**JUDEA** (jū-dē'á), or *Judaea*, the name used in ancient geography to designate the kingdom of Judea to distinguish it from the kingdom of Israel. After the Babylonian captivity and up to the time of the Roman occupation it denoted the whole of Palestine. The Romans used the name in a general sense to signify the land of the Jews. In a restricted sense it applied to the southern part of Palestine, which was bounded on the north by Samaria, east by the Jordan and the Dead Sea, south by Idumaea, and west by the Mediterranean. See *Palestine*.

**JUDGE**, an officer who has authority to hear and determine causes at law. The term is sometimes used interchangeably with *justice*, or *lord justice*, and extends to the presiding officer in courts of both equity and civil and criminal law. Although a justice of the peace is in a certain sense a judge, he is not usually spoken of in this respect, since the term applies more properly to the judges of district, circuit, and supreme courts. These officers are sometimes spoken of as a *district judge*, *circuit judge*, or *supreme judge*. It is necessary that a judge be an entirely disinterested party, hence one who has a private or pecuniary interest is disqualified from hearing a case. Although a judge may be prosecuted for a violation of the law, he cannot be held for damages in consequence of his decisions.

**JUDGES**, *Book of*, one of the historical books of the Old Testament. It is so named because it narrates the deeds of the thirteen judges of Israel from Othniel ben-Kenaz to Samson, the first and the last of the judges. Though fragmentary and somewhat disconnected, it gives a reasonably full account of Beborah and Barak, Gideon, Jephthah, and Samson. This book shows at its beginning that the calamities suf-

fered by the Hebrews after the death of Joshua were due to their apostasy from Jehovah.

**JUDGMENT**, in psychology, the operation of the mind that involves comparison and discrimination, by which a knowledge of the values and relations of things is obtained. In forming a logical judgment or thought the mind has before itself two concepts, or a single percept and a single concept, and through a process of comparing decides wherein they agree or disagree, hence, every judgment involves two concepts and the decision respecting them. The concepts may be simple or very complex, and in either case knowledge is made more valuable through the forming of a logical judgment.

**JUGGERNAUT** (jüg-gēr-naŭt'). See *Jagannatha*.

**JUGGLER**, one who produces tricks by sleight of hand, or performs feats in legerdemain. The magicians of Egypt were skilled in apparent sleight of hand performances, and delighted to repeat the wonders performed by Moses and others mentioned in ancient history. Tricks of different kinds have been devised by jugglers as matters of amusement or wonderment. Performers of this kind were common among the Romans and other ancient peoples. The art is still practiced largely in all countries, but particularly at exhibitions and various entertainments.

**JUGULAR** (jū'gū-lēr), the name of a large vein in the neck, through which the greater part of the blood that circulates in the neck, face, and head is returned to the heart. There are two of these veins, located on either side of the neck, one of which is near the skin and the other is somewhat deeper, the external jugular returns blood from the face and neck, and the internal jugular from the brain and interior of the skull.

**JUJUBE** (jū'jūb), the name of a small tree native to Africa and the warmer parts of Asia and Europe. The common jujube is a small spiny tree and produces a reddish-yellow fruit about the size of an olive, which, when dried, is sold on the market as a sweetmeat. It was formerly used to make jujube paste, a well-known confection, but this product is now obtained by compounding sugar, gum arabic, and the whites of eggs. Several species of these plants have been naturalized in Mexico and the southern part of the United States. According to tradition, the spines of the jujube were used in preparing the crown of thorns placed upon the head of Christ.

**JULEP**, in medicine, a refreshing drink flavored with aromatic herbs. It is a sweet demulcent liquid and is used chiefly as a vehicle. The



name is likewise applied to a beverage composed principally of whisky or some other spirituous liquor. A drink made with brandy or whisky and mixed with sugar and sprigs of mint is called a *mint julep*.

**JULIUS** (jūl'yūs), the name of three popes of Rome, who reigned between 337 and 1555. The most notable of these is Julius II. He was born at Albisold Marina in 1443; died Feb. 21, 1513. Julius II. occupied the papal throne from 1503 until his death. It is said of him; "he made his tiara a helmet and his cross a sword." See **Pope**.

**JULY**, the seventh month in the Gregorian calendar, but formerly the fifth month of the year, when it was called Quintilis. It has 31 days and is so named in honor of Julius Caesar, who was born on the twelfth day of July.

**JULY**, Column of, the name of a memorial erected in Paris, France, to commemorate those who fought for the liberty of that country on July 27, 28, and 29, in the year 1830. It is located in the Place de la Bastille, and on four bands that encircle the column are the names of the 615 who fell in the Revolution. Beneath the column are the vaults that contain their remains, together with those of the victims connected with the Revolution of 1848.

**JULY REVOLUTION**, the revolution that overthrew the Bourbon dynasty and restored the house of Orleans to the throne of France. It occurred in July, 1830, in Paris, and was the means of giving the crown to Louis Philippe. The Bourbon dynasty had become unpopular through the reactionary policy of Louis XVIII. and Charles X., and matters came to a climax when the latter undertook to interfere with the liberty of the press and to greatly abridge the right of franchise. By the July Revolution the influence of the clergy in the administration was removed. Contemporary revolts occurred in Poland and Belgium, with the result that the latter country gained its independence.

**JUMPING MOUSE**. See **Jerboa**.

**JUNCO** (jūn'kō), the name of several birds common to North America, from Mexico to Canada, sometimes called black snowbirds. The plumage is ashy above and nearly white below. The nests are built of grasses and rootlets on or near the ground, and are frequently lined with hair and feathers. Birds of this class move southward as far as the Gulf of Mexico in autumn, and in the spring migrate to the northern part of the United States and Southern Canada.

**JUNCTION CITY**, a city of Kansas, county seat of Geary County, 135 miles west of Kansas City, at the confluence of the Smoky Hill and

Republican rivers. It is on the Union Pacific and the Missouri, Kansas and Texas railroads. The surrounding country is fertile and productive and near the city are extensive limestone quarries. Large quantities of grain, flour, and live stock are shipped. The chief buildings include those maintained by the county and several schools and churches. Electric lights and waterworks are among the utilities. A military post is located at Fort Riley, which is two miles east of the city. The first settlement was made in the vicinity in 1858 and it was incorporated the following year. Population, 1910, 5,598.

**JUNE**, the sixth month in our calendar, so named from the Roman surname Junius. Formerly it was the fourth month and consisted of 26 days, to which four were added by Romulus. Numa took one day from it, but Julius Caesar again lengthened the month to 30 days.

**JUNEAU** (jū-nō'), a city and the capital of Alaska on the Gastineau Channel, opposite Douglas island. It is located 110 miles south of Skagway, and is surrounded by a productive gold and silver mining district. Steamships ply regularly between it and Seattle, Vancouver, San Francisco, and other cities of the Pacific coast. The enterprises include cigar factories, iron works, sawmills, bottling works, breweries, and supply houses. It has a large market in furs, lumber, and merchandise. Among the improvements are electric lights waterworks, a courthouse, and several schools and churches. It was made the capital of Alaska by an act of Congress. Population, 1900, 1,864.

**JUNEBERRY**, the name of several trees and shrubs found in Canada and the United States. Many species are included in this class of plants, some of which are cultivated for their flowers and others are grown for their fruit. The fruit is known as the juneberry, which is of a purple color and about the size of a cranberry. The fruit is known locally as the service berry and the mountain whortleberry.

**JUNE BUG**, or **May Beetle**, a large beetle common to North America. It is attracted by lamplight and often enters houses in the evening during early summer. When on the ground it is quite clumsy, but it flies swiftly through the air with a buzzing sound, and frequently strikes objects and falls from the stun received. The larvae are white grubs that injure the roots of grasses when numerous, and the adult beetles are harmful to the foliage of fruit and shade trees.

**JUNGFRAU** (yōng'frou), meaning the maiden, a celebrated mountain of Switzerland, situated in the Bernese Alps. It has an elevation of 13,670 feet above sea level. The peak is beautified by the presence of great snow de-



posits. It was first ascended in 1811. A railway line passes to the summit from Lauterbrunnen.

**JUNGLE FOWL**, the name of a bird native to the East Indies, regarded the source of the barnyard poultry. It resembles our domestic fowls. The cocks crow and the hens cackle and cluck like the domestic species of chickens. Several allied species are native to India. They are so named from the jungles of that country, in which they are found in large numbers. They live in small parties and frequently come out of the forests to feed in the cultivated fields.

**JUNIPER** (jū'nī-pēr), a genus of hardy exogenous shrubs and trees, belonging to the cypress subfamily of the cone-bearing group. Twenty species are known, all of which are evergreen, and abound chiefly in the temperate and cold regions of both hemispheres. The common wild juniper is generally a shrub from two to seven feet high, but in rare cases attains



JUNIPER SHRUB.

JUNIPER TREE.

the height of twenty to thirty feet. In this genus the leaves are awl-shaped and the flowers are whitish. The fruit is bluish-black, about the size of a currant, and requires two years to come to maturity. Within the fruit is a stone that yields oil of juniper, which constitutes a powerful diuretic, and the product of some species serves as a local irritant. The juniper tree found in Virginia is the red cedar of North America. It bears bright blue berries. Juniper trees often attain a height of from 25 to 50 feet. The wood is valuable for manufacturing lead pencils, cigar boxes, and cabinet products, and the berries of many species are used in flavoring gin.

**JUNIUS** (jūn'yūs), a signature affixed to seventy letters which were published between January, 1769, and January, 1772, in the *Public Advertiser*, in London, England. These letters became celebrated on account of the boldness with which various institutions, tendencies, and officials were attacked. Though the author never

became known, public suspicion was fixed strongly on Burke and Viscount Sackville. It is now generally believed that the letters were written by Sir Philip Francis, but the evidence is wholly circumstantial. The most characteristic statement made by Junius to George III. was: "Remember that while the crown was acquired by one revolution, it may be lost by another." Henry S. Woodfall, the editor of the *Public Advertiser*, collected and published them in one volume. He was afterward prosecuted, but on some legal technicality escaped punishment.

**JUNK** (jūnk), a Chinese vessel used in navigating their seas, but which has served for voyages extended to America and Europe. It is the largest of the Chinese vessels and has no prominent stem or keel. The bow on deck is square, the stern is full, and the rudder extends beneath the bottom of the vessel. The sails are usually of matting and stretched on large center masts.

**JUNTA.** See page 1163.

**JUPITER**, the largest planet of the solar system, fifth in order of distance from the sun, being situated in space an average of 478,500,000 miles from that luminary. The mean diameter is about 86,000 miles and the polar diameter is about 82,200. It has a density of about one-fourth that of the earth, but the bulk is nearly 1,250 times greater. It is estimated that the weight is 300 times as great as that of our planet. The orbit of Jupiter is inclined to the ecliptic at the angle of 1° 18' 40", and its period of revolution round the sun is eleven years and ten and one-third months. It is believed that the interior mass is intensely heated, which gives rise to light and dark belts. They are usually parallel to each other, but often merge into one another, and somewhat resemble the spots seen on the sun. When viewed with the naked eye, it is the brightest planet, next to Venus. In 1610 Galileo discovered four of the satellites, or moons, of Jupiter. The principal characteristics of each are as follows:

SATELLITES OF JUPITER.

NAME.	Mean Distance From Jupiter.	Diameter, Miles.	Density Water As 1.	Sidereal Period.		
				D.	H.	M.
I. Io.....	267,380	2,352	114	1	18	28
II. Europa.....	425,156	2,099	171	3	13	4
III. Ganymede.....	678,393	3,436	396	7	3	43
IV. Callisto.....	1,192,823	2,929	222	19	16	32

To the above list must be added at least three others, one discovered by E. E. Barnard in 1892, another by C. D. Perrine in 1904, and still another by the same astronomer in 1905. How-



ever, these are small and comparatively insignificant. The satellites of Jupiter, like that of our planet, revolve once upon their axis while making one complete revolution round the planet. They are eclipsed in the shadow of Jupiter and also by their own shadows, and appear to move in lines nearly parallel from one side of the planet, thus evidently having orbits similar to the orbit of Jupiter, but within the plane of the ecliptic of that planet. In 1706 the Danish astronomer, Olaus Römer (1644-1710), carefully observed the eclipses of Jupiter's satellites and discovered the progressive movement of light. Prior to his time light was considered instantaneous, but he became convinced that it requires sixteen and one-half minutes to travel the orbit of the earth, which has since been verified by the phenomena of the aberration of light, and the velocity has been fixed at 186,000 miles per second.

**JUNTA** (jūn'tà), the Spanish name given to legislative assemblies and administrative councils. The assemblies of the representatives of the nation called by the monarch in the Middle Ages were termed general juntas, and Charles II. established a great junta to regulate the competency of the Inquisition. Subsequently the name was extended to assemblies of a strictly legal character.

**JURA** (jū'rà), a range of mountains in Europe, chiefly in France, Germany, and Switzerland. These highlands trend from northeast to southwest and form the principal boundary between France and Switzerland. In Germany the range is called the German or Franconian Jura. The name is derived from the Jurassic limestone which constitutes the principal geological formation, though this is alternated with sands belonging to the lower Cretaceous series. Several gorges cross the mountain range, and it is otherwise characterized by stalactite caves in which the bones of extinct animals are numerous. The Ain and Doubs rivers rise in the western slopes and form tributaries of the Rhone. Among the highest peaks are Crêt de la Neige, elevation 5,650 feet; Reculet, 5,648 feet, and Mont Tendrè, 5,520 feet.

**JURASSIC** (jū-rās'sik), a system of rocks, so named from the Jura Mountains in Switzerland, found above the Triassic and below the Cretaceous systems. Rocks of this system occur in all the continents, but they do not correspond in all cases with the system of Europe. In general they are assigned to the Mesozoic Era, and in most instances are associated with the formations designated as the Lias and the Oölite. They cover large areas of France and Germany, where they contain several thousand species of

fossils, and are traceable in Colorado, California, British Columbia, and other sections of North America. The reptiles are very prominent among the fossils, especially the lizards and the Pterosauria, a class of flying reptiles.

**JURUÁ** (zhōō-rōō-ä'), a river of Brazil, rises in the Andes of western Peru, flows toward the northeast, and joins the Amazon some distance above Fonteboa. Its entire length is 1,100 miles, of which about 560 miles are navigable. The valley of the Juruá is timbered heavily and yields large quantities of rubber.

**JURY** (jū'rý), a body of men selected under legal provisions, impaneled, and sworn to investigate questions of fact, and to return a true verdict or decision according to evidence legally placed before them. Two kinds of juries are maintained in connection with courts of justice, grand juries and petit, or common, juries. *Grand juries* generally consist of less than twenty-four men and more than eleven, who are summoned by the county, or parish, sheriff and duly impaneled for service, though in some states the jurors to serve are limited to five or seven, these being selected by lot from the whole number summoned, and those remaining are excused. After administering the necessary oath, the presiding judge instructs them in their duty, when they repair to a closed room and select a *foreman* from their number. Their duties include the consideration of various accusations brought before them by the county attorney, or others, and if they agree by unanimous vote that certain charges against individuals are based upon fact and are of indictable character, they return a *true bill* or *indictment*, which forms the basis of subsequent prosecution in the court of record, otherwise the accusations are dismissed for want of sufficient foundation. Grand juries hear only one side of criminal procedures. They are relics of the Star Chamber abolished by the Magna Charta, a document which was exacted by the people of England from King John in 1215. They have been abolished in a number of the states.

*Petit juries* in most instances consist of twelve men, unless a smaller number is agreed upon by the parties to a cause. A petit jury is summoned to serve both in civil and in criminal cases. The decision of a trial jury, known as the *verdict*, is reached by a unanimous agreement. In the lower courts and in some special cases, juries consist of a smaller number of men, usually six. The panel for juries in courts of record includes generally twenty-four men, of which twelve are selected by parol, though a number of those chosen in this way may be excused peremptorily, or all may be challenged for



cause. After the trial jurors have been finally chosen, they are sworn by the clerk or the judge. They hear the evidence in the cause, listen to the plea of the attorneys, are instructed by the judge in relation to points of law, and retire for the purpose of agreeing upon a verdict.

After an agreement has been reached, the jury reports by a written and sealed verdict to the judge at the session of court immediately following an agreement, and before being discharged from service. However, if they cannot reach an agreement, they are discharged from service and a new jury may be impaneled to try the same cause at the same or a subsequent session of the court, though causes of a criminal nature cannot be taken up for trial a second time in case the accused is found *not guilty*. In cases of death by accident or violence, a *coroner's jury* is summoned for the purpose of determining the cause from which death resulted. It is under the direction of the county coroner, or an officer corresponding to a justice of the peace. The investigation may be made at the place where death occurred and in the presence of the body, and, in some cases, a corpse may be exhumed for that purpose. The person or persons who are designated by a coroner's jury as being guilty of a crime are subject to indictment by the grand jury, and triable by the petit jury. However, in many instances, as in a case of death by accident or from an unknown cause, it is impossible to determine who is responsible when no one is accused.

**JUSTICE**, Department of. See **United States, Departments of**.

**JUSTICE OF THE PEACE**, a subordinate official in Great Britain and the United States, elected or appointed to exercise certain subordinate administrative functions within the limit of a town, borough, or county. Such an officer in the United States is elected by the people and has jurisdiction in minor civil and criminal cases. He may act as coroner and solemnize marriages in some of the states. In most instances he has the power to hold a preliminary examination of those who are charged with grave offenses, and he may either dismiss or bind them over to appear for trial in the upper courts. The duties of the justice are practically uniform in most divisions of Great Britain, but in England this officer is appointed by the Lord Chancellor, and the judicial functions are supplemented by certain executive duties.

**JUSTIFICATION** (jūs-tī-fī-kā'shūn), a doctrine of Christian theology. It is based upon the writings of Saint Paul, particularly on his epistles to the Galatians and the Romans. The doctrine teaches that justification is an act by

which the individual is accounted just or righteous in the sight of God. It is not a mere remission of sin, but embraces the sanctification and renewal of the inward man through the voluntary reception of the grace of God. The doctrine had its beginning at the time of the Reformation, when Luther came to his spiritual liberty and taught the doctrine of justification by faith.

**JUTE** (jūt), the fiber of two plants of India, belonging to the natural order *Tiliaceae*. They are cultivated extensively in the warmer coun-



JUTE (*Corchorus capsularis*).

tries of Asia and elsewhere. The plants are annuals, have yellow flowers, and attain a height of from five to fifteen feet. The fiber forms the inner bark and is separated from the outer by steeping in water for several days. It is of fine texture, possesses a shining surface, and the injury that accrues when exposed to water renders it illy adapted for canvas and cordage. However, it is used profitably for carpets, gunny bags, and in a mixture with hemp for cordage and mats. Paper is made from the smaller fragments and cuttings. Though cultivated and used in manufactures in India for many centuries, jute did not come largely into use in America until 1830. Within recent years the plant has been naturalized and is now grown successfully in the southern part of the United States. Gunny-bags are employed largely in transporting cotton, rice, pepper, coffee, and other articles of commerce from Asiatic ports, while the raw ma-

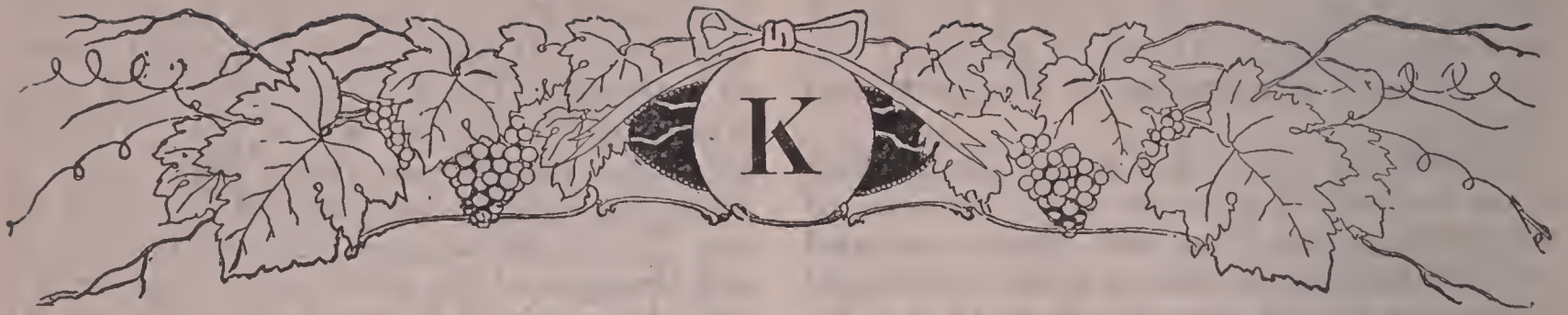


terial is transported to the manufactories of America and Europe. Dundee, Scotland, is noted as a center of the jute manufacturing industry. The annual importation of jute to the United States is valued at \$3,500,000. In 1908 the total consumption of the world was 7,500 tons.

**JUTES**, the name of a people who resided in the lowlands of Germany at the beginning of the Christian era. They were closely associated with the Angles and Saxons in the conquest of England in the 5th century. Bede (q. v.), the Saxon writer of England, classifies the Teutons who conquered England into Angles, Jutes, and Saxons, but some writers treat the Jutes as Frisians.

**JUTLAND** (jüt'land), in Danish *Jylland*, an important peninsula of Europe, located north of Germany. On the east, north, and west it is bounded by the Cattegat, Skager Rack, and the North Sea. It comprises the principal portion of Denmark. The area is 9,746 square miles. Nearly all the surface is low, but a ridge of hills runs through the center from north to south, the highest point being 564 feet above the sea. The inhabitants have preserved the customs and language of the ancient Jutes, who were a powerful people of Northern Europe in the 5th century, and with the Angles and Saxons conquered and settled portions of Britain. Aalborg and Aarhus are the principal seaports. Population, 1906, 1,124,694.





## K

**K**, the eleventh letter and eighth consonant of the English alphabet. It has a guttural articulation before all consonants and vowels, except before *n*, where it is silent, as in *knell*, *knife*, and *knit*. From the 16th to the 18th centuries it was written after *c* at the end of a word for the purpose of strengthening the hard *c*, as in *publick*, *musick*, and *almanack*. In the French the letter *k* is used only in a few Greek derivatives, and in the Italian, Spanish, and Portuguese it has gone out of use. In German some words are written either with *c* or *k*, as *Carl* or *Karl*, *Cöln* or *Köln*. As a symbol, in chemistry, *K* stands for potassium (*kalium*). *K* signifies *knight*; *K. B.*, Knight of the Bath; *K. G.*, Knight of the Garter.

**K A A B A** (kā-ā'ba), or **Caaba**, an oblong stone structure in the great mosque of Mecca. It constitutes the sacred shrine to which Moslems make their pilgrimages for religious worship. According to legendry, it is located on the spot where Adam offered his first worship after being expelled from the Garden of Eden. Some writers assert that a tent was sent from heaven in which the worship took place, but others hold that Adam built a structure of stone and clay, which was destroyed by the deluge, but was afterward rebuilt by Abraham and Ishmael. The structure is 45 feet wide, 55 feet long, and about 40 high. It occupies a place in the sacred area of the mosque, which is surrounded by a wall and colonnades. The black-stone, or *Keblah*, is at the southeast corner of the Kaaba, where it is held by masonry, and toward it every pious Moslem directs his face when praying. To kiss the Kaaba is the supreme object of every pilgrim.

**KABUL** (kā'bul), or **Cabul**, the capital of Afghanistan since 1774, when it was made such by Timour. It is situated in a province of the same name, at the junction of the Loghar and Kabul rivers, on a productive plain southwest of

## KADIAK

the Hindu-Kush Mountains, at an altitude of 6,375 feet above the sea. The walls of former times are largely in ruins. Besides a number of government buildings, it contains a Jewish synagogue, several mosques, and the tomb of Sultan Baber. The manufactures consist chiefly of marble products, guns and ammunition, textiles, and machinery. It has systems of electric lighting and waterworks, but the streets are not well paved. Many of the buildings are of wood and adobe brick. It has an important trade in merchandise, fruits, jewelry, and live stock. Many of the bazaars are large and are noted for their trade in fine carpets and rugs. Kabul was captured by the British in 1842 and 1879. Within recent years it has been influenced more or less by the advances of Russia. The inhabitants include Afghans, Hindus, and Jews. Population, 1908, 68,502.

**KADESH BARNEA** (kā'dësh bär'ne-à), a city mentioned in the Scriptures as the place of encampment of the Israelites as they journeyed on their exodus from Egypt. It was the death place of Miriam, sister of Moses, and became celebrated on account of Moses and Aaron offending the Lord by presuming that water would flow from the rock when struck before the people with a rod in their own name, rather than by the help of God. For this sin Moses and Aaron were punished by being forbidden entrance into the promised land. The district of Kadesh is prominent in the accounts written of Abraham, Hagar, and Ishmael.

**KADIAK** (käd-yäk'), an island immediately south of Alaska. It is about 100 miles long and 60 miles wide. The area is 4,680 square miles. Much of the surface is rugged. Numerous inlets characterize the coast, which is rocky and more or less precipitous. The climate is made disagreeable by dense fogs and frequent rains. The principal industries are fishing, canning, and furring. The salmon canning industry employs



1,250 hands and derives its supply of fish mainly from the Karluk River. Saint Paul, the principal town, is a shipping point of fur and fish. The population, consisting chiefly of Eskimos, is about 2,500.

**KAFIR CORN**, a species of sorghum which is native to South Africa. It has been naturalized in the arid region of the United States, where it is grown extensively for fodder and for its seed. Large fields of this product are grown in the region extending from western Nebraska to the Gulf of Mexico. It is drilled in rows similar to sorghum and cultivated in the early growing season like corn. The crop is harvested with a corn harvester, by which the stalks are bound in bundles



KAFIR CORN.

or sheaves, after which it is either thrashed to separate the seed, or both the stalks and the seed are fed to stock.

**KAFIRISTAN** (kä-fê-rês-tän'), meaning *the country of infidels*, the name applied to a region of Asia, located southeast of Afghanistan. The area is about 5,000 square miles. It is situated between the Hindu-Kush Mountains and India. The country is mountainous and is inhabited by the Siaposh, or Kafirs, a native race consisting of tribes that vary greatly in stature and complexion. They engage chiefly in agriculture, fruit growing, and cattle raising. They have become distinguished for their love of independence and their strenuous resistance to the Mohammedan faith. Their dress is mostly of goatskins and fabrics woven from the hair of goats. Some writers consider the Kafirs of Asia an admixture of Greeks and Hindus. The total number of these people is about 200,450.

**KAFIRS** (käf'êrz), or **Kaffirs**, an Arabic word meaning *unbelievers*, the common name of the most important native race of Southeastern Africa, a branch of the Bantu family. The region occupied by these people extends with more or less variation from Delagoa Bay to Cape Colony. The head of the Kafir is shaped more like that of Europeans than the head of Negroes. The nose is high, the hair is frizzled, and the

complexion is brown, with lighter variations in those found in the southern districts. In their habits they are frugal and simple. The race generally is tall and muscular and the occupations pursued chiefly are hunting and cattle raising. The women engage to some extent in the cultivation of cereals, vegetables, and fruits. Several distinct branches of Kafirs have been described, including the Swazi, Pondos, Fingoes, and Zulus. The last named tribe is especially numerous in the British colonies of Natal and Cape Colony, and has shown marked improvement under the influence of missionaries and teachers. As a rule the Kafirs are deficient in sentiments of religion. They are exceptionally superstitious and generally believe in witchcraft.

The first accounts of the Kafirs were published in 1617, when they came in contact with the Dutch colonists, who began to make settlements near the Cape of Good Hope. After 1688 they are mentioned frequently in the colonial records kept by the Dutch. After settling in Cape Colony, the British began to press them and claim their lands, which resulted in several wars, notably those in 1811-12, and at numerous times since. The War of 1846 led to the reservation of a district known as Kaffraria, which in 1853 was made a crown colony. Originally they occupied territory which comprised 1,000,000 square miles, but with the general occupation of Africa by European powers they have been largely localized and their habits of living have been greatly modified. The total number at present is about 3,000,000. See **Zulus**.

**KAGÓSHIMA** (kä-gō-shē'mä), a city of Japan, situated on the Kagóshima River, at the southern end of the island of Kiushiu. It is an important seaport, contains a college, and has a large trade. The manufactures include earthenware, clothing, silks, and machinery. It has electric lights, waterworks, and well-paved streets. The export trade is chiefly in tea, rice, and camphor. Population, 1903, 59,001.

**KAILAS** (kī-lās'), an elevated mountain peak of the Himalayas, situated near the Sutlej and Indus rivers. The summit is 20,230 feet above sea level. It is celebrated as a sacred mountain of the Hindus. The slopes are covered with fine forests of deciduous and evergreen trees.

**KAISER** (kī-zēr), a word derived from the Latin term Caesar and applied as the official title of the Emperor of Germany. The title was originated from certain provinces near the Danube formed by Diocletian and, though anciently assigned to a Caesar, they became a part of the German Empire in 1438. When William III. of Prussia was proclaimed Emperor of Ger-



many at the conclusion of the Franco-German War, in 1871, the ancient title of the German Emperor was revived.

**KAISER WILHELM CANAL**, an artificial waterway of Germany, extending from Holtenau on the Baltic to Brunsbüttel on the Elbe. It connects the navigation of the North Sea with that of the Baltic Sea. The width at the bottom is 85 feet and at the surface it is 190 feet. It is 29 feet deep and 61.3 miles long. This canal shortens the distance from the Baltic to the North Sea about 200 miles. It was constructed by the government of Germany for naval and military purposes, but is utilized in the freight and passenger traffic. The canal was completed in 1885 at a cost of \$39,500,000.

**KAISER WILHELM'S LAND**. See *New Guinea*.

**KAISERSLAUTERN** (kī-zērs-lou'tērn), a city of Germany, in the Bavarian Palatinate, forty miles west of Mannheim. It has convenient railway facilities, an industrial museum, fine public schools, and a large Protestant church. The manufactures include furniture, cotton and woolen goods, boots and shoes, machinery, and ironware. It contains the ruins of a palace built by Frederick Barbarossa in the 12th century. In 1801 it was made a part of France, but in 1816 became a possession of Bavaria. Within recent years it has grown rapidly, owing to the establishment of large manufacturing enterprises, and it is supplied with electric lights, waterworks, and street railways. Population, 1905, 52,306.

**KALAHARI** (kā-lā-hā'rē), a vast desert in South Africa, located north of the Orange River and east of German Southwest Africa. The extent from east to west is 400 miles and from north to south, 600 miles. Much of the surface is level, having an elevation of 3,500 feet, and vegetation thrives in various parts of the interior. Rains fall copiously from August to April, but the rivers and most of the lagoons dry up during the season of drought. Bushmen and Bakalahari are the principal inhabitants. The giraffe, lion, leopard, antelope, and other wild animals are met with. Melons, grasses, shrubs, and thorny trees comprise the principal plants.

**KALAMAZOO** (kāl-ā-mā-zōō'), a city in Michigan, county seat of Kalamazoo County, on the Kalamazoo River, forty miles from Lake Michigan. It is on the Lake Shore and Michigan Southern, the Michigan Central, the Grand Rapids and Indiana, and other railroads. Large quantities of celery, fruits, and grain are grown in the vicinity. The noteworthy buildings include the post office, the city hall, the public

library, and the Y. M. C. A. building. It is the seat of the Michigan Female Seminary, the Kalamazoo College, the Michigan Asylum for the Insane, and an academy of music. Among the industries are flouring mills, iron foundries, and factories for the production of windmills, plows, vehicles, machinery, sleds, cigars, and furniture. The place was settled in 1829, incorporated as a village in 1843, and chartered as a city in 1884. Population, 1910, 39,437.

**KALAMAZOO**, a river in the United States, rising near the southern boundary of Michigan, in Hinsdale County. It has a general course of 200 miles toward the northwest, flowing into Lake Michigan 28 miles south of Grand Haven. The mouth is deep and is entered by large vessels. Along its banks are fine forests and it furnishes excellent water power. Kalamazoo and Battle Creek are on its banks.

**KALEIDOSCOPE** (kā-lī'dō-skōp), an optical instrument which produces an endless variety of symmetrical and beautifully colored designs, invented in 1817 by David Brewster. It is made of a tube with two plane mirrors, usually formed of slips of glass from six to twelve inches in length, darkened at the back. It tapers in width from about three inches at one end to one inch at the other. Some varieties are made rectangular, but the trapezoidal form is the most common. The mirrors are adjusted so their reflecting surfaces face each other and form any angle of which 360 is a multiple, the usual angle being 60°. The conical tube is made of paper, tin, or brass. It is a trifle larger than the mirrors, and of sufficient diameter at its wider end to inclose their points. A metal plate containing a small hole at the center closes one end of the tube, to which the eye is applied. The opposite end contains two plates, the one next the eye being of clear glass and the other being ground, between which a number of beads or small pieces of colored glass are placed so they may move freely. When applied to the aperture, the eye sees beautiful symmetrical figures produced by the mirrors, and these are greatly diversified whenever the tube is shaken or turned. It has been a favorite toy from its invention, but also serves a useful purpose for illustrating the optical problem of the multiplication of images produced by reflection. It is used by designers to secure patterns for calico, carpets, and wall papers.

**KALI** (kā'lē), the name of a Hindu goddess, formerly worshiped with sacrifices of human beings. She is one of the forms of the wife of Siva, and is the goddess of cholera and other epidemics. In statuary she is represented standing on the body of her husband, wearing a



necklace of skulls and a belt of serpents. A famous shrine built to her memory is maintained at Calcutta, where goats and other animals are offered as a blood sacrifice on her altars.

**KALISPEL**, or **Pend d'Oreille**, a tribe of Indians in the United States, found chiefly in Idaho and Washington. Formerly they occupied territory along Pend d'Oreille Lake, whence they came annually to the plains to hunt the buffalo. They made a treaty with the government in 1855 and the larger portion was removed to Montana, where they are federated with the Flatheads and Kootenai Indians on the Flat-head reservation.

**KALK** (kälk), a town of Germany, in Prussia, on the Rhine. It is located opposite Cologne, with which it is connected by railway and electric lines. It has well-paved streets, electric lights, and many modern business and residential buildings. The manufactures include porcelain, machinery, chemicals, and electric apparatus. Formerly it was a part of Deutz, but became a separate city in 1867. Population, 1905, 25,478.

**KALMIA** (käl'mī-ā), a genus of shrubs native to North America, consisting mostly of evergreen species. The common kalmia attains a height of three feet and bears corymbs of beautiful flowers. To this class of plants belongs the *mountain laurel*, which is native to the Allegheny Mountains, where it grows to the height of thirty feet. It has been naturalized in Europe as a favorite garden shrub. The leaves are poisonous to many animals.

**KALMUCKS** (käl'müks), or **Calmucks**, a people of the Mongolian race. In character they are warlike and nomadic and engage largely in agriculture and stock raising. The Kalmucks are native to the Chinese Empire and certain districts of Siberia and European Russia, extending westward as far as the Volga. They are colonized in large settlements on the Volga, Ural, and Don rivers. In stature they are of middle height, possess considerable strength, and are marked by prominent cheek bones, a short chin, a thin beard, and very shaggy hair. Their religion is Lamaism. The language is allied closely to the Mongolian proper, and is written with a similar alphabet and grammatical construction. The total number includes about 700,000, of which one-half reside in China, about 125,000 in Russia, and the remainder in Central Asia. They have conducted numerous wars against the Tartars, Chinese, and Russians. Those in Europe have been converted largely to the Greek Church by Russian missionaries.

**KAMA** (kă'mä), a river of Russia, the largest branch of the Volga. Its source is in the

province of Vyatka. It makes a bold turn through Perm and flows into the Volga in the province of Kazan, about forty miles below the city of Kazan. The Kama forms a part of the principal highway of commerce for boats between Saint Petersburg and Siberia, is free from ice about eight months of the year, and has been improved by several canals. The total length is 1,300 miles. It is navigable about 850 miles. A canal connects it with the Dwina, thus uniting the White and Caspian seas.

**KĀMA**, or **Kâmâdēva**, the god of love among the Hindus, corresponding to Cupid of the Romans and Eros of the Greeks. He was the son of Brahma and lost his life while trying to tempt Siva, but was born again as the son of Kirshma. After his second birth he was called Pradyumna, another name for Cupid. In statuary he is represented with a bow made of sugar cane, which is strung with a line formed of bees, and he bears five arrows ornamented with the blossoms of flowers. With these arrows he is able to overcome the five senses.

**KAMCHATKA** (kâm-chät'kâ), or **Kam t-chatka**, a peninsula which extends from northeast to southwest in the northeastern part of Asia. It is bounded on the east by Bering Sea, south by the Pacific, and west by the Sea of Okhotsk. The area is 104,000 square miles. It varies in width from 70 to 250 miles, being the widest in the central part, and is about 700 miles long. The climate is cold, though vegetation during the warmer parts of the year is remarkably luxuriant. The Kamchatka is the most important river, having a length of 110 miles, and flows northward through the most fertile and populous portion of the peninsula. Among the minerals are iron, copper, mica, lignite, and sulphur, which are mined largely under Russian supervision, but the principal products include furs and fish. Many fur-bearing animals are native to the region, including the beaver, bear, sable, and Arctic fox. The inhabitants consist chiefly of Kamtschadales, Koryaks, and Russians. Since 1706 it has been a possession of Russia. It is governed from the local capital, Petropavlovsk, a town of 1,200 population. The total population of the peninsula is 7,250.

**KAMERUN** (kâ-mâ-rōon'), or **Cameroon**, a German colony on the west coast of Africa, extending from the Cross River to the mouth of the Rio del Rey. It is bounded on the north by Lake Tchad, east by French Congo, south by Spanish Rio Muni, and west by Nigeria. The area is 191,130 square miles. A part of the colony is mountainous, being crossed by the Ka-



merun Mountains, which have peaks of 13,760 feet. The Kamerun River, from which it derived its name, flows into the Bight of Biafra by an estuary over twenty miles wide. Much of the colony is fertile and produces grasses and other plants in profusion. The rainfall is abundant and the climatic conditions are favorable to agriculture and stock raising. Among the products are tobacco, vanilla, palm oil, cloves, and cereals. The mines yield cobalt, iron, silver, and gold. Rubber, ivory, fruits, palm oil, grains, and live stock are exported. The chief town is Kamerun, on the Atlantic coast, and the most important trading stations are Campo, Bibund, and Victoria.

The colony is governed under an imperial governor, who is assisted by a chancellor and a legislative council. Buëa is the capital and largest town. Schools are maintained at Garna, Victoria, Duala, and other points. Kamerun became a colony of Germany in 1884. The boundary between it and the Niger Coast Protectorate was formerly settled in 1893. Most of the inhabitants are Bantus. In 1908 the colony contained 1,225 whites. Population, 1906, 3,850,640.

**KANAKA** (kā-nā'kā), the name applied by white traders and sailors to a native of the Hawaiian Islands. Later the term came into use to designate the natives of New Caledonia, the New Hebrides, and other oceanic islands. The term kanakas is now used in the sense of the name *coolies*, when speaking of the native laborers of Hawaii.

**KANAZAWA** (kā'nā-zā'wā), a city of Japan, situated near the northeastern coast of the island of Hondo. It contains numerous public institutions, several famous temples, and ruins of old fortifications. The manufactures include porcelain, silk, toys, and paper. It has railroad connections, waterworks, several parks, and a large trade. Population, 1903, 99,657.

**KANDAHAR** (kān-dā-hār'), or **Candahar**, one of the principal cities of Afghanistan, situated 250 miles southwest of Kabul, at an elevation of 3,400 feet. Its location on a general route to India makes it an important commercial and strategical center, which fact has induced the government to fortify it with strong works. A wall with a thickness of from ten to sixteen feet, a height of twenty-five feet, and a length of four miles has been built around it. A strong fortress is located two miles north on a precipitous rock, which has proven of much utility against the attacks of invaders. Few modern conveniences have been introduced. Excellent bazaars are maintained by numerous Persian and Hindu merchants. It contains the tomb of

Ahmed Shah. The manufactures include earthenware, clothing, jewelry, shawls, and utensils. It is thought that Alexander the Great founded the city, though it appears to be entirely of Persian origin. Population, 1906, 61,385.

**KANDY** (kān'dē), a town in the island of Ceylon, located on an elevated plain, about eighty miles from Colombo. It has railway facilities, electric lights, and several large buildings occupied by the government. Near it are the famous botanical gardens of Peradenia. It contains the palace of its former kings and has several ancient monuments and Buddhist temples. Population, 1906, 26,625.

**KANE**, a borough of Pennsylvania, in McKean County, 95 miles southeast of Erie, on the Pennsylvania, the Baltimore and Ohio, and other railroads. The surrounding country produces oil and natural gas. Among the manufactures are glass, brushes, machinery, cigars, and lumber products. It has a healthful climate and is a favorite summer resort. Population, 1900, 5,296; in 1910, 6,626.

**KANGAROO** (kāṅ-gā-rōō'), a species of herbivorous quadrupeds native to Australia, Tasmania, and New Guinea. The kangaroos were first made known to the Europeans by Captain Cook in 1770. They are distinguished by long hind legs, small fore legs, a huge tail, a small, deerlike head, and large ears. When standing erect, they are about the height of a man. They spring from ten to fifteen feet by means of the hind legs and tail, and are able to resist an attack with much skill and fury, though they have a timid disposition and are easily domesticated. The principal food is grass and other vegetable forms. Owing to the consumption of large areas of grass by herds of kangaroos, they have been hunted for destruction, but also for their skins, which are valuable in the manufacture of gloves and shoes. A peculiar pouch or marsupium is attached to the lower part of the body of the female, in which the nipple of the mammary glands open, and serve for the protection of the immaturely born young for a period of about eight months. The flesh of these animals is prized for food, resembling venison, while the tail is a favorite article for soup. Many species of kangaroos have been described, of which the *great kangaroo* described in this is the best known. Other species include the *red kangaroo*, *brush kangaroo*, and *agile kangaroo*. The kangaroo rat and kangaroo bear are other marsupials found in Australia and New South Wales. See illustration on following page.

**KANGAROO ISLAND**, an island at the entrance of Saint Vincent Gulf, South Aus-



tralia, about 102 miles southwest of Adelaide. It is separated from the mainland by Investigator Strait. The surface is barren and the island is valuable mainly for its fisheries. The area is 1,675 square miles.

**KANKAKEE** (kăŋ-kă-kē'), a city in Illinois, county seat of Kankakee County, on the Kankakee River, which supplies an abundance of water power. It is on the Illinois Central, the Illinois and Iowa, the Cleveland, Cincinnati, Chicago and Saint Louis, and other railroads. The noteworthy buildings include the high school, the county courthouse, the public library, the Y. M. C. A. building, and Saint Viateur's College. It is the seat of the Eastern Illinois Hospital for the Insane. The surrounding country is agricultural and fruit growing and has valuable deposits of limestone. Among the manufactures are clothing, flour, ironware, nails, machinery, and cigars. It has street railways, electric lights, pavements, and a sewerage system. The place was settled in 1853 and incorporated the next year. Population, 1910, 13,986.

**KANKAKEE**, a river of the United States, rising near the northern boundary of Indiana. It has a general course toward the west until it reaches Waldron, Ill., where it is joined by the Iroquois, after which it flows toward the northwest until it joins the Des Plaines to form the Illinois River. The valley of the Kankakee is highly fertile. Kankakee, in Illinois, is the principal city on its banks.

**KANSAS** (kăŋ'zās), a central state of the United States, situated in the geographical center of the Union, popularly called the *Sunflower State*. It is bounded on the north by Nebraska, east by Missouri, south by Oklahoma, and west by Colorado. In shape it is rectangular, with a length of 410 miles from east to west and a breadth of 210 miles from north to south. Its geographical position is between 94° 37' and 102° west longitude. In latitude it extends from the 37th to the 40th parallels. The area is 82,080 square miles, being the tenth State in size.

**DESCRIPTION.** The State consists largely of an undulating plain that slopes toward the southeast, and lies within the Great Plains which extend from the Missouri River to the Rocky Mountains. The surface rises gradually

from the eastern border, where the altitude is 750 feet, to a height of 3,875 feet on the western border. Sherman County, in the northwestern part, is the highest point in the State, having an altitude of 4,425 feet. Fertile valleys with belts of timber extend along the streams. The rivers of the eastern part are characterized by bluffs that rise from 100 to 200 feet above the valleys. The average altitude is about 2,000 feet above sea level, which is the height of a line passing a little west of the center. Though the surface is quite elevated, none of the eminences rises more than 500 feet above the general level. A sandy region about 100 miles in length is located in the southwestern part, south of the Arkansas River.

None of the rivers is navigable, except the Missouri, which forms the northeastern boundary. All of the streams belong to the Mississippi system, and the drainage is principally by the Kansas River into the Missouri and the Arkansas into the Mississippi. The north-



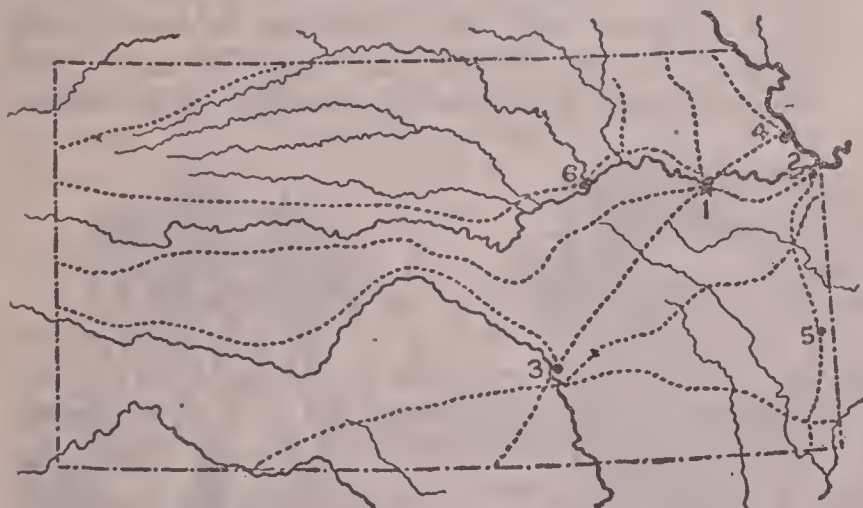
AUSTRALIAN KANGAROO.

ern half of the State is drained by the Kansas and its tributaries. The Arkansas drains most of the remainder, flowing eastward to about the south central part, where it forms a bold curve and after a general course toward the southeast passes the border into Oklahoma. The Cimarron, a tributary of the Arkansas, drains the southwestern part. Other tributaries of the Arkansas include the Neosho and the Verdigris. The chief tributaries of the Kansas are the Republican, Smoky Hill, Solomon, Saline,



and Big Blue rivers. While timber is found along most of the streams and water courses, the forests are most extensive in the eastern portion.

The climate is agreeable and is marked by windy but usually mild winters. The summers are tempered by breezes and the nights are refreshing and cool, except in the hottest part of the year, when they sometimes become quite warm. Owing to limited rainfall in the extreme west, that portion is not so favorable to the cultivation of cereals as the other parts of the State, though the soil contains marked elements of fertility. Rains fall most largely from April to July, which is the principal growing season, and the mean rainfall for the State is 27 inches. In the eastern part it is about 35 inches, whence it decreases toward the western border, where it ranges from 12 to 20 inches. In the north



KANSAS.

1, Topeka; 2, Kansas City; 3, Wichita; 4, Leavenworth; 5, Pittsburg; 6, Junction City. Dotted lines show chief railroads.

the mean annual temperature is 52°, whence it rises gradually toward the south, where it is 58°. Though snow falls in the winter, it does not lie on the ground a great length of time. A large portion of Kansas was formerly covered with the so-called buffalo grass, but this prevails at present only in the western portion, while the valleys are covered with an excellent and abundant growth of blue-stem and other bladed grasses valuable for hay and pasture.

**MINING.** The mining industry is centered largely in the southeastern part. Lead and zinc are mined in the vicinity of Galena, and the output is smelted in works that utilize fuel products obtained within the State. In the output of coal Kansas ranks third among the states west of the Mississippi River, and the yield has increased steadily for several decades. Cherokee and Crawford counties are located in the center of a large coal field. Allen County is noted for its output of natural gas and mineral oil. The yield of petroleum is about 3,125,-

000 barrels per year, and the output of coal is about 6,750,000 tons. Large quantities of salt are obtained in the central portion. The most important gas deposits are in the vicinity of Iola and Independence, and much of the output is utilized in smelting and various manufacturing enterprises. Workable quantities of gypsum, red and yellow ocher, fire and brick clays, and stone suitable for construction and monuments are obtained in many localities.

**AGRICULTURE.** Farming was formerly confined chiefly to the eastern half of the State, but it now extends to the western border. This has been made possible in part through irrigation canals, but mainly by introducing plants suitable to an arid climate, and by the adoption of a system of farming calculated to aid in retaining moisture in the cultivated lands. About 80 per cent. of the surface is utilized in farming, and the average size of farms is about 240 acres. In the acreage cultivated it is exceeded only by Iowa. In the production of hay and corn it usually holds third rank. Corn is grown most extensively in the east, where the climate and rainfall are peculiarly favorable. Other crops grown include wheat, oats, potatoes, vegetables, flax, and fruits. It holds high rank in the production of apples, tobacco, sugar beets, broom corn, and castor beans. Alfalfa yields abundantly throughout the State, while timothy and clover are grown more successfully in the east. Among the leading crops of the western part are alfalfa, kafir corn, millet, wheat, rye, and vegetables.

Large interests are vested in stock raising. Cattle are reared both for meat and dairy purposes, and butter and cheese making are important industries. Horses, mules, and swine are raised most extensively in the east, while the grazing lands of the west have contributed to the development of ranches for rearing sheep, cattle, and horses. Kansas City is one of the largest slaughtering centers of the United States, and much of the stock produced in the State is transported to that market.

**MANUFACTURES.** The manufacturing enterprises have grown in importance with every decade, but are not developed to the extent of their possibilities. Kansas City, on the eastern border, has large slaughtering and meat-packing establishments, and is a center for the manufacture of soap, candles, and leather. The products next in importance are flour and meal, which are produced in nearly all parts of the State. Condensed milk, butter, and cheese are exported in large quantities. The presence of vast deposits of natural gas, petroleum, and bituminous coal has caused a large increase in



the smelting and refining industries. Other manufactures embrace cigars, brick and tile, glass, beet sugar, brooms, railway cars, earthenware, wagons and carriages, and farming machinery.

**TRANSPORTATION.** River transportation is confined wholly to the Missouri. Railroad building has been promoted extensively since 1875, and the State is favorably situated with reference to transcontinental traffic. It is crossed by a number of trunk lines, several of which furnish direct communication with ports on the Great Lakes and the Gulf of Mexico. The eastern part is particularly favored in having numerous branches and electric railways. The total lines of steam railroads aggregate 9,200 miles. All of the larger cities are important as railway centers, especially Topeka, Kansas City, Wichita, Coffeyville, Fort Scott, Hutchinson, and Pittsburg. The telephone, telegraph, and electric railways are utilized extensively. Large quantities of live stock, fruit, wheat, wool, packed meats, corn, and dairy products are exported. The imports consist chiefly of merchandise, clothing, and machinery.

**GOVERNMENT.** The present constitution came into effect in 1861. It vests the executive power in a governor, lieutenant governor, auditor, treasurer, superintendent of public instruction, secretary of State, attorney-general, secretary of horticulture, superintendent of insurance, and secretary of labor statistics, all of whom are elected for two years. In addition there are the board of railroad commissioners, the State agricultural society, the free employment agency, the board of control of charitable institutions, and the executive council, the last mentioned being constituted of the Governor and six other State officials. The Legislature is composed of the senate and the house of representatives, the former having 40 and the latter 125 members. The senators are elected for four and the representatives for two years, and the legislative sessions are held biennially. A supreme court of seven judges elected for three years is the highest judicial tribunal. Subordinate to it are the district judges, who preside over the courts in districts made up of several counties. The judges of the supreme court serve for six years, while the district judges are elected for four years. Each county has a clerk of the district court and a probate judge. Justices of the peace are elected in the townships.

**EDUCATION.** Kansas has a high rank in educational affairs among the states. It contains the highest proportion of native born citizens. In 1900 the illiterate population was only 2.3

per cent. of the inhabitants. This result was attained largely because of a compulsory attendance law and the excellent system of public schools maintained in the State. A large majority of the inhabitants reside in rural districts, hence the elementary schools are well distributed in all the more densely populated sections. All the towns and cities have high schools, which are graded under a course of study prepared by the state department, and the public system terminates in the University of Kansas, situated at Lawrence. The State normal school is at Emporia, at which a large proportion of the teachers receive training, and a number of private normal schools and departments of other institutions furnish special courses for those who desire to enter the profession of teaching. Licenses are granted to teachers on the basis of training and experience, ranging from those issued in the counties to the State certificates granted by the State board of examiners. The average length of the school year is a little less than eight months, but all of the cities and many rural districts have nine months per year.

The State has many private institutions of higher learning. These include Washburn University at Topeka; Baker University, Baldwin; Bethany College, Lindsborg; Friends' University, Wichita; Ottawa University, Ottawa; Fairmount College, Wichita; Lane University, LeCompton; Salina Wesleyan University, Salina; Southwest Kansas College, Winfield; and Saint Benedict's College, Atchison. Kansas City has an institution for the blind. Olathe has a school for the deaf and dumb, and Leavenworth has a national soldiers' home. The soldiers' orphans' home is at Atchison, the State penitentiary is at Lansing, and the industrial reformatory is at Hutchinson. Beloit has an industrial school for girls. Topeka has a reform school for boys, and Leavenworth has a Federal prison. Osawatamie is the seat of an insane asylum.

**INHABITANTS.** The inhabitants consist largely of American-born citizens, many of whom immigrated from states farther east. The per cent. of foreign-born is smaller than that in most states of the Mississippi Valley. The urban population is comparatively small, owing to the fact that the State has no large cities, none of them having more than 75,000 inhabitants. Topeka, on the Kansas River, is the capital. Other cities include Kansas City, Leavenworth, Wichita, Atchison, Pittsburg, Lawrence, Fort Scott, Parsons, Hutchinson, Emporia, Coffeyville, and Independence. In 1900 the State had a population of 1,470,495. Of this number 54,176 were colored inhabitants, including 2,130



Indians and 52,003 Negroes. In 1905 the population was 1,544,968; in 1910, 1,690,949.

**HISTORY.** The larger part of Kansas constituted a portion of the Louisiana Purchase acquired from France in 1803, but the region lying south of the Arkansas River and west of longitude 100° W. was ceded in 1850 by Texas to the United States. It was first visited in 1541 by Coronado, a Spaniard, and was partly explored in 1819-20 by Major Long of the United States army. The region was a part of Missouri Territory until 1821, and then remained unorganized until the Kansas-Nebraska bill, in 1854, formed the Territory of Kansas, which then included part of the present State of Colorado. After much controversy between opposing parties to make Kansas a free or a slave State, it was admitted to the Union on Jan. 29, 1861, under the Wyandotte Constitution, prohibiting slavery. Prior to its admission occurred the celebrated border war, resulting from an attempt of people from the Northern and Southern states to influence its final position as to slavery.

Kansas furnished a larger proportion of men for the Civil War than any other State. It was not a direct battle ground, but Quantrell's guerrillas invaded the State from Missouri and captured Lawrence, where a large number of citizens were killed. About 40,000 Negroes migrated from the South into Kansas in 1878 and 1880. Prohibition became incorporated in the general laws shortly after 1880, after a period of extended discussion. It continues to attract considerable attention from time to time.

**KANSAS, University of,** a coeducational State institution at Lawrence, Kansas, established in 1864. It comprises the schools of pharmacy, medicine, arts, law, engineering, and fine arts. With it are included a graduate school and the University Geological Survey. Admittance is free to all residents of Kansas, and students from other states are required to pay a small tuition. The institution has a library of 45,000 volumes, property valued at \$1,125,000, and an attendance of 2,050 students. It is governed by a board of seven regents, consisting of the chancellor of the university and six members appointed by the Governor for four years.

**KANSAS CITY,** the largest city in Kansas, county seat of Wyandotte County, separated from Kansas City, Mo., by the State boundary. It is on the Union Pacific, the Chicago, Rock Island and Pacific, the Missouri Pacific, the Atchison, Topeka and Santa Fé, and other railroads. The site extends to both sides of the Kansas River, at its confluence

with the Missouri, and includes an area of twelve square miles. A part of the city is on the low bottom of the rivers, but the large part extends along the slopes and over the bluffs. Several bridges across the Kansas River unite the two parts of the city. It is also closely connected with Kansas City, Mo., by well-graded streets and a system of electric railways. The streets are well paved with brick and asphalt.

Kansas City, Kan., is the seat of Kansas City University, a Methodist Episcopal institution. It has a fine Carnegie library valued at \$80,000. Other noteworthy buildings include the public high school, the county courthouse, the State institution for the blind, and many churches and schools. The live stock business ranks as the second largest in the world. It is one of the most important packing-house centers in the United States, and those located in the city have given a world-wide reputation to the two cities. It has many large grain elevators and numerous manufacturing enterprises. Among the general manufactures are soap, leather, flour, candles, hardware, and machinery. Kansas City was chartered in 1886, when it was formed of Armstrong, Wyandotte, Armourdale, and several other villages. Population, 1910, 82,331.

**KANSAS CITY,** the second city in Missouri, situated in Jackson County, on the south bank of the Missouri River, separated by the State boundary from Kansas City, Kan. It is one of the most important railroad centers in the Mississippi Valley, being on the line of numerous trunk railroads, some of which pass through while others have their terminus in the city. They include the Chicago and Alton, the Wabash, the Chicago Great Western, the Atchison, Topeka and Santa Fé, the Chicago, Rock Island and Pacific, the Kansas City Southern, the Chicago, Milwaukee and Saint Paul, the Chicago, Burlington and Quincy, the Missouri Pacific and other railroads. Most of the lines use in common a large union depot, and a terminal circular railway furnishes intercommunication among the different lines. Several great bridges have been constructed across the Missouri River, which at this place receives the inflow from the Kansas River. A fine system of electric street railways has lines to all parts of the city, and suburban and inter-urban transit is furnished by branches and lines extending to various points in Kansas and Missouri. Additional transportation facilities are furnished by steamboat lines on the river.

The streets are broad, regularly platted, and improved by asphalt, brick, and stone paving. The site of the city is on a rolling and rather



uneven tract of land, but it has been greatly improved and beautified by grading and leveling. Many of the buildings in the business section are from ten to eighteen stories high. The construction is modern and of substantial material, mostly of stone. Among the noteworthy buildings are the Federal courthouse, the city hall, the United States customhouse, the board of trade building, the Kansas City Club building, the art gallery and museum, the public library, and the Y. M. C. A. building. It has many tall structures and office buildings, such as the Scarritt, the Dwight, the Midland, the Commerce, and the New York Life buildings. The public institutions include the Kansas City College of Law, Scarritt Training School, the University Medical College, and a number of hospitals. Among the leading parks are Holmes Square, Scarritt Point, and Fairmont and Washington parks. All the leading Christian denominations have commodious church buildings. Many fine public and private schools are maintained.

Kansas City is a distributing point for a large region in the Southwest and has an extensive wholesale and jobbing trade. It is important as a market for grain and live stock, and contains extensive mills and elevators. The milling products, including flour, oatmeal, and cornmeal, take rank as the most important manufactures within the city. Other products include clothing, malt liquors, confectionery, machinery, leather, hardware, brick and tile, and foundry products. The first settlement on its site was made by French fur traders in 1821 and it was platted as a town in 1838. It was incorporated in 1853, when it was known as Westport Landing. The early growth of the city is due to the navigation facilities of the Missouri River, by which it was built up before the construction of railways. It received its first impetus as a commercial city in 1865, when it was reached by the Missouri Pacific Railroad. In 1903 it suffered much damage by an overflow of the Missouri River. Population, 1910, 248,381.

**KANSAS-NEBRASKA BILL**, the name of a bill introduced in the Congress of the United States by Stephen A. Douglas in 1854, which was passed in the same year. It is so named because it separated and organized the territories of Kansas and Nebraska, and its importance is in the fact that it practically repealed the Missouri Compromise. It embodies the *squatter sovereignty* idea of Douglas, in that the question of slavery in the two territories was to be settled by the people residing therein, and if the people decided to adopt slavery the fugitive slave law was to apply. Nebraska was easily settled as a free territory, but the passage of the

bill was the occasion of much trouble in Kansas. It was one of the causes that hastened the Civil War.

**KANSAS RIVER**, a river of Kansas, formed in Dickinson County by the union of the Solomon and Smoky Hill rivers. It is joined near Junction City by the Republican and near Manhattan by the Big Blue River. After an easterly course of about 200 miles, it joins the Missouri at Kansas City. The valley of the Kansas River is highly fertile, producing large quantities of fruits and cereals.

**KANSAS STATE NORMAL SCHOOL**, institution of learning at Emporia, Kas., established by an act of the Legislature in 1863. In 1901 the Western Branch State Normal School was organized at Hays and two years later the Manual Training Auxiliary was founded at Pittsburg. The management of these schools is by law vested in one board of regents and the president of the normal school at Emporia is president of the three schools. These institutions are conducted for the instruction of persons in the art of teaching all grades of work from the kindergarten to the high school. On completion of two, three, and four years of work, respectively, state certificates for one year, three years, and life are granted. An advanced course of collegiate grade at Emporia confers the degree of bachelor of arts and education. The special features at Emporia are kindergarten and primary methods, the school of music, the practice school, the commercial department, and the advanced college course. The library of 25,000 volumes with its new building and equipment offers good opportunity for the practical training of teachers in primary methods. Among the special organizations for students are the literary societies, debating clubs for young men and women, the Y. M. and Y. W. C. A., the music society, the orchestra, and classes in chorus work.

In addition to the main building, there are separate buildings for the library, the training school, the gymnasium, the hospital, the boiler house, and the science department. Special attention is given to athletics, football, baseball, golf, tennis, and other out-of-door sports. The teaching force for the three schools is composed of 85 instructors, with a student attendance of approximately 2,700 students.

**KAOLIN** (kā'ō-līn), a hydrated silicate of alumina, so named by the Chinese from a hill in China called Kaoling. It is a soft clay formed by the decomposition of rocks and contains mica, feldspar, and quartz. This product is now obtained in various parts of Germany, France, England, and the United States. De-



posits of considerable extent occur at Schneeberg, in Saxony; at Cornwall, in England; and in various parts of Georgia, Pennsylvania, and Vermont. The proportion of silica to alumina varies in different countries. It is used extensively in the manufacture of porcelain and white earthenware and in paper making. It somewhat resembles mortar in the natural state, but becomes pure white when burned.

**KARAKORUM MOUNTAINS** (kā-rā-kō'rūm), an elevated range in the central part of Asia, extending from the Himalayas into Kashmir and Eastern Turkestan. These mountains terminate at the Pamir, where they merge into the Hindu Kush. Mount Godwin-Austin, elevated 28,278 feet above the sea, is the culminating peak and one of the highest summits in the world. The Karakorum Pass is one of many lofty passes that connect the intervening valleys.

**KARIKAL** (kā-rē-kāl'), a French possession on the Coromandel Coast of India, in the British district of Kanjore, 150 miles south of Madras. It has an area of 63 square miles and is inhabited chiefly by natives. This possession was made French territory in 1759, but was captured by the English in the early part of the 19th century, and was restored to the French in 1814. It has considerable trade with France and the French colonies, chiefly in rice and fruit. Karikal, the chief town, in 1906, had a population of 17,511. Population, 1906, 71,554.

**KARLSBAD.** See **Carlsbad.**

**KARLSRUHE.** See **Carlsruhe.**

**KASCHAU** (kā'shou), or **Kassa**, a city of Hungary, capital of the county of Adauj-Torna, 168 miles northeast of Budapest. It is located on the Hernád River, has railroad conveniences, and its streets are regularly platted. The surrounding country produces large quantities of wine and cereals. It has a fine Gothic cathedral, a royal law school, a coeducational seminary for teachers, and several schools and Protestant churches. The manufactures include flour, paper, cigars, spirits, and clothing. In 1241 the region was settled by German colonists. It was the scene of a battle between the Austrians and the Hungarians in 1849, in which the latter were defeated. Population, 1906, 43,150.

**KASHAN** (kā-shān'), a city of Persia, in a province of the same name, 120 miles south of Teheran. It has public baths, a Mohammedan college, and numerous mosques and bazaars. The manufactures include faïence, jewelry, and silk and woolen textiles. Population, 30,500.

**KASHGAR** (kāsh-gār'), a city of Asia, in East Turkestan, on the Kashgar River. It is surrounded by mud walls and the new part of

the town is defended by a citadel. The manufactures consist chiefly of textiles, carpets, and jewelry. It has considerable trade and is the seat of several native schools and mosques. Population, 65,808.

**KASHMIR.** See **Cashmere.**

**KASKASKIA** (kāś-kās'kī-ā), a river in Illinois, rises in Champaign County, flows south-east and enters the Mississippi at Chester. It has a length of 200 miles and is navigable for about 50 miles. The first settlement in the State was founded by the French on the Kaskaskia River, about seven miles from its mouth, in 1680. Kaskaskia was the first capital of Illinois. It is now a small post village. Population, 1900, 177.

**KATAHDIN** (kā-tā'dīn), or **Ktaadn**, a celebrated mountain peak, the most elevated in Maine. It is situated in the central part of the State, about eighty miles west of Bangor, and has a height of 5,385 feet above sea level.

**KATRINE** (kā'trīn), **Loch**, a lake of Scotland, in Perthshire, five miles east of Loch Lomond. It is eight miles long and about two miles wide, and is visited annually by many tourists. Ellen's Isle, located in this lake, is the scene of Scott's "Lady of the Lake."

**KATTEGAT.** See **Cattegat.**

**KATYDID** (kā'ty-dīd), a pale green insect, about an inch and a half long, allied to the grasshopper. Several widely distributed species have been studied. The name is an imitation of their peculiar note heard at night, which is caused by the friction of membranes attached to the covers of the wings. It is made only by the males, being a call to the noiseless females.

**KAUKAUNA** (kā-kā'nā), a city of Wisconsin, in Outagamie County, on the Fox River, 22 miles above Green Bay. It is on the Chicago and Northwestern Railroad, which maintains extensive shops at this place. Other industries include brick and tile works, flouring mills, and paper mills. It has electric lighting, waterworks, and several fine schools. Water power for manufacturing is obtained from the Fox River. Population, 1905, 4,991.

**KAW** (kā), or **Kansa**, a tribe of Sioux Indians who formerly occupied the lower valley of the Kansas River, in Kansas. They speak a dialect of the Osage language. At the beginning of the 19th century they numbered about 1,300, but at present not more than 200 full-bloods remain. In 1846 they were removed to Oklahoma, where they occupy a reservation with the Osage Indians.

**KAZAN** (kā-zān'y'), the chief city and capital of the Russian government of Kazan, on the Kazanka River, near its junction with the



Volga. It is strongly fortified. The industries include tanneries, soap factories, machine shops, and establishments for wool combing, weaving, and dyeing. Near it is a government dockyard. Its convenient navigation and railroad facilities make it an important market for flour, hemp, timber, and cereals. As an educational center it ranks among the most important of Russia. The university was founded by Alexander I. in 1804. It has an extensive observatory, botanical gardens, and a library of 100,000 volumes, and is attended by 1,000 students. Near the city are the shipyards in which Peter the Great built the Russian fleet, which became famous on the Caspian Sea during his reign. Kazan was founded in the 13th century, but originally the town was thirty miles farther east than the present location. It was the capital of the khanate of Kazan under the Tartars. The Russians under Ivan the Terrible captured it in 1552 after a prolonged siege. Population, 139,250.

**KEARNEY** (kär'nī), a city in Nebraska, county seat of Buffalo County, on the Platte River, about 125 miles west of Lincoln. It is on the Union Pacific and the Chicago, Burlington and Quincy railroads, and is surrounded by a fertile stock and agricultural country. The noteworthy buildings include the county courthouse, the high school, the public library, the city hall, the opera house, and the Nebraska Industrial School for Boys. Lake Kearney, which covers about forty acres, is near the city. Among the manufactures are brick, machinery, canned articles of food, crackers, cigars, and flour. The municipal facilities include systems of sewerage and waterworks. Kearney was settled in 1871 and incorporated in 1872. Population, 1900, 5,634; in 1910, 6,202.

**KEARNY**, a town of Hudson County, New Jersey, on the Passaic River, opposite Newark. It is on the Erie and other railroads and is popular as a residential center. The chief buildings include the townhall, an Italian orphan asylum, a State soldiers' home, the public library, and the high school. It has electric street railway connections with Jersey City, is important as a manufacturing center, and has a growing trade in merchandise. Kearny was first settled by Germans, when it was known as New Barbadoes, and it was incorporated under its present name in 1871. Population, 1910, 18,659.

**KEARSARGE** (kēr'särj), a famous battleship of the United States, which was used for effective service in the Civil War. It was launched at Portsmouth, N. H., in 1861, and on June 19, 1864, engaged in battle the Confederate cruiser *Alabama* off the harbor of Cherbourg, France, disabling and sinking that privateer,

which had destroyed a large part of the American merchant marine. In 1894 the *Kearsarge* was wrecked in the Caribbean Sea, though the officers and crew were saved. The vessel was burned by natives before a wrecking party arrived.

**KECSKEMÉT** (kěch'kě-māt), a town of Hungary, capital of the district of Pesth-Solt, fifty miles southeast of Budapest. It is surrounded by an agricultural and stock-growing country, and is the seat of an important annual cattle fair. The chief buildings consist of grain elevators, several churches, and a number of secondary educational institutions. Most of the inhabitants are Magyars. Population, 1906, 60,045.

**KEEL**, the lower timber of a wooden ship or vessel, answering to the spine, and giving the main support to the ribs and the whole structure. In most wooden vessels an additional timber beneath is called a *false keel*, and a piece bolted to the keel on the inside is called the *keelson*. Iron vessels are arranged with entirely different parts. The keel is the first part of a ship to be built, hence the term *laying of the keel* has reference to the first work in constructing a ship.

**KEENE**, a city in New Hampshire, county seat of Cheshire County, on the Ashuelot River, about ninety miles northwest of Boston. It is on the Boston and Maine Railroad, within ten miles of Monadnock Mountain, and is surrounded by chains of hills. The noteworthy features include a fine public library, the county courthouse, and a handsome monument dedicated to the soldiers of the Civil War. Among the manufactures are machinery, furniture, vehicles, ironware, woolen fabrics, and shoes. It has electric lights and street railways, waterworks, pavements and a system of sewerage. Keene was settled in 1734, but was known as Upper Ashuelot until 1753, when it was incorporated under its present name. Population, 1900, 9,165; in 1910, 10,068.

**KEEWATIN** (kê-wä'tin), a large district of Canada, extending from Manitoba and Ontario to the Arctic Archipelago. It is bounded on the north by Franklin, east by Franklin and Hudson Bay, south by Ontario and Manitoba, and west by Manitoba, Saskatchewan, and Mackenzie. The extent from north to south is 1,300 miles and the area is 756,000 square miles. Much of the surface is rugged, but it is characterized by numerous lakes, swamps, and patches of good arable land. All of the rivers drain into Hudson Bay. They include the Nelson, Severn, Churchill, and Back rivers. The English River, flowing west, and the Albany



River, flowing east to James Bay, form the southern boundary. The southern half of the district is covered with a dense growth of forests, but the timber in the north is sparse and scrubby. Pine, spruce, and aspen poplar are the chief species. Gold and copper are the most important minerals, but furring is the principal commercial enterprise.

The agents of the Hudson Bay Company exercise a personal influence among the Indians and half-breed trappers, thus fulfilling to some extent the functions of a civil government. When necessary the authority of the Dominion is enforced through the efficiency of the Northwest Mounted Police, a force of constabulary upon which the maintenance of peace devolves to a large extent. As magisterial powers are exercised by the officers of the police in their several districts, the development of the region has been aided to a considerable extent by the presence of these royal officials. Small detachments are kept on patrol duty and they visit regularly every point where settlement has begun. However, the few inhabitants are found mainly in the small villages along the west coast of Hudson Bay, where they engage in fishing and hunting. Population, 1901, 8,546.

**KELP**, the common name of several species of brown seaweeds found along the seacoast. Some of these plants are of large size, ranging from five to ten feet in length on the Atlantic coast of North America to the giant kelp of the Pacific, which is several hundred feet in length. These plants form submarine forests of gigantic size in the Southern Hemisphere. Some of the species are used as food, but their value is principally as a manure for enriching the soil. Formerly kelp was employed to a considerable extent in making soda, for which purpose it was dried and burned at a low heat. The product is itself called *kelp*, and is now used chiefly in the production of iodine and chloride of potassium.

**KENESAW MOUNTAIN, Battle of**, an engagement of the Civil War, fought near Marietta, Ga., on June 27, 1864. General Sherman with a Federal force of 95,000 men undertook to march from Chattanooga to Atlanta. At Kenesaw Mountain he came in contact with 60,000 Confederates under General Johnston, who repelled the Federal assault after fighting vigorously for nearly three hours. About 3,000 Federals were missing in killed and wounded. The Confederates were compelled to retreat after a vigorous attack directed by General McPherson on July 1, and soon after took a position beyond the Chattahoochee River.

**KENILWORTH** (kĕn'ĭl-wŭrth), a market town of Warwickshire, England, situated on a

tributary of the Avon, about ninety miles northwest of London. It is noted for its castle, which, until the year 1563, was a crown possession, and at that time was given to Robert Dudley, Earl of Leicester (q. v.), by Queen Elizabeth. This earl entertained the queen there in the year 1565 for a period of eighteen days at a daily cost of \$5,000. Sir Walter Scott's novel, "Kenilworth," is based upon this gorgeous entertainment. Population, 1907, 4,602.

**KENNEBEC** (kĕn'nĕ-bĕk), a river of Maine, being next to the Penobscot the most important in the State. It rises in Moosehead Lake, has a general course toward the south, and flows into the Atlantic Ocean. The length is 150 miles, falling 1,000 feet in the course from the source to the mouth. It is navigable for ships to Bath and for steamers as far as Hollowell. Among the cities on its banks are Bath, Augusta, and Waterville.

**KENOSHA** (kĕ-nŏ'shà), a city in Wisconsin, county seat of Kenosha County, on Lake Michigan, 33 miles south of Milwaukee. It is on the Chicago and Northwestern Railroad and has a fine harbor. The notable buildings include the public library, the county courthouse, the high school, and many churches. Among the manufactures are machinery, furniture, wagons, wire mattresses, hosiery, malt, bicycles, and ironware. The municipal facilities include electric street railways, waterworks, sewerage, and pavements. It is surrounded by a fine farming country and has a growing trade in produce and merchandise. Kenosha was incorporated as a city in 1850. Population, 1910, 21,371.

**KENSINGTON GARDENS**, a park about two miles in circumference, situated in the city of London, England. It extends west of Hyde Park, from which it is separated by the Serpentine. Near the northwestern part is Kensington Palace, which was purchased in 1689 by William III. This palace served as a royal residence for more than a century.

**KENTON** (kĕn'tŭn), a city and the county seat of Harden County, Ohio, on the Scioto River, seventy miles northwest of Columbus. It is on the Erie, the Toledo and Ohio, and the Cleveland, Cincinnati, Chicago and Saint Louis railroads. The chief buildings include the county courthouse, the public library, the armory, and the high school. Among the manufactures are machinery, ironware, furniture, strawboard, and bee-keepers' supplies. It is the seat of the largest iron fence factory in America. Kenton was settled in 1833 and incorporated in 1885. Population, 1900, 6,852; in 1910, 7,185.

**KENTUCKY** (kĕn-tŭk'ĭ), a southern state of the United States, known popularly as the



*Bluegrass State.* It is bounded on the north by Illinois, Indiana, and Ohio, east by Virginia and West Virginia, south by Tennessee, and west by Missouri and Illinois. The greatest breadth from north to south is 190 miles and the extreme length from east to west is 460 miles. It is separated from Virginia by the Big Sandy River, from Missouri by the Mississippi River, and from Illinois, Indiana, and Ohio by the Ohio River. The area, including 400 square miles of water surface, is 40,400 square miles.

**DESCRIPTION.** The surface slopes from the southeast to the northwest, and is comprised largely within the Allegheny Plateau. In the southeastern portion are the Cumberland Mountains and the Kentucky Ridge, which form elevations from 1,800 to 3,550 feet above sea level. A range of hills, known as the *Knobs*, extends centrally across the State from the southern border to the Ohio. In the interior and northeastern parts the elevations are from 300 to about 1,000 feet above sea level, much of which region is included in the celebrated bluegrass country. Swamps abound in the southwestern part among the elevated ridges, where the country is characterized by extensive forests. In the same region, but somewhat toward the west, are vast limestone formations that extend to the central



KENTUCKY.

1, Frankfort; 2, Louisville; 3, Newport; 4, Lexington; 5, Paducah; 6, Bowling Green. Chief railroads are indicated by dotted lines.

part of the State. Within this section are numerous caves and caverns, including the celebrated Mammoth Cave (q. v.).

The drainage belongs exclusively to the Mississippi system and the Mississippi River receives the inflow almost entirely through the Ohio, Mayfield Creek and a few minor streams being the only tributaries that discharge directly into it. The Mississippi forms 80 miles of the western border and the Ohio forms the entire northern boundary, having a winding course of nearly 600 miles. In the western part are the Cumberland and Tennessee rivers, but the former, owing to its great length, also drains a large region

in the southeastern part. Other important streams include the Tradewater, Green, Kentucky, and Licking rivers. Many of the streams are navigable and supply splendid facilities for interior commercial intercourse. The State has no lakes aside from a few small sheets of water.

The climate is equable and healthful. In the winter the prevailing winds are largely from the northwest and in the summer they blow mostly from the southwest. The mean temperature is about 55°, ranging from 35° in winter to 78° in summer. During the summer season the thermometer rises as high as 100° and in winter it very rarely falls to zero. Snow seldom falls in winter in the southern part, but it is frequently quite heavy in the northeastern section. The annual rainfall averages about 40 inches, ranging from 36 to 45 inches as the years are wet or dry.

**MINING.** Kentucky has an abundance of many useful minerals. Extensive deposits of coal are worked in the central and eastern parts of the State. The coal area is about 13,500 square miles in extent, forming a continuation of the fields in Indiana and Illinois. In 1908 the output was 10,385,000 tons, which is about the average yield for the past several years. The larger output consists of bituminous coal, but small quantities of cannel coal are obtained. Iron ore is found in more or less paying quantities in the coal regions, but this mineral is not worked extensively. Petroleum occurs in the south central part of the State and natural gas is obtained in several counties. Other minerals include salt, lead, gypsum, fluor spar, and fire and brick clays. Building stones of a superior quality are widely distributed.

**AGRICULTURE.** Originally the State was covered almost entirely with dense forests, but at present about 86 per cent. of the area is included in farms. Fully two-thirds of the farms are operated by the owners and the remainder are worked largely in small tracts by tenants. Corn and tobacco are the principal crops. The area cultivated in corn is nearly twice as great as that utilized in raising all other cereals, which include wheat, oats, and rye. A large acreage of hay is grown to supply the extensive interests vested in stock raising. Other crops include hemp, potatoes, sorghum, vegetables, and fruits. Kentucky is the leading tobacco-growing State and produces more than one-third of the crop grown in the entire country. The breed of road horses reared in Kentucky is well known, and the class of driving horses peculiar to that State have a high reputation. Large interests are vested in the cattle industry, both for the production of meat and for dairying. Other do-



mestic animals include swine, sheep, mules, and poultry.

**MANUFACTURING.** Kentucky has taken high rank as a manufacturing state for more than half a century. In the output of tobacco and tobacco product it holds first rank, the annual value of these products being about \$25,500,000. Next in the list are the malt and distilled liquors, which have a combined value approximately as large as that of the manufactures of all classes of tobacco. The output of the flouring and grist mills is likewise large. Being favored with an abundance of hardwood forests, such as oak, walnut, and cypress, the State has large interests in the manufacture of timber products, especially lumber and furniture. Other manufactures taking high rank include meat and other slaughtering products, leather, iron and steel, railway cars, clothing, and cotton and woolen goods. Louisville, Covington, Newport, and Lexington are among the manufacturing centers.

**TRANSPORTATION.** Few states are as favorably situated for river transportation as Kentucky, having ample facilities on the Ohio, Mississippi, Cumberland, Tennessee, Green, and Licking rivers. The State has 3,300 miles of steam railways in operation, including lines of the Illinois Central, the Chesapeake and Ohio, the Louisville and Nashville, and the Mobile and Ohio. Electric lines have been built in all parts where the population is reasonably dense. Many highways have been graded and macadamized. Considering the fact that much of the surface is very rolling and rugged, it must be said that Kentucky has made rapid strides in constructing means of communication, although a number of counties in the eastern part of the State are not supplied with railway facilities.

**GOVERNMENT.** The executive authority is vested in the Governor and Lieutenant Governor, who are elected for a term of four years and are not eligible to reelection. Other State officers include the treasurer, register of land office, auditor of public accounts, secretary of State, superintendent of public instruction, attorney-general, and commissioner of agriculture, labor, and statistics. The legislative functions are exercised by a senate and a house of representatives. Members in the former are elected for four years and of the latter for two years, the upper house having 38 senators and the lower house 100 representatives. Sessions of the Legislature are held in even years, beginning the first Tuesday after the first Monday in January. The supreme court, known as the court of appeals, is the highest judicial tribunal. It is presided over by from five to seven judges, who are elected from districts for a term of eight years. Sub-

ordinate to it are the circuit courts, county courts, and justice courts. The county officers are elected for terms of four years.

**EDUCATION.** The census reports show a steady decrease in illiteracy. Those who were unable to read and write in 1900 constituted 16.5 per cent. of the inhabitants of ten years or over, as against 21.6 per cent. in 1890. A system of public instruction is maintained by interest on State bonds and by general taxation. The presence of a large proportion of Negro inhabitants in many parts of the State has given rise to separate schools. Supervision is under the direction of county and city superintendents, who look after the schools locally under the superintendence of the State department of public instruction. Systematic courses of study have been devised by a State board for the public schools, particularly the high schools of cities and towns, which are graded so as to articulate with the institutions of higher learning. Kentucky University, at Lexington, is the most important educational center in the State. However, higher instruction is given in about 35 colleges and 67 academies, besides in numerous institutions for special culture. Among the centers of learning are the Central University, Danville; Berea College, Berea; Williamsburg Institute, Williamsburg; Georgetown College, Georgetown; Ogden College, Bowling Green; Eminence College, Eminence; South Kentucky College, Hopkinsville; Kentucky Military Institute, Farmdale; and Liberty College, Glasgow.

Ample provisions have been made for the care of the unfortunate and incorrigible. Danville has a school for the deaf, Louisville has a school for the blind, and Frankfort has an institution for feeble-minded children. The penitentiaries are at Eddyville and Frankfort. Asylums for the insane are located at Anchorage, Hopkinsville, and Lexington. Many hospitals are maintained by private interests in the cities, all of which have one or more benevolent institutions.

**INHABITANTS.** The foreign-born population is small, being only 50,249. As compared with most of the southern states, Kentucky has a large urban population. Frankfort, in the north-central part of the State, on the Kentucky River, is the capital. Other cities include Louisville, Covington, Newport, Lexington, Paducah, Owensboro, Bowling Green, Maysville, Henderson, and Hopkinsville. In 1900 the State had a population of 2,147,174. In this number were included 284,706 Negroes, 57 Chinese, and 102 Indians. Population, 1910, 2,289,905.

**HISTORY.** Kentucky, like other states of the Mississippi valley, contains historic relics of the



mound builders. Its name, signifying "The dark and bloody ground," was derived from the different tribes of Indians who met in various warlike conflicts in the region, which did not form the possession of a single tribe. Thomas Walker, who visited the section in 1750, was probably the first white man to make an extended report on its resources. Daniel Boone made an exploring expedition from North Carolina in 1769, and the first settlement was formed at Harrodsburg by James Harrod in 1774. Originally the entire territory was included with the colony of Virginia. It was made a separate territory in 1790 and admitted into the Union as a State in 1792. Many of its citizens took an active interest in the Mexican War. The State did not secede during the Civil War, though Kentuckians served in both armies, and it was represented in the Confederate Congress. Lincoln proclaimed martial law in the State in 1864, and Johnson restored civil authority the following year. The battles fought within its borders include those of Richmond, Mill Spring, and Perryville.

In 1908 local differences among the growers of tobacco were the occasion of much agitation and litigation. The tobacco trust had dictated the price paid for tobacco, which caused many producers of tobacco to organize a movement for mutual protection. However, a class of independent tobacco growers refused to join in the movement, which caused parties of men, known as *Night Riders*, to destroy much property at Hopkinsville and other places. Many of the raiders were captured, convicted, and executed.

**KENTUCKY**, a river in Kentucky, formed in Lee County by the junction of three forks that rise in the Cumberland Mountains. After a tortuous course of about 260 miles it flows into the Ohio River at Carrollton. It courses through a rich mineral and agricultural country, has been improved in its lower portion, and is navigable beyond Frankfort. The basin of the Kentucky contains deposits of coal, iron ore, and marble.

**KENTUCKY RESOLUTIONS**, a series of resolutions adopted by the Legislature of Kentucky, closely associated in spirit and contents with the Virginia Resolutions. They resulted from a feeling that the Federal party was making illegitimate use of the powers granted by the constitution to the Federal government. The Kentucky Resolutions were framed by Thomas Jefferson and introduced in the Legislature of Kentucky by John Breckenridge in 1798. They set forth the unconstitutionality of the Alien and Sedition Laws, and declared that the Union is not based upon the principle of un-

limited submission to the general government. In 1799 the Legislature of Kentucky declared a nullification of a Federal law by a State to be the rightful remedy in cases of Federal usurpation. The Virginia Resolutions were similar in sentiment, but were milder in their expression. They were passed by the Legislature of Virginia in 1798, and were probably written by James Madison. Though copies of both sets of resolutions were sent to the governors of all the states, no favorable response was evoked.

**KENTUCKY UNIVERSITY**, an institution of higher learning founded at Georgetown, Ky., in 1837, and removed to Lexington in 1864. It comprises four colleges, the College of the Bible, the College of Liberal Arts, the Commercial College, and the College of Medicine. The last named is located at Louisville and the first three mentioned are at Lexington. It is under control of the Disciples of Christ, has property valued at \$600,000, and is attended by 1,250 students.

**KEOKUK** (kē'ō-kūk), a city of Iowa, one of the county seats of Lee County, at the confluence of the Des Moines and the Mississippi rivers, over the latter of which it is connected by a fine railroad bridge with Warsaw and Hamilton, Ill. It is on the Wabash, the Chicago, Burlington and Quincy, the Chicago, Rock Island and Pacific, the other railroads. A short distance above the city are the rapids of the Mississippi, which formerly obstructed navigation, but they have been overcome by a canal constructed by the Federal government. This canal is 300 feet wide and nine miles long and cost \$8,000,000. The noteworthy buildings include the high school, the union depot, the Federal building, the opera house, the public library and the Y. M. C. A. building. Rand Park, which contains the grave of the Indian Chief Keokuk, and the National Cemetery are other features of interest.

The site of the city is on limestone bluffs 150 feet high. The business blocks are substantial and largely of native material. Among the general facilities are electric street railways, graded and paved streets, waterworks, and a sewerage system. Among the manufactures are starch, flour, machinery, clothing, pottery, firearms, and gunpowder. It has a large trade in grain and merchandise. The place was incorporated in 1848. It is popularly called the Gate City. Population, 1905, 14,604; in 1910, 14,008.

**KEROSENE** (kēr'ō-sēn), an oil used to illuminate and for heating purposes. Formerly it was obtained from the distillation of shales and bituminous coal, hence is sometimes called *coal oil*, but it is now produced principally by



the distillation and purification of petroleum. It has a slightly yellowish color, a disagreeable odor, and the property of burning with a bright flame. Russia and the United States are the largest producers of kerosene. Gas and electric lights have displaced it very largely for illuminating purposes in cities.

**KESTREL** (kēs'trēl), or **Windhover**, a species of falcon native to Europe and Africa. It is about one foot in length and in color and habits closely resembles the sparrow hawk of America. The kestrel hovers in search of prey at a height of about forty feet and pounces suddenly upon small birds, mice, and reptiles, hence the name *windhover*. Young kestrels may be trained to pursue small birds, such as larks, quails, and snipes. The plumage is of a variety of colors, usually light grayish-blue in the male and somewhat reddish in the female.

**KETCHUP**, or **Catsup**, a sauce made extensively for table use, so named from the Japanese *kitjap*, which is a favorite article in the East for seasoning fish and meat. The table sauce used commonly is made from tomatoes, mushrooms, and walnuts. It is a healthful condiment.

**KEW** (kū), a village of England, in the County of Surrey, on the Thames, opposite Brentford and about one mile northeast of Richmond. It is noted as the seat of the royal botanical gardens. These gardens were commenced by the mother of George III., and visitors are still shown a cottage with furniture as it was left by Queen Charlotte. They have been open to the public since 1840, when they were presented to the nation by Queen Victoria. Besides containing a large collection of native and exotic plants, these gardens have an observatory, a gallery of paintings of tropical flowers, and several museums.

**KEWANEE** (kē-wā'nē), a city of Henry County, Illinois, about 130 miles southwest of Chicago. It is on the Chicago, Burlington and Quincy Railroad, in a coal-producing region, and is surrounded by a fertile agricultural, fruit-growing, and dairying country. The chief buildings include the public library, the high school, and a number of churches and business blocks. Many of the streets are well graded and paved. The manufactures include pumps, flour, iron-ware, windmills, bottled goods, and machinery. It has municipally owned waterworks. The government is under a charter granted in 1897. Population, 1900, 8,382; in 1910, 9,307.

**KEY WEST**, a city and the county seat of Monroe County, Florida, on the island of Key West, sixty miles southwest of Cape Sable. It is the most southerly city of Florida and of the

United States, has a fine harbor, and is connected with the mainland by a railroad. The harbor is defended by Fort Taylor, which is near the entrance on an artificial island. Two lighthouses are maintained at the harbor. Steamships furnish regular communication with Havana and the principal ports of the Atlantic coast.

Key West is a fine city and has well-lighted and substantially paved streets. The noteworthy buildings include the public library, the post office, a Methodist seminary, the county courthouse, the customhouse, a marine hospital, and the United States building. Intercommunication is by a system of electric railways. It has an important jobbing trade, especially in tobacco and fruits. Among the manufactures are cigars, smoking and chewing tobacco, clothing, and machinery. The climate is agreeable and as a health resort it is a favorite place for consumptives. The island of Key West is about seven miles long, from two to three miles wide, and has an elevation of about ten feet above sea level. Key West, the city, was founded about 1822 and was incorporated in 1832. Population, 1906, 21,174; in 1910, 19,945.

**KHAN** (kän), the title applied to Tartar and Mongol chiefs and sovereigns. Though formerly it expressed high rank, it is now applied especially to the chiefs of the nomadic tribes and to governors of cities.

**KHARKOV** (kär'köf), a government in the south central part of Russia, in Europe, with an area of 21,050 square miles. Kharkov, the capital, is one of the most important cities of southern Russia. It is situated at the junction of the Lopan and Kharkov rivers, and is a convenient railroad center. Besides numerous public schools and churches, it is the seat of the University of Kharkov. The surrounding country is fertile and produces large quantities of bituminous coal and petroleum. Among the manufactures are beet sugar, candles, leather, machinery, soap, and canned fruit. It was founded in the 16th century. Population, 1906, 201,308.

**KHARTUM** (kär-tōom'), or **Khartoum**, a city in Eastern Soudan, on the Blue Nile, near its junction with the White Nile, on the line of the Cape-to-Cairo Railway. The surrounding country is a sterile and treeless region. In 1830 it began to grow rapidly and soon after became the capital of the Egyptian Soudan, when it developed an important trade in gum, senna, ivory, ostrich feathers, and fruits. The older portions contain numerous houses constructed of sun-dried brick, but in the newer part the buildings are imposing and largely built of na-



tive wood and stone. In 1884-85 General Gordon was held captive in the city by superior forces under command of the native Mahdi, and was slain along with many others before the British relief army arrived. At that time it had a population of 72,498, but it was razed to the ground and the capital was removed to Omdurman, on the opposite side of the river. Lord Kitchener captured the place in 1898 and reinstated it as the capital. Population, 1908, 21,065.

**KHEDIVE** (kâ-dēv'), the title of the Egyptian rulers. It was first used in 1866, when it was applied to Ismail Pasha. The word signifies lord or lordship.

**KHIVA** (kē'vâ), a semi-independent khanate in Central Asia, forming a part of Turkestan. The general surface is sandy, but there are numerous fertile tracts. It is inhabited by various resident and nomadic tribes. The area is about 22,000 square miles. It is governed from Khiva, a city situated on two canals west of the Amur River, which contains a population of 6,085. In 1717 Peter the Great of Russia sent an expedition to conquer Khiva and a second attempt was made by Czar Nicholas in 1839. Since 1873 it has been a part of Asiatic Russia. A short distance south of it passes the Trans-Caspian Railroad, from the Caspian Sea to Samarkand. The construction of this railroad line has materially affected its importance, and has given an impetus to various manufactures. Khiva, the capital, is the seat of several Mohammedan colleges, has many bazaars, and is fortified by walls and earthworks. The Khanate has a population of 800,550.

**KHORSABAD** (kōr-sä-bäd'), a village in Asiatic Turkey, twelve miles northeast of Mosul, near the ancient city of Nineveh. Extensive excavations led to the discovery of the palace of Sargon, which was built about 700 B. C., and from it were obtained the first historical inscriptions found in ancient Assyria. The French government uncovered a large part of the palace in 1844. Most of the relics found there are now in the Louvre of France.

**KHYBER PASS** (ki'bēr), a military road between Afghanistan and the Punjab. This pass is an important strategic point. It has a length of 30 miles and a width of from 10 feet to 150 yards. The cliffs on either side rise perpendicularly to heights of from 800 to 3,000 feet. Alexander the Great, as well as the Russian and British, found the pass of vast importance in military operations. It constitutes the key to northern Afghanistan.

**KIAO-CHAU** (kyä'ō-chou), or **Kiao-chow**, a German protectorate in China, on the south coast of the peninsula of Shan-tung. The pos-

session has an area of 200 square miles. A good harbor is located at Tsing-tao, which was greatly improved and made the capital of the German zone. It has wide and regularly platted streets, waterworks, electric lighting, and a number of fine government buildings. A railway line extends inland to the coal fields of Lao-shan. Kiao-chau, the largest native city within the possession, was formerly the center of an important trade, which has been transferred to the new port of Tsing-tao. The possession has been German territory since 1898.

**KICKAPOO INDIANS** (kĭk-ä-pōō'), a tribe of Algonquin Indians. They were first found by the French and English pioneers of the Ohio valley, but their largest centers were on the Illinois River. In 1779 they assisted the French against the English, but, after being defeated by Wayne, they ceded a part of their lands, in 1802-4. They allied themselves with the English in the War of 1812, but sustained disastrous defeats, and in 1822 the majority removed from the Illinois to the Osage. The greater number emigrated to Kansas in 1854, and in 1863 a large party removed to Mexico, but ten years later returned and settled in Indian Territory, now Oklahoma. The present number of Kickapoos in the United States is 550, of whom about 230 reside in Kansas. Within recent years many have been favorably inclined to education and have taken up civil arts.

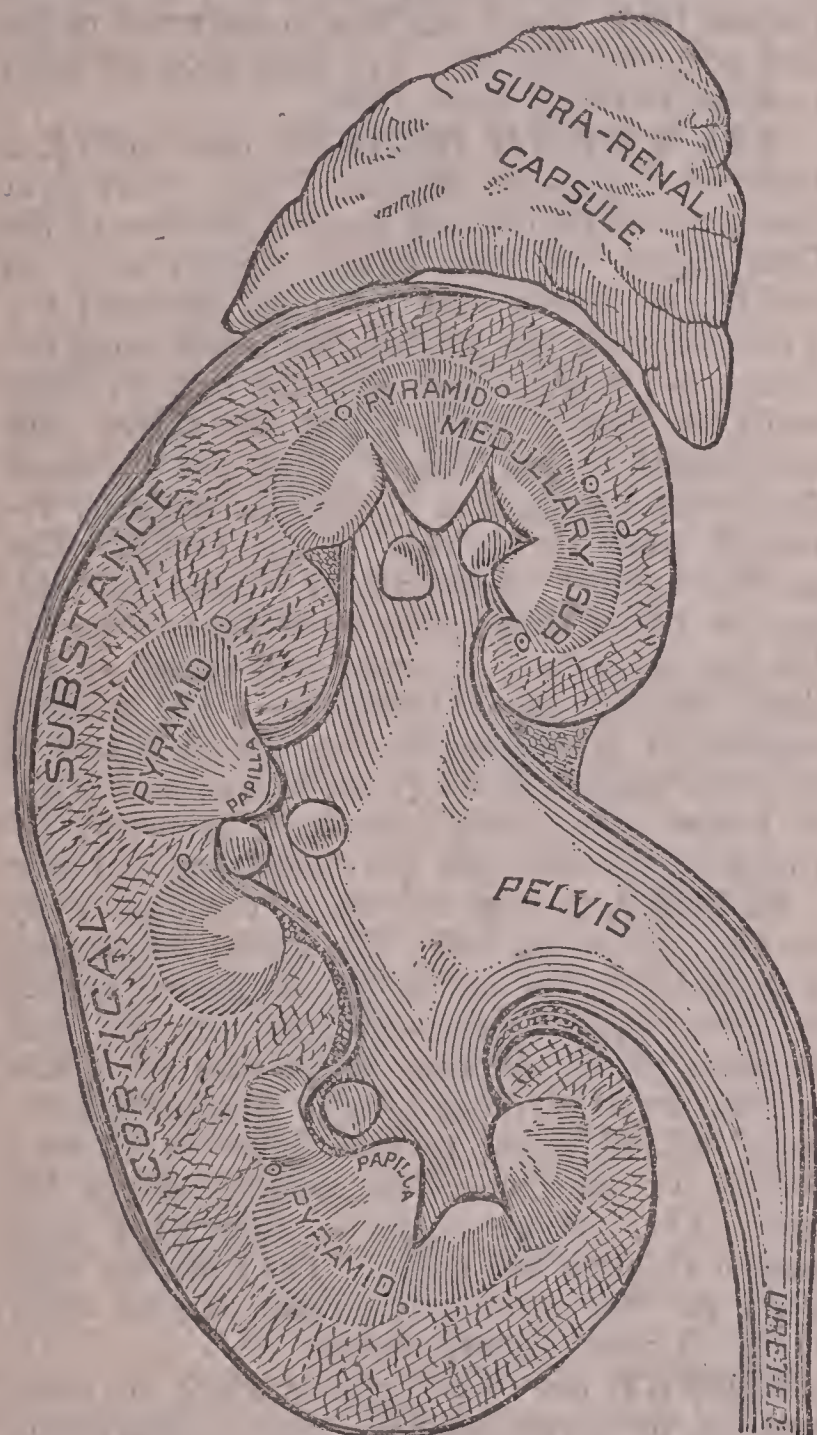
**KIDNAP**, to steal, secrete, or carry away any person against his will. The act of kidnapping is regarded by the law as an aggravated species of false imprisonment and embraces the legal elements of that offense. It includes an assault and the act of carrying away or transporting the party injured, either to some place in his own country or to some other country against his will. The offense may be committed both against children and adults. The statutory penalties for the crime are severe, varying from 10 to 25 years' imprisonment.

**KIDNEY**, one of two glands which are common to vertebrate animals, whose function is to secrete urea and other waste products from the system. They are situated at the back of the abdominal cavity, one on each side of the vertebral column. In man they are near the fifth rib, but, owing to the position of the liver, the right kidney is somewhat lower than the left. The accompanying illustration shows the internal cavity, which is bounded by the outer *cortical substance*. The conical masses of the *medullary substance*, from fifteen to twenty in number, form the *pyramids*. At the apexes of the pyramids are the *papillae*. Above or anterior to each kidney is the *suprarenal capsule*,



whose function is not understood. The inner cavity, or *pelvis*, terminates in the ureter. The shape of these organs is that of the kidney bean, the concave side being turned inward and toward the spine, and each is imbedded in a layer of fatty tissue.

The average weight of the kidney in man is from four to six ounces. It is about four inches long, the color is deep red, and the constitution



SECTION OF KIDNEY.

is dense and fragile. The outer part is covered by a thin but tough membrane. A canal, known as the *ureter*, conveys the urine from the kidney to the bladder, where it is retained until a normal quantity has accumulated, when it is expelled from the body. The health depends in a large measure upon the regularity with which the uric acid is taken up by the kidneys. Among the diseases of the kidneys is the well-known Bright's disease (q. v.). See **Gout**.

**KIEL** (kēl), a city of Germany, capital of

Schleswig-Holstein, situated on Kieler Hafen, an inlet of the Baltic Sea. It has extensive shipyards, dry docks, flouring mills, iron foundries, tobacco works, machine shops, sugar factories, oil mills, and engineering works. Besides its numerous public schools and historic churches, it is the seat of a noted university, which has an attendance of 1,250 students and a library of 250,000 volumes. The city is supplied with all modern municipal facilities. It has extensive railroad connections, electric street railways, and communication with the Elbe by a ship canal. As a member of the Hanseatic League it attained much commercial importance. In 1814 it was the seat of the congress that concluded the Treaty of Kiel by which Denmark ceded Norway to Sweden. Population, 1905, 163,772.

**KIESELGUHR** (kē'sēl-gōor). See **Dynamite**.

**KIESERITE** (kē'zēr-īt), a mineral obtained in the mines of Stassfurt, Germany. It is a hydrated magnesium sulphate and is used in the manufacture of fertilizers and Epsom salt.

**KIEV** (kē'yēf), or **Kieff**, a government in the southwestern part of European Russia. It has an area of 19,690 square miles. The capital, Kiev, is an important commercial and manufacturing city. It is situated on the Dnieper River, 270 miles north of Odessa, and has communication by several railroads. The University of Kiev has fine botanical and zoological gardens, extensive courses of study, and an enrollment of 2,675 students. The manufactures include beet sugar, clothing, machinery, woolen goods, porcelain, and tobacco. The surrounding country is farming and dairying and has a mild climate. It is an important commercial center. Kiev is an ancient city and is mentioned as early as the 5th century. It has been a part of Russia since 1668. Population, 1908, 342,027.

**KILAUEA** (kē-lou-ā'ā), one of the most noted volcanoes in the world, situated on the island of Hawaii, thirty miles southwest of Hilo. The crater is oval and has a circumference of about eight miles. Volcanic action is constant, the most extensive disturbances occurring in 1789, 1823, 1832, 1840, and 1866.

**KILDEER**. See **Plover**.

**KILIMANJARO** (kīl'ē-mān-jā'rō), a celebrated snow-clad mountain in German East Africa, 98 miles from the port of Mombasa and 150 miles from Lake Victoria Nyanza. It has two elevated peaks or craters called Kimawenzi and Kibo, the highest of which, Peak Kibo, is 19,680 feet above sea level. It forms the most elevated peak of the African continent. The summit is covered with snow perpetually, but





KINDERGARTEN EXERCISES.







on its lower slopes are fine forests. Hans Meyer ascended Kibo in 1889.

**KILLARNEY** (kīl-lār'nī), a town of Kerry County, Ireland, celebrated as a resort for tourists. Three beautiful lakes are located within the immediate vicinity. The smaller of the lakes has an area of 430 acres; largest, 5,000 acres; and the one known as the middle lake, 680 acres. These lakes are famous for their remarkable beauty and the shady dells surrounding them. They are fed by the Flesh River and several smaller streams. The Laune River is the outlet. Numerous picturesque islands dot their surface. The town has a population of 5,680.

**KILN**. (kīl), a structure or furnace of brick or stone. Kilns are used for calcining, baking, burning, drying, or annealing various substances, especially such as brick, iron ore, corn, cement, hops, pottery, and malt. They are constructed according to various patterns best fitted for the purpose for which they are intended, but in all of them it is designed to generate an abundance of constant heat with the least possible consumption of fuel. Those intended for drying and baking cereals, or their products, are often constructed of light material, while those designed for generating great heat are made of the best fire-clay brick. According to the course of the draught, they are classified as *up-draught* and *down-draught*.

**KILOGRAM** (kīl'ō-grām), a measure of weight in the metric system, being a thousand grams, equal to 2.2046 pounds avoirdupois. It is equal to the weight of a cubic decimeter of distilled water at the temperature of 39° Fahr., its maximum density.

**KILOGRAMMETER** (kīl'ō-grām-mē-tēr), a measure of energy, being the amount expended in raising one kilogram through the height of one meter, in the latitude of Paris, France.

**KIMBERLEY** (kīm'bēr-lī), a city and the capital of Griqualand West, in Cape Colony, South Africa, about 540 miles northeast of Cape Town. It has an exceedingly favorable climate, regularly platted streets, and numerous improvements, such as waterworks, electric street railways, a public library, and fine public buildings. Kimberley has a large jobbing trade. It was the seat of the De Beers Consolidated Company for some time prior to the war between England and the Transvaal Republic, and during that conflict was besieged by a formidable Boer army. The city is well connected by railroads and surrounded by a fertile agricultural and mining country. Within the immediate vicinity are some of the most celebrated diamond mines now operated. It was founded in 1871. Population, 1907, 38,482.

**KINDERGARTEN** (kīn'dēr-gär-těn), a name applied by Friedrich Froebel to a system of education devised by him for young children, the word signifying, in German, "garden for children." The system is based on the fundamental idea that the nature and faculties of children must necessarily be understood in order to secure their highest, right development. In this system the playful tendencies are employed by active realities in the form of objects. To secure this end it is necessary to make use of familiar objects in which the children are interested. The methods are necessarily conversational, the purpose being to cultivate freedom of expression on the part of the child. In this way the teacher, observing the characteristics of each learner, becomes enabled to develop perceptive power as well as moral and intellectual strength. Froebel held to the theory that all learning is pleasurable, and, when the playful activities are rightly employed, the children learn with ever-growing interest, thus developing mental and physical strength and a consciousness of right and wrong. The objects employed with greatest success in the kindergartens are such as toys, pictures, tools, flowers, beetles, and various other convenient and familiar forms that the child is allowed to handle, or use as objects for conversational lessons and for various simple drawings.

Froebel made use of five classes of objects, known as *gifts*. They were grouped as *solids*, *surfaces*, *lines*, *points*, and *construction material*. These were employed in active work, which consisted of the use of the gifts in a logical order. Sand and plastic clay for modeling, paper and crayons for folding and coloring, strips and slats for intertwining and interlacing, and beads and buttons for stringing were among the materials for employing the activities.

By bringing the children in contact with the useful and convenient at an early age, it is possible to give them an early bent toward acquiring right tendencies, as well as to instill in them traits of industry and strength of character. To make the work most highly efficient, it is necessary for the teacher to possess and cultivate a true motherly spirit, through which the children under her care may be encouraged by the most wholesome relations. In this way growth is stimulated under right and spontaneous activities. From the incentive given by Froebel kindergartens rapidly spread to all civilized countries, and at present are a part of the school systems of the more populous communities of Canada and the United States.

Special training schools to teach kindergarten methods are maintained in the larger cities, whose purpose is to properly prepare the teach-



ers for this class of work. The instruction given to young children is modeled with the view of preparing them for entrance into the regular primary and second primary departments of the school course. Associated with these kindergartens are manual training departments, whereby industrial teaching may be successfully carried through all the lower as well as the higher grades. A modified system of kindergartens has been introduced in the schools for blind and feeble-minded children. In recent years the study of kindergarten methods has been facilitated greatly by the publication of numerous periodicals and teachers' text-books. All the higher classes of normal schools have added departments for teaching kindergarten methods.

**KINETOSCOPE** (kî-nē'tō-skōp), or **Vitascope**, an instrument for producing a series of images with a very lifelike effect, commonly called *moving pictures*. The kinetoscope in general use consists of a magic lantern (q. v.) with a strong light, and the images are produced from a fine projecting lens in such rapid succession upon a screen that the figures appear to be in actual motion. The images are produced from pictures made on a long celluloid film about an inch in width, the length depending upon the series of pictures to be cast upon the screen. The pictures upon the film are a series of photographs and the exposure is about one-fiftieth of a second in duration, hence from fifty to sixty exposures pass before the eye in a second. Movement of the film through the instrument is obtained by a rotating mechanism, the film being unwound from one cylinder and wound upon another by a belt and pulley or an electric motor, and a revolving shutter is operated by the same mechanism that moves the film. This shutter alternately cuts off and admits the passage of the light between the film and the projecting lens, serving to permit the passage of light as the picture is in position for a brief time in front of the projecting lens and shutting it off as the picture is changed. This apparatus is used in scientific investigations, but chiefly to give entertainments.

**KING**, a title to designate the supreme ruler of a nation or country. The term was probably derived from khan and other eastern terms of similar meaning. The difference between a king and an emperor is not always one of power or extent, but is sometimes the result of historical developments. Though Louis Philippe was satisfied with the title of king, Napoleon III., who governed the same dominions, assumed that worn by Napoleon I. In very ancient times the king was considered the representative of God on earth and was absolute in ruling his domain.

This distinction was lost or modified with the growth of the spirit of liberty among the people, and at present the powers of the king in most European countries are abridged by a constitution. Though the view that a king can do no wrong still prevails in some countries of Europe, the responsibility of his office is vested largely in a ministry, in which are inherent many of the functions formerly exercised by the sovereign.

**KINGBIRD**, the name of an American bird, frequently called bee martin and flycatcher. It is about eight inches long, the extended wings measuring fourteen inches. The bill is short and stout, the tail is slightly rounded and longer than the wings, and the color is bluish-ash. On the head is a small patch of bright red feathers, usually concealed, but capable of being erected as a crest. The nest is built in trees, in which four to six eggs are laid, and the parents defend it with remarkable bravery. It is not uncommon to see the kingbird pursue hawks and other birds for some distance to drive them from the vicinity of its nest, from which habit it has been named.



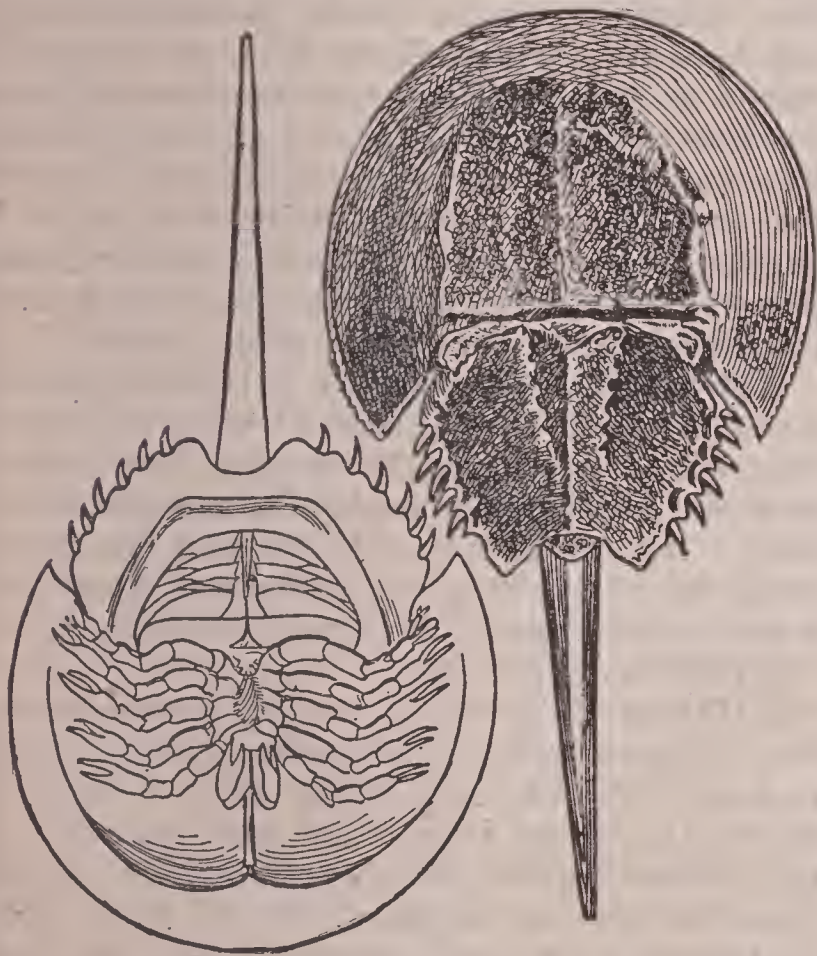
KINGFISHER; 2, KINGBIRD.

The kingbird is useful in devouring noxious insects, but also eats fruits and seeds. It pursues flies and other insects while on the wing. The note is not musical or pleasing, but during the breeding season it seems to lose some of its petulance.

**KING CRAB**, or **Horseshoe Crab**, an animal of the genus *Limulus*, so named from its great size. Only five species are known, all of which appear to date from the Cambrian times.



They are found in the tropical and northern coasts of America, in the Antilles, Japan, and the archipelago southeast of Asia. The head is composed of six fused segments. They have two pairs of eyes upon the upper surface, the head resembles a broad horseshoe, the mouth opens on the lower surface, and the tail is spine-like. Each side has six legs, a total of six pairs, but one pair is usually rudimentary. The inner side of the legs is armed with sharp spines to aid in retaining a hold upon the food or prey. As a means of obtaining food, the animal burrows in the bottom of the water, using the tail as a sort of a brace to burrow in the sand or



KING CRAB.

Lower View.

Upper View.

mud. The average length of king crabs is about two feet. They do not possess power to swim, and, like turtles, appear to be in agony when placed upon their backs.

**KINGFISHERS**, a family of incessorial birds noted for their bright plumage, stout bill, strong feet, and short tail. Several well-marked species are native to America and Europe, of which the common kingfisher is the best known. This species has the head feathers spotted with blue, while the sides of the neck are greenish and the bill is black. The length of the body is about seven inches. It frequents the coasts of lakes and banks of streams, where it engages in catching fish for food. In endeavoring to catch its prey the kingfisher occupies a position where

it may watch the fish, and, when an opportune time occurs, it darts down quickly and secures its prey by diving. The smaller fish are swallowed whole, while the flesh of larger ones is picked from the bones, after being carried to the perch, and the bones are used in building its nest. The eggs are nearly white, six to eight in number, and the nest is guarded with considerable care against intrusion of other birds. A species of kingfisher native to the Himalayas is spotted and is known as the *fish tiger*. The *laughing jackass*, so called from its peculiar cry, is a large species native to Australia. It is singular that the kingfisher is the subject of many superstitions. This bird is celebrated in the ancient poetic lore and mythology. See **Halcyon**.

**KINGLET**, the name of several small birds of the thrush family. The common kinglet of North America has yellow feathers with greenish markings and is one of the smallest perching birds. It is known locally as the *golden-crowned kinglet*. Another species, the *ruby-crowned kinglet*, has a red crest partly hidden by grayish feathers. These birds breed as far south as the Carolinas and in the spring move northward into Canada. Several species are native to Europe, including the *gold-crest*, which is noted for its song.

**KINGS, Books of**, the name of two books of the Old Testament. Commencing with the close of the history of David, they relate the events of the Hebrew state under Solomon and Rehoboam, give an account of the divided state under the rival dynasties of Israel and Judah, and carry the events down to the destruction of Jerusalem by the Babylonians. Many acts of Elijah and Elisha, the prophets, are detailed. According to the Talmud the Books of Kings were written by Jeremiah, but this is not admitted by Christian commentators, who generally treat the author as unknown.

**KING'S MOUNTAIN**, the name of a mountain range in North Carolina, trending north and south through Gaston and adjoining counties. It was the scene of a battle on Oct. 7, 1780, between the British and Americans. The Americans were commanded by Benjamin Cleaveland and the British by Colonel Ferguson. The battle terminated in favor of the Americans, but they lost their brilliant leader, Col. James Williams. However, the British lost 716 men as prisoners and 390 were slain, including General Ferguson. The Americans lost only 28 killed and 60 wounded. This battle had a favorable influence upon the American cause.

**KINGSTON** (kingz'tūn), a city and the capital of Jamaica, in the southeastern part of the island. It is defended by several forts, has an



extensive commercial trade, and contains a number of fine buildings and modern facilities. The harbor is commodious and admits the largest vessels. It is strongly fortified. Several fine parks and gardens are maintained. Rum, sugar, tobacco, coffee, dyewood, and fruits are exported. Spanish Town became the capital in 1858, but the seat of government was moved to Kingston in 1872, since which time it has grown rapidly. Population, 1908, 48,036.

**KINGSTON**, a city in New York, county seat of Ulster County, on the Hudson River, 87 miles north of New York City. It is on the West Shore, the Walkill Valley and the Ulster and Delaware railroads. The chief buildings include the public library, the county courthouse, the armory, the city hall, and Kingston and Ulster academies. It has the Senate House, which was formerly the meeting place of the State Legislature and now contains a collection of relics. Large quantities of coal, timber, and building stone are obtained in the vicinity. It has a large trade in grain, lumber, and merchandise. The manufactures include glass, cement, farming machinery, cigars, railroad iron, flour, earthenware, and liquors. Kingston was first settled in 1652 by the Dutch, when it was called Esopus, and the name was changed to Wiltwyck in 1661. In 1664 it was taken by the English and the name was soon after changed to Kingston. Later it was the capital of the State, when, in 1777, the first State constitution was adopted here. It was incorporated as a city in 1872. Population, 1905, 25,557; in 1910, 25,908.

**KINGSTON**, a city of Ontario, capital of Frontenac County, on the northeastern shore of



Lake Ontario, and on the Canadian Pacific, the Grand Trunk, and other railroads. It is finely situated on the bay of Quinte, near the source of the Saint Lawrence, and is connected with Ot-

tawa by the Rideau Canal. Kingston is 165 miles from Toronto and 172 miles from Montreal. It has a large trade in manufactures and produce. The chief buildings include the Royal Military College, the University of Queen's College, the Anglican and Roman Catholic cathedrals, and numerous substantial business blocks. In the public park is a bronze statue of Sir J. A. Macdonald. It is strongly fortified. Being located near the Thousand Isles, it is frequented during the summer by many tourists.

Kingston has a fine harbor and extensive shipyards. The manufactures include locomotives, edge tools, hardware, railway cars, clothing, cotton and woolen textiles, and spirituous liquors. The streets are substantially paved and well lighted with gas and electricity. An extensive system of street railways supplies transportation facilities to all parts of the city and many inter-urban points. It was made the site of a French fort in 1673. The city was incorporated in 1838. Originally the name was Fort Frontenac, but this was changed to Kingston after the American Revolution. Population, 1901, 18,043.

**KINKAJOU** (kin'ká-jōō), or **Potto**, a small mammal found in the tropical parts of South America. It resembles the raccoon, is nocturnal in habits, and feeds upon insects and small animals. The fur is soft and gray and the tail is prehensile. This animal is tamed and treated as a pet in some parts of Central America.

**KIOTO**. See **Kyoto**.

**KIOWA** (kī'ō-wā), a tribe of North American Indians, formerly numerous in the upper region of the Missouri River. They were considered the most savage and warlike tribe of the prairies, where they were dreaded by the early settlers, and formerly carried their raids as far south as the Gulf of Mexico. In 1875 they were removed to Oklahoma, where they became more or less associated with the Comanches. At present they number about 1,125.

**KIRGHIZ** (kīr-gēz'), the name of a Tartar-Mongol nomadic people of Asia. They occupy a vast region which extends from the Caspian Sea to the Altai Mountains, and from the Syr Daria River and the Sea of Aral to the Tobol and the Irtish. This section is characterized by several mountain ranges. It includes many salt lakes and the great steppe region. In language these people belong to the Turkish stock and many have embraced the creed of Islam. The total number of this race is placed at 3,000,000.

**KIRKSVILLE** (kērks'vil), a city and the county seat of Adair county, Missouri, 65 miles southwest of Keokuk, Iowa. It is on the Wabash and the Quincy, Omaha and Kansas City railroads, and is surrounded by a fertile farming



and dairying country. Bituminous coal is mined in the vicinity. Among the noteworthy buildings are the county courthouse, the high school, and a State normal school. It is the seat of the American School of Osteopathy and was long the residence of its founder, A. T. Still. Kirksville was first settled in 1840 and was incorporated in 1893. The manufactures include woolen goods, furniture, wagons, farm machinery, and cheese. Population, 1900, 5,966; in 1910, 6,347.

**KISHINEV** (kê-shê-nyôf'), or **Kishineff**, a city of Russia, capital of the government of Bessarabia, 85 miles northwest of Odessa. It is located on the Byk, an affluent of the Dniester, and is at the junction of several railways. The chief buildings include a public library, two gymnasia, several large Greek churches, and many substantial business blocks. It is important as a market for cereals and live stock and has manufactures of tobacco, clothing, and machinery. The inhabitants consist of Russians, Jews, Bulgars, Tartars, and Moldavians. It has been a possession of Russia since 1812. In 1905 and 1906 it was the scene of severe persecutions of the Jews. Population, 1906, 128,872.

**KITCHEN CABINET**, the name applied in American politics to a group of men during the administration of Andrew Jackson. These men were supposed to influence the action of the President more than the members of the Cabinet, though they were not important as government officials. Those who were included with these unofficial advisers were William B. Lewis, Duff Green, Isaac Hill, Amos Kendall, and Francis P. Blair, Sr., editor of the *Globe*.

**KITE**, the common name of many birds of prey. They belong to the falcon family, but differ from the true falcons in having shorter legs and longer wings. The wings are pointed, the tail is deeply forked, and the flight is easy and graceful. The *swallow-tailed kite* is common to the southern parts of the United States. It has glossy black feathers on the back and wings and the lower part is white. The common kite of Europe has a reddish-brown color. It is skillful in catching fish, insects, and small snakes.

**KITE**, a contrivance formerly used only as a toy, but now employed for various economic and scientific purposes. It is constructed of a light framework, covered with paper or cloth, and is raised into the air by the wind acting upon it. The effect of the wind upon a kite is similar to that upon a sail, and depends upon the contrivance being held by a string in a way that the wind will be most effective in lifting it. Kites are constructed chiefly in the form of dragons, and soar upward to the extent of the string by

which they are held. Besides furnishing the means of healthful pastime for children, kites are used in advertising, photographing landscapes, meteorological observations, communicating between stranded ships, and determining the temperature in the clouds. Benjamin Franklin made electrical experiments by using the kite. The forms used for amusement usually have a tail, which gives steadiness to the kite in sudden flaws of wind.

**KLAMATH** (klä'mät), a river in California, rises in the southern part of Oregon and flows into the Pacific Ocean about twenty miles south of Crescent City. In a part of its course it flows through the Klamath lakes, but the greater part of its distance is through deep and narrow canyons. Fine forests of cedar and redwood abound in its valley. It is 275 miles long.

**KLAMATHS**, the name of several tribes of Indians found originally near the Klamath lakes of southern Oregon and northern California. They are naturally of a peaceable disposition, but become aggressive when they are assailed, and have made material advancement in industrial arts. The early settlements made in California by the whites led to troubles in 1851, but peace was soon restored by a treaty. They ceded a large tract of land to the United States in 1864, reserving a productive region of about 1,200 square miles, on which they conduct agriculture, lumbering, and trading.

**KLAUSENBURG** (klou'zēn-bōork), or **Kolozsvár**, a city of Hungary, capital of the county of Klausenburg, 125 miles northwest of Hermannstadt. It is the seat of the Francis Joseph University, which has a library of 75,000 volumes and is attended by 750 students. Other institutions include a museum, a botanical garden, a Froebel institute, and a Roman Catholic cathedral. The manufactures are flour, cloth, beet sugar, cigars, and machinery. German colonists founded the city in 1178. The larger part of the inhabitants are Magyars of the Protestant faith. Population, 1906, 51,184.

**KLEPTOMANIA** (klēp-tō-mā'nī-à), a species of insanity in which is displayed an irresistible desire or propensity to steal and hoard. In a case of this affection it is considered that the afflicted person, while not absolutely insane, is nevertheless unaccountable and his acts are not held criminal. The symptoms usually consist of peculiar motives in stealing and hoarding, peculiar judgment as to the character of the commodities taken, and a characteristic interest in many articles of little value.

**KLONDIKE** (klōn'dik), a small tributary of the Yukon River, which has a general course toward the west, and flows into the Yukon near



Dawson. Valuable deposits of gold were discovered in the region by George Carmack, a native of Illinois, in August, 1896, and subsequently the district became known as the Klondike region. This region is largely in Canada, but extends along the Yukon across the boundary into Alaska. In 1897 many prospectors and miners proceeded to the Klondike region, and in that year secured fully \$2,000,000 in gold. Since then the work has progressed continuously during the summer season, and large quantities of the valuable mineral have been procured.

The precious metal occurs largely in a free state in the form of nuggets and grains, and is separated from the gravel and dirt by washing. As a rule the washing is done in the summer season, but much of the pay dirt is excavated from the frozen bed of muck at all times of the year. Formerly it was extremely difficult to reach this section, but a railway is now operated from Skagway to Hazelton, on the White Horse River, a tributary of the Yukon. Another line has been projected and partly built by the Grand Trunk Railway Company, extending from the eastern part of Canada to Dawson, the chief town of the Klondike.

**KNIFE.** See **Cutlery.**

**KNIGHTHOOD, Orders of,** a term applied to organized and constituted orders or bodies of knights. Two classes of orders of knighthood are generally recognized, one constituting fraternal associations and the other honorary. The associations or fraternities possess property as independent bodies, to which class belongs the Hospitalers, Templars, and Teutonic Knights. Honorary associations were established by sovereigns within their own dominions and embrace most of the orders now maintained in European countries, such as the orders of Saint George, Golden Fleece, Saint Michael, and Holy Ghost. The orders of the Garter, Saint Patrick, the Thistle, Saint George, and several others are British. The Star of India is an order of India. Each order of knighthood in the different countries has an appropriate insignia, with which is included a badge, ribbon, collar, jewel, and star. The Normans first introduced knighthood into England as a feudal institution, but at present a knight holds a title of honor next below a baronet. Since the 16th century it has been considered a title of honor conferred as a reward for personal merit or for service rendered the crown or the country. The title carries with it the right to prefix *sir* to the Christian name and the wife is legally called *dame*, though *lady* is by courtesy her designation. Knights who belong to no special order of knighthood are properly knights bachelor. Those belonging to

an order take the name of such order, as knight of the Garter and knight of the Bath. The rank is not hereditary. See **Chivalry.**

**KNIGHTS OF LABOR,** a fraternal labor association organized at Philadelphia, Pa., in 1869. The object of the organization is to protect the laboring classes, ameliorate the condition of the workingman, and promote industrial interests. It constitutes one of the most intelligent associations of the wage workers in the United States. The membership has declined within recent years, since the American Federation of Labor has superseded it in many localities.

**KNIGHTS OF PYTHIAS** (pīth'ī-ās), a fraternal and benefit association organized in 1864, whose purpose is to exemplify true and noble friendship. Three degrees are conferred, those of page, esquire, and knight, and the general control is vested in the supreme lodge, which likewise has charge of the uniform rank and the insurance branch. It is based upon the friendship of Damon and Pythias, two celebrated Pythagoreans of ancient Syracuse. Dionysius the Elder, tyrant of Syracuse, had condemned Pythias to death, but permitted him to visit his wife and family once more on the condition that Damon take his place in suffering the penalty, in case Pythias should not return. The latter returned before the time set for the execution, which so impressed Dionysius that both were set free. In 1909 the Knights of Pythias had 708,535 members. The total death claims paid by the insurance department equal \$28,947,608.

**KNIGHTS OF THE GOLDEN CIRCLE,** a secret society of the United States, organized in 1855 to advance the slave-holding interests of the South. The original purpose was to found a government in the vicinity of the Gulf of Mexico, which was to be the seat of vast slave-holding plantations. As a means to further organization, numerous lodges, or *castles*, were maintained. The members of this organization were not only numerous in the South, but were represented very extensively in the North. They had not less than 40,000 members in Indiana and a corresponding number in many other states. In the presidential campaign of 1860 they were a factor in defeating the Democrat party since they supported the Southern wing instead of McClellan.

**KNITTING,** the art of weaving a single thread so as to form a kind of fabric. It is done by means of knitting needles, which are made of various sizes to suit the fineness of thread used, usually of ivory or steel. Formerly the work of knitting was done wholly by hand, but the larger part of knit goods is now made



with knitting machines. The first knitter was invented in 1589 by William Lee of England, but many improvements have been introduced to make these machines highly utilitarian. Those in general use are rotary or circular in form, fitted to produce a circular web. They have a circular series of vertical parallel needles that slide in grooves in a cylinder, and are raised and lowered successfully by an external rotating cylinder which has cams on the inner side that act upon the needles. A hook at the end of each needle serves to draw down the thread so as to form a loop as it is depressed. This loop is slipped off over the hook when the needles are again elevated, thus forming a part of the web as the next hook is joined to it. Within the circle is an opening for the web, which is held in position by a weight attached to the lower end of it. The invention of the modern knitting machine has revolutionized the manufacture of knitted fabrics, such as hosiery and underwear.

**KNOT**, a fastening or twisting together of the ends or parts of one or more threads or ropes, or the looping of such threads around some other object so as not to come apart easily. The art of tying knots is important on shipboard, and those in use among seamen require much skill in the adjustment. They include about 200 different kinds, but of this number only a comparatively few are in general use. These include the so-called reef knot, figure of eight knot, bow line knot, running bow line knot, rope-yarn knot, manrope knot; and Matthew Walker knot.

**KNOW-NOTHINGS**, a name given to the members of the American party, which was organized in the United States in 1855. This appellation was applied because the party was a secret organization and, when asked about its affairs, the members professed to know nothing about them. Among its tenets were that naturalization should be granted only after 21 years' residence, that America should be governed only by Americans, and that allegiance to any foreign power should constitute a bar to selection for office. The party was organized for an active campaign in 1855, when it carried the state elections of Kentucky, New York, California, and most of New England. Millard Fillmore was its candidate for President in 1856 and received 874,534 votes, but in the electoral college obtained only eight votes, those cast by the State of Maryland. After the election of 1856 the party became disorganized and most of its members went over to the newly organized Republican party.

**KNOXVILLE**, a city in Tennessee, county

seat of Knox County, on the Holston River, 110 miles northeast of Chattanooga. It is on the Southern, the Atlanta, Knoxville and Northern, the Knoxville and Augusta, and other railroads. The site is at the foothills of the Clinch Mountains, which have much fine natural scenery. Among the noteworthy buildings are the post office, the county courthouse, the public library, the State Agricultural College, the University of Tennessee, the Tennessee School for Deaf Mutes, the East Tennessee Asylum for the Insane, and the Austin school for colored pupils. The surrounding country produces vast quantities of coal, zinc, and marble. Among the manufactures are flour, machinery, cotton and woolen goods, stoves, furniture, leather, soap, car wheels, and ironware. It has well graded and paved streets, waterworks and sewerage systems, and a large trade in produce and merchandise. Knoxville was settled in 1787, was the capital of the State from 1786 until 1811, and became a city in 1815. It was occupied by a Union army of 12,000 men under General Burnside in November, 1863, and a siege was laid by Longstreet. Sherman's army was sent to relieve Burnside in the latter part of 1863, after which the Confederates were compelled to raise the siege. Population, 1910, 36,346.

**KOALA** (kō-ä'là), or **Kangaroo Bear**, a bear or sloth native to Australia. It is a marsupial mammal. The tail is rudimentary, the head is small, and the color is ash-gray. It feeds largely on the leaves and tender shoots of the blue-gum tree. The length of its body is about two feet and the claws are well fitted to climb trees, in which it spends the greater portion of the time. Koalas live in pairs, are very tenacious of life, and the young are carried on the back of the mother when they have outgrown the marsupium.

**KOBE** (kō'bâ), a seaport city of Japan, in the southern part of the island of Hondo, on the Bay of Osaka. It has a safe and commodious harbor, extensive shipyards, and large railway shops. Direct steamboat communications are maintained between it and the leading ports of the world. Paper, clothing, saki, pottery, and machinery are among the leading manufactures. The principal buildings include those of the government, several schools and theaters, and a number of clubhouses and Buddhist temples. The streets are paved substantially and are improved by electric lighting and street railways. It has an extensive commerce with Great Britain, Germany, France, and the United States. Population, 1908, 288,516.

**KOHINOOR** (kō-ï-nōor'), or **Kohinur**, a famous diamond now owned by the crown of



Great Britain. It was secured from India when the Punjab was annexed. Originally the weight was 793 carats, but it was reduced by cutting until now it weighs only  $102\frac{3}{4}$  carats. The present value is about \$600,000.

**KOKOMO** (kō'kō-mō), a city in Indiana, county seat of Howard County, 54 miles north of Indianapolis. It is on the Lake Erie and Western, the Pittsburg, Cincinnati, Chicago and Saint Louis, and the Toledo, Saint Louis and Kansas City railroads. The chief buildings include the high school, the county courthouse, and several churches. It has a fine park, electric street railways, and a large trade in produce. The manufactures include stoves, carriages, lumber products, flour, cigars, furniture, and machinery. The place was settled in 1844 and incorporated in 1865. Population, 1910, 17,010.

**KOLA** (kō'lā), or **Cola**, the name of a plant native to the tropical regions of Africa, but now cultivated for its fruit in Brazil and the West Indies. The fruit, known as *kola nut*, is about an inch long, has a reddish-gray color, and its odor resembles that of nutmeg. It contains about two per cent. of alkaloid caffeine. Kola is used to some extent in the preparation of a drink similar to coffee. It has digestive and stimulating properties.

**KONG MOUNTAINS**, a mountain chain of Western Africa, stretching along the northeastern boundary of Liberia, and attaining to heights of about one mile above sea level. In these mountains the Niger has its source, flowing from them toward the northeast. The district is populated by Mohammedans. It contains valuable timber and minerals. The slopes and valleys are highly fertile, producing grasses, cereals, and fruits.

**KONGO.** See **Congo.**

**KÖNIGGRÄTZ** (kē-nīg-gräts'), a fortified town of Bohemia, on the Elbe River, seventy miles east of Prague. It has connections by railways and a considerable local trade. It is noted in history on account of an important battle between the German army of Prussia and the forces of Austria, which occurred July 3, 1866, and resulted in the defeat of the Austrians. As a consequence of the battle Prussia became the supreme power in the German states. Venice was ceded to Italy, and Hungary became constitutionally independent. The battle is better known by the name of Sadowa, from an adjoining town. Königgrätz is an old town. It has a fine library, a Gothic cathedral, and a theological seminary. Population, 1906, 10,302.

**KÖNIGSBERG** (kē'nīgs-bērg), a city and seaport of Germany, capital of the province of East Prussia, on the Pregel River, about five miles from Frisches Haff, an inlet from the

Baltic Sea, and 330 miles northeast of Berlin. It occupies a fine site on both sides of the Pregel, which is crossed by many stone and steel bridges. The streets are clean and well paved with stone and asphalt. Ample transportation facilities are furnished by steamships, steam railroads, and electric railway lines. An island in the river, at the west end of the city, contains the fort of Friedrichsburg, and other fortifications include twelve forts in the main walls on both sides of the river. It has extensive manufactures of clothing, chemicals, machinery, textiles, cigars, earthenware, and musical instruments.

The city is famous for the University of Königsberg, which dates from 1544, when it was founded as a Lutheran institution. At present it has 148 teachers, about 1,000 students, and a library of 225,000 volumes. Kant taught at the university nearly fifty years and a beautiful monument was erected to him in 1864. Among other famous teachers are Herbart, Bessel, Herder, Neumann, and Von Baer. The city has several fine schools, seminaries, colleges, and churches. It contains many valuable buildings, public parks, and several statues and monuments. The cathedral is one of the finest in Europe. Frederick I. was crowned King of Prussia at Königsberg, and in 1861 similar ceremonies were celebrated when William I. ascended the throne. Population, 1905, 223,770.

**KÖNIGSHÜTTE** (kē-nīgs-hüt'te), a city of Germany, in the province of Silesia, seven miles from the frontier of Russia. It has communication by railroads and electric railways, paved streets, and systems of waterworks and sewerage. In its vicinity are vast coal, iron, and zinc mines. The manufactures include ironware, machinery, and clothing. It is comparatively a new city and owes its prosperity to the development of mining and manufacturing. Population, 1905, 66,042.

**KOODOO** (kōō'dōō), or **Kudu**, the name of a large antelope found in Africa. It is about four feet high. The color is grayish-brown, with several vertical stripes of white on the sides. The flesh is considered very nutritious, hence it is hunted almost to extermination. This animal is easily domesticated and is grown in some places for its milk and flesh. The male has horns nearly four feet long. They are twisted spirally.

**KOORDISTAN** (kōōr-dīs-tān'), or **Kurdistan**, a region of eastern Turkey in Asia, including an area of about 80,000 square miles. The northern boundary is formed by Armenia and the eastern by Persia, extending into the latter country as far as Lake Urumiah. The inhabitants are principally Kurds, who adhere to the



Mohammedan religion, but differ from the Turks in language. They are fanatical in their religious views and extremists in government. The larger portion follow a pastoral life. They have been a source of strength to the Turks against the Armenians, but have opposed the spread of Turkish customs and language. The entire population is estimated at 2,750,000.

**KOOTENAI**, or **Flatbows**, a North American Indian tribe, resident in Montana, Washington, and British Columbia. Their chief seat in British Columbia is in the vicinity of Lake Flatbow. They support themselves mostly by hunting and fishing. The Kootenais are peaceable and quite industrious.

**KOOTENAY** (kōō'tê-nā), or **Kootenai**, a river of North America, which rises in the Rocky Mountains of British Columbia. It passes from British Columbia through the states of Montana and Idaho, thence reënters Canada, where it passes through Kootenay Lake, and after a course of 400 miles joins the Columbia River. Navigation is insignificant, owing to numerous rapids and the tortuousness of its course. The valley of the Kootenay is rich in iron and other minerals.

**KORAN** (kō'ran), or **Al Koran**, the book containing the sacred scriptures of the Mohammedan religion. It is made the basis of all civil, military, and social transactions among the Moslems. The name is usually written Al Koran; that is, *The Koran*, meaning originally "The reading," or "That which is to be read." The Mohammedans teach that the book is coeval with God, having existed eternally. In the beginning of time the transcript was made in rays of light upon gigantic tablets that were situated in the highest heavens, near the throne of the Almighty. Gabriel, the angel, is said to have communicated the different portions to Mohammed within a period of 23 years, both at Mecca and Medina. Mohammed dictated the Koran in manuscripts to a scribe, who preserved them in written form for the followers of the faith.

At first the different portions appeared without definite arrangement, but, after the death of Mohammed, Abu Bekr directed Zaid Ibn Thabit of Medina to collect them into a volume. Later this edition was revised by Caliph Othman, and in the thirtieth year of the Hegira, the year 652 A. D., it was published. This revision contains 114 chapters, and at the head of each is a title which indicates the nature of its contents, these often being strange sounding, including such as *The Cow*, *The Star*, *The Towers*, *The Poets*, etc. The chapters begin with the introduction: "In the name of God the Merciful, the Compassionate."

Among the tenets taught in the Koran are that there is but one God, and he is all-wise, merciful, and everlasting; that there is a punishment for the wicked and a reward for the just; and that all peoples will go to their reward at the day of judgment. Christ is assigned a place in the highest or seventh heaven, where he lives in the presence of God. When mankind becomes wayward and forsakes the path of righteousness, prophets are sent to direct them toward the true God. Among the prophets sent to earth are Adam, Noah, Abraham, Moses, Jesus, and Mohammed, the last named being the greatest of all the prophets. It teaches the doctrine of good and bad angels, outlines severe condemnation for the idolatrous, and describes heaven as a place in which seven degrees of award for righteousness will be made, these being called first, second, third, etc., heaven, and ranging from entertainment by music to the supreme joy of meeting God face to face.

The decrees of God are held to be unchangeable, the doctrine of predestination is taught, and all are admonished to fast, give alms, repeat prayers, and go on pilgrimages to Mecca and Mount Ararat. In praying it is advised that five prayers be said a day, during which the face is to be turned toward Mecca. When ready for prayer, it is necessary to perform the act of purification, which consists of bathing the hands, for which purpose sand or dry dust may be used where water is not obtainable. The laws of Moses and the decrees of Jewish rabbis are adhered to in the treatment of divorce, polygamy, inheritance, and other practices. In language the Koran is elegant and pure, and is considered the ideal production of Arabic classics. The Moslems think that no human being is capable of producing its equal. In size the Koran is about the same as the New Testament, the work containing 77,639 words. Innumerable commentaries on the Koran have been published. It is claimed that the Tripoli library in Syria at one time contained fully 20,000 different treatises on this book.

**KORDOFAN** (kôr-dō-fän'), a region in the Egyptian Sudan, located between Darfur and the White Nile. It has an area of 95,125 square miles. Much of the surface is level, but it is characterized by isolated hills, and during the rainy season is covered with a rich vegetation. In the hot and dry season the climate is quite unpleasant to Europeans. Water is obtained chiefly from wells, except from June to October, when the rainfall is abundant. The inhabitants consist chiefly of Arabs and Berbers, who engage in stock raising and the cultivation of cotton, sesame, tobacco, and millet. El Obeid is



the capital and chief town. The population is estimated at 300,000.

**KOREA.** See **Corea.**

**KOSCIUSKO** (kōs-sī-ūs'kō), **Mount**, one of the most elevated mountain peaks of Australia, situated in the Australian Alps, in New South Wales. It has a height of 7,308 feet above sea level.

**KOUMISS** (kōō'mīs), or **Kumys**, a fermented beverage made originally by the Tartars from the milk of mares. It is now made from the milk of cows. Large quantities are manufactured in Europe and the United States. It is valuable for its nutritive and digestive properties, and is prescribed by physicians in cases where other food cannot be retained by the stomach. Mares' milk, which contains a high per cent. of sugar, is used largely for this purpose in Russia and Siberia, but the product made from it and from the milk of goats is characterized by a somewhat unpleasant odor. About forty hours are required for fermentation. The product contains a considerable per cent. of alcohol and carbonic acid.

**KOVNO** (kōv'nō), a city in Russia, capital of the government of Kovno, situated near the junction of the Vilia and Niemen rivers. It is important as a railroad and commercial city. The streets are well paved and cross each other at right angles. It is surrounded by an agricultural country and has a large trade in produce. The manufactures include beet sugar, clothing, earthenware, and machinery. Kovno was founded in the 10th century. For many years it was a point of contention between the Poles and the German knights. Population, 1906, 78,302.

**KRAKATOA** (krā-kā-tā'ō), an island in the Strait of Sunda between Java and Sumatra. It is of volcanic origin. The area is six square miles. This island is celebrated on account of numerous earthquakes and volcanic eruptions that are associated with it. It was the scene of vast disturbances in 1883, when the explosions were perceptible a distance of 150 miles. Though the island is uninhabited, about 35,000 people were killed on the islands in the vicinity by great sea waves that swept away several villages and a number of towns. Prior to the disturbances the island was about twice its present size.

**KREFELD** (krā'fēlt), or **Crefeld**, a city of Germany, in Rhenish Prussia, about thirty miles northwest of Cologne. It is located four miles west of the Rhine, at the junction of several railroads, and has extensive electric railway facilities. The streets are regularly platted and substantially paved and lighted by gas and electricity. It is celebrated as a center for the manufacture of silk and velvet, in which en-

terprise it has few rivals in Europe. Other manufactures include soap, hosiery, chemicals, sugar, leather, paper, and machinery. It is the seat of an academy, a gymnasium, a conservatory of music, and many fine schools and churches. Krefeld dates from the 12th century. It has been a part of Prussia since 1702. Population, 1905, 110,344.

**KREMENTCHUG** (krēm-ën-chōök'), a city in the government of Poltava, Russia, on the Dnieper River, 68 miles southwest of the city of Poltava. It has extensive railroad connections and a large trade in tallow, salt, and timber. The manufactures include machinery, beet sugar, furniture, and fabrics. A large tubular railway bridge crosses the Dnieper. The municipal facilities are modern, including electric railways, sewerage, and waterworks. Population, 1905, 64,073.

**KREMLIN** (krēm'līn), the name applied in Russia to a citadel. The most celebrated of these structures is the Kremlin at Moscow, which is situated on the north bank of the Moskva River. It is surrounded with walls from 12 to 16 feet thick and from 28 to 50 feet high. These walls are supplied with battlements, embrasures, five gates, and numerous towers, and they inclose a space about one and a half miles in circumference. Within the Kremlin are many churches, cathedrals, monasteries, and fine public buildings. As a whole it presents a peculiar and imposing aspect. Many of the inhabitants remove their hats when passing by the gate known as that of the Redeemer, and no one passes it without bowing and crossing himself. Among the curiosities of this remarkable place are an ancient monster cannon and the broken Tsar Kolokol, a bell weighing 200 tons, cast for the Empress Anna in 1733. Napoleon I. resided in the Kremlin for a short time in 1812.

**KRISHNA** (krīsh'nā), in Hindu mythology, the eighth incarnation of the Brahmanic god Vishnu, and the most popular deity in the Pantheon of the Hindus. He is the hero of the greatest Sanskrit poem. His life history is similar to that of Hercules and Apollo.

**KRONSTADT** (krōn'stāt), a free town of Austria-Hungary, in Transylvania, at the foot of the Transylvanian Alps. It is conveniently connected by railways and is noted for its manufacturing and commercial trade. The municipal facilities include electric street railways, waterworks, and public parks. Among the noteworthy buildings are the townhall and the Church of Saint Bartholomew. It is surrounded by a mountainous country, which is well wooded and rich in minerals. The inhabitants are mostly Germans. Population, 1906, 33,807.



**KRONSTADT**, a seaport of Russia, on the island of Koblan, twenty miles west of Saint Petersburg. It is strongly fortified and serves as a strategic military protection to the national capital. The city is thought to be almost impregnable, being defended by strong granite forts and armed with heavy guns. Peter the Great founded it in 1710, but it has since been improved greatly. It has regularly platted streets, many Greek Catholic churches, a thoroughly organized school system, and modern municipal facilities. The harbor is safe and large. It has manufactures of ships, cannon, clothing, machinery, and various implements of war. Population, 1906, 61,206.

**KRYPTON**, a gaseous element which resembles argon, discovered in the air by William Ramsay in 1898. Owing to the rarity of this element, it is not well known. Ramsay estimated that only one part in a million of the atmosphere consists of krypton. The atomic weight is 58.74.

**KUBAN** (kōō-bän'y'), a river of the Caucasus, in Russia. It rises in the Caucasus Mountains, near Mount Elbruz, and discharges partly into the Black Sea and partly into the Sea of Azov. It passes through a fertile region, but in its lower course are many marshes. The total length is 525 miles.

**KU-KLUX KLAN** (kū-klūx'), a society founded at Pulaski, Tenn., in 1866, in the reconstruction period that followed the Civil War. At first the purposes of the society were for amusement, but later it took on the object of opposing the reconstruction acts and preventing freedmen from voting. In some cases the Negroes were persecuted, prevented from voting, and acts of violence were perpetrated upon them. The organization in the period of its greatest strength numbered about 550,000 members, all of whom were people of the Southern States, but its largest membership was in Mississippi, South Carolina, Georgia, Tennessee, Alabama, and Kentucky. An act of Congress passed April 20, 1871, provided suppressive measures and the society disbanded.

**KUMAMOTO** (kōō'mā-mō-tō'), a commercial city of Japan, near the western shore of the island of Kiushiu, on the Shira River. It is the capital of the Kumamoto district, is strongly fortified, and has an extensive interior and foreign trade. The municipal facilities are modern, including waterworks, sewerage, and rapid transit. It is an educational center and is reached by steamers. Population, 1906, 60,346.

**KUMASSI** (kōō-mās'si), or **Coomassie**, a town of Western Africa, in the British Gold Coast, capital of the native kingdom of Ashanti. It is located about 150 miles north of the Gulf

of Guinea and has railroad connections with Sekondi, on the Gulf of Guinea. The streets are regularly platted and somewhat improved. An exchange and market place are in the central part. The town has considerable trade in cereals, live stock, and fruit. Population, 1906, 30,680.

**KURDISTAN**. See **Koordistan**.

**KURO SIVO**, **Kuro Siwo**, or **Japan Current**, a warm equatorial current formed in the region southeast of Asia. It flows past Formosa, Japan, and the Aleutian Islands, after which it passes southward to California. Though important in commerce and in the modification of climate, it is inferior to the Gulf Stream.

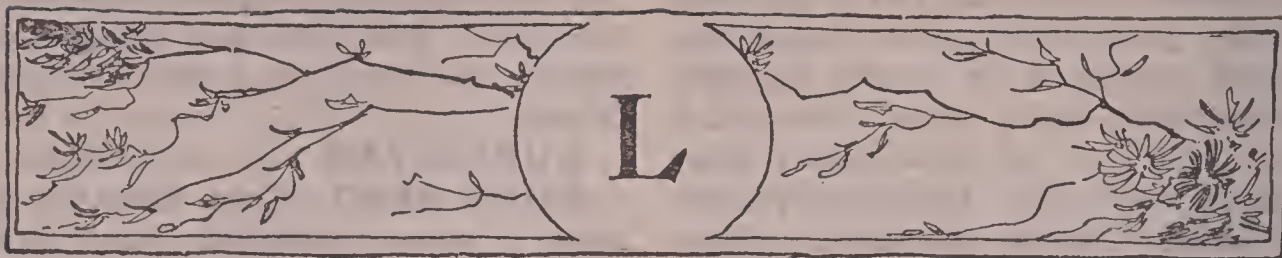
**KUSKOKWIM** (kūs'kō-kwīm), a river of Alaska, the second in size of that territory. It rises on the north side of the Alaskan mountains, has a general direction toward the southwest, and after a course of 500 miles flows into Kuskokwim Bay, an inlet from Bering Sea. The channel is irregular and passes between precipitous rocks in much of the course. About 300 miles are navigable.

**KYANITE** (kī'ā-nīt), a mineral which is similar to garnet and is used in making inkstands, paperweights, and table tops. It varies in color, but blue predominates. This mineral is found in Bohemia, Switzerland, and various parts of the United States, especially in Virginia and Massachusetts.

**KYOTO** (kyō'tō), or **Kioto**, the third city of Japan, on the island of Hondo, connected with the other trade centers by important railroad lines. The surrounding country is fertile. About six miles from the city is Lake Biwa. The Kamogawa River divides the city into two nearly equal parts. For many years it served as the official residence of the Mikado and was the ecclesiastical capital. At present it is a center of learning, contains many excellent educational and other buildings, and has divers modern facilities. The municipal facilities include electric street railways, electric lights, telephones, and public parks. As a commercial center it ranks among the first of Japan, both in exports and imports. Among the manufactures are silks, clothing, lacquered ware, ivory ornaments, machinery, bronze ornaments, and textiles. Population, 1908, 382,658.

**KYRIE ELEISON** (kīr'i-ē ē-lī-sōn), a form of prayer, meaning "Lord have mercy." It is used in both Greek and Latin liturgies, and occurs in the prayer books and songs of the Anglican and Lutheran churches. In the ordinary mass of the Roman Catholic church it immediately follows the introit and precedes the *Gloria in Excelsis*.





## L

**L**, a letter of the Indo-European alphabet, the ninth consonant. In the English *l* has only one sound but is sometimes silent, as in *calm* and *half*, and is usually classed as a semivowel or a liquid. It is made by raising the tip of the tongue and passing the sonant breath through openings on both sides with a thrill or rustle. The letter *r* is more closely allied to *l* than any other letter which is associated with the latter, and the two are often interchanged in various languages. It is considered that *l* is a later modification of *r* in the Indo-European alphabet, *r* often changing to *l*, while *d* also takes the place of *l* in some of the languages. As a symbol, in chemistry, it stands for *lithium*.

**LAALAND** (lā'lān), or **Lolland**, an island in the Baltic Sea, belonging to Denmark. It is 36 miles long, about 12 miles wide, and has an area of 465 square miles. The soil is fertile, producing corn, hops, hemp, and fruit. It has about 50 square miles of oak and beech forests. Maribo is the capital and Nakskov is the largest city. Population, 1906, 71,956.

**LABIATAE** (lā-bī-ā'tē), the botanical name of the plants which belong to the mint family. The order embraces 150 genera and 2,800 species, most of which are native to temperate climates. These plants are widely distributed in the continents, including many that are prized for their flowering and economic properties. Among the best known are the thyme, lavender, marjoram, basil, horehound, sage, rosemary, and peppermint. See **Mint**.

**LABOR**, the voluntary effort put forth by man to secure some desired object. As associated with land and capital, it constitutes an important factor in the production of wealth. Land, labor, and capital are the three agents of production, but, since labor is the basis of all wealth, it may be regarded the most important factor in economic science. Nature and man are the two great agencies that cooperate in production, nature furnishing the material upon

## LABOR

which labor is to be exerted, and man supplying the necessary labor to render the materials of nature available for useful purposes. Labor includes not only muscular exertion, but all the mental effort involved in securing objects of desire. It does not create, but moves and affects changes upon things. By bringing the natural forces to the service of man, and moving materials and objects into positions where forces can act upon them with the desired effect, labor effects its chief productiveness.

The direct changes effected by labor are *transmutation*, *transformation*, and *transportation*; or, a change of elements, a change of form, and a change of place. These are exemplified by the agriculturist in the production of cereals, fruits, and cheese; by the manufacturer in transforming leather into shoes, cloth into garments, and lumber into houses; and by the transporter, who transfers the production of one community to a locality where it is consumed. Labor is productive or unproductive, depending upon the results that accrue. *Productive labor* is that form which increases wealth or adds to human intelligence, happiness, or morality. *Unproductive labor* includes the misdirected activities, such as are exemplified by failures in speculative projects and by most wars.

In ancient times labor was largely compulsory, such as was applied in the building of the Egyptian pyramids and the wall of China. Through almost the entire history of the world the laboring man has been suppressed more or less in his activities by potentates or men of great wealth, but with the concentration of labor in manufacturing centers powerful efforts began to be exerted for the protection and amelioration of the laborer. The first organizations of this character were formed in the early part of the 18th century, and through all of the last century educational organization tended to render the laboring man more intelligent and efficient. He has come to be an important factor in the govern-



ment, influencing legislation by the election of such men as are friendly to the interests for which the labor unions stand.

The Knights of Labor and the American Federation of Labor are the strongest industrial organizations of North America, but there are many affiliated branches in the latter, such as the powerful unions supported by miners, railroad workers, and employees of manufactories. Others are associated with the transportation enterprises, such as the International Brotherhood of Teamsters and the International Union of Steam Engineers. Legislation favorable to the interests of labor has been promoted in all the civilized nations of the world. This organization on the part of laborers has been a source of much benefit to the material industries, aiding in production as well as benefiting the laborer intellectually and financially. The most important objects of the labor movement of recent times embrace the compulsory arbitration of differences between employers and employees, the establishment of the eight-hour system of labor, and the improvement of the sanitary conditions of the mines and factories.

**LABOR DAY**, a legal holiday in many civilized countries. In Canada and the United States it occurs on the first Monday in September, but in most countries of Europe it is observed on May 1. Labor Day was first celebrated in a few states in 1886, but since then it has grown in favor. In many localities it constitutes a holiday of much importance. The celebration usually includes parades on the streets by industrial unions, music, speeches relating to labor interests, various games, and often fireworks in the evening.

**LABOR UNIONS.** See **Labor; American Federation of Labor; Knights of Labor; Co-öperation.**

**LABRADOR** (läb-râ-dôr'), a British possession of North America, situated mainly east and north of Quebec, and forming a dependency of Newfoundland. It extends from the Strait of Belle Isle to Hudson Strait, is bounded on the west by Ungava and the east by the Atlantic, and has an area of about 120,000 square miles. The surface is greatly diversified, portions being desolate and rocky, while in some localities are extensive forests of birch and fir trees. Among the principal streams are the Grand and Northwest rivers, the latter draining Lake Aswanipi, or Hamilton, which is in Quebec. The coast is rocky and is indented by many bays and fjords. Many fish, such as the salmon, cod, and trout, are abundant, and the region is visited annually by over 30,000 fishermen from Canada. The interior contains many

valuable fur-bearing animals, among them the otter, marten, fox, bear, wolf, reindeer, and beaver. The winter season is of nine months' duration and very cold, but the summer is moderately warm and adapted to the culture of potatoes and other forms of vegetables. Barley and oats are grown extensively for fodder.

Labrador was visited by the Norsemen in the year 1001, by Cabot in 1498, and by a Portuguese expedition under Cortereal in 1500. In the 11th century it was described by some Norse settlers of Greenland as Helluland, meaning the land of rocks. In 1763 it became a dependency of Newfoundland. The name Labrador was given to the region by the Portuguese, meaning Laborers' Land, and is frequently applied to the entire peninsula between the Saint Lawrence and Hudson Bay. In the latter sense it comprises a large part of Quebec and Ungava. The portion belonging to Newfoundland, in 1906, had a population of 4,023.

**LABRADORITE** (läb'râ-dôr-ît), a mineral formerly called Labrador hornblende, found on the coast of Labrador. The colors are commonly blue and green. Labradorite is formed chiefly of calcium, aluminum, and sodium silicate. It forms an essential constituent of many rocks, being associated with augite, hornblende, and other mineral substances, and serves a useful purpose for inlaid work and jewelry.

**LABUAN** (lä-bö-än'), an island in the East Indies, situated west of the coast of British Borneo, comprising a crown colony of Great Britain. The area is thirty square miles and the surface is mountainous. Coal, timber, sago, honey, and fruits are the chief products. Victoria, the capital, has a population of 1,500. It is the seat of a brisk trade with Singapore and Borneo. The island has been a possession of Great Britain since 1844. It is under the government of the British North Borneo Company. Population, 1906, 8,530.

**LABURNUM** (lä-bûr'nûm), a small tree native to the Alps of Europe, now planted in gardens and villas as an ornamental shrub. In May and June it presents a beautiful appearance, every twig and small branch being hung with racemes of brilliant yellow flowers. The wood is so hard and heavy that it sinks in water. It takes a high polish, has a greenish color, and is used largely for ornamental work and handles to knives. The seeds are poisonous. Rabbits are so fond of the bark that they damage the tree in the winter. See illustration on following page.

**LABYRINTH** (läb'î-rînth), a building which contains many tortuous passageways, so constructed that they are difficult to traverse



without a guide. Many buildings of this character were maintained anciently, notably in Egypt and Crete. The labyrinth of Crete, according to legendry, contained passages from which no one could escape, hence the visitors became the prey of Minotaur. It was reputed to have been built by King Minos. The only safeguard was a linen thread, which, in being followed, made it possible to reach the exit. This celebrated labyrinth was situated in the district



LABURNUM.

now called Fayoum, near Lake Moeris, contained 3,000 chambers, and is classed as a wonder of the world. Other celebrated labyrinths were at Clusium, Italy, and in Samos and Lemnos. Mazes are imitations of labyrinths and are fashionable in gardens and at expositions. The maze at Hampton Court, in England, is a good example in gardening, while the mystic maze exhibited at the Columbian Exposition, in 1893, was a fine example of a labyrinth with mirrors.

**LAC** (lāk), a resinous substance obtained from an insect called *coccus lacca*, or lac insect, found in the East Indies, Siam, Burmah, China, and other Asiatic countries. It consists of a granular substance. Among these insects there are about 5,000 females to each of the males, the latter being winged and about twice the size of the females. After the eggs are laid, the mother dies, and when the young come out they secrete the lac. They feed upon the resinous juices of the same tree for several generations, causing the superfluous excretions to form a coat about

half an inch thick. This product yields a red fluid for making crimson and scarlet dyes, which are quite similar to the coloring matter of the cochineal. In some portions of India the lac insect is cultivated, both for its lac and dye properties. When in a natural state the product is called *stick-lac*; when crushed and washed, *seed-lac*; and when transformed into a thin crust by melting, *shell-lac*. Lac is used in the manufacture of lacquer, varnish, sealing wax, and materials to stiffen various articles of apparel, such as the calico frame of silk hats. Lac dye produces a beautiful scarlet and is an important article of commerce.

**LAC**, or **Lak**, a term used in the commerce of the East Indies. It is derived from the Sanskrit word *lakṣa*, meaning 100,000. One lac is equal to 100,000 rupees and 100 lacs make a *crore*.

**LACCADIVES** (lāk'kā-divz), a group of small islands in the Arabian Sea, about 200 miles west of the Malabar coast of British India. They consist of about 20 islands of coral formation and have an area of 745 square miles. The surface is low and flat and much of it is barren and unproductive. The chief products include cocoanuts, plantains, and betel nuts. The inhabitants are Mohammedans of Arabian descent, who engage largely in fishing and seamanship. Population, 1906, 14,500.

**LACE**, a delicate fabric or network of threads formed of linen, cotton, silk, gold or silver wire, or some other suitable material, forming a fabric of transparent texture. The origin of lace is unknown, but it was used by the ladies of ancient Greece and Rome. In Italy the manufacture of lace was an important industry during the Middle Ages, whence it was introduced into France. A law passed in England in 1483 prohibited its importation, but in the 16th century the manufacture became quite extensive in Western Europe. Brussels, Alençon, and Maltese are among the best known point laces. They have been produced extensively in Belgium and France for many centuries. In the 16th century lace manufactories were established at Honiton, England, and at North Hampton in the 17th century, and in 1768 a machine for manufacturing lace was installed at the latter place.

Many styles of laces are now made, depending upon the mode of manufacture and the purposes for which they are to be used. The finest grades are handmade, these excelling in strength, delicacy, and beauty, and likewise commanding the highest prices. No branch of the textile industry has received more attention than that of lace manufacture, and it is one of the industries in which machine work does not com-



pete in fineness and delicacy with the handmade products. Pillow lace is made largely by hand, but many kinds of fine fabrics of this class are produced wholly by machinery. In lace weaving the threads of the weft are twisted around those of the warp. The character of the net and its name are determined by the manner of twisting, as pattern net, spider net, bobbin net, Paris net, and whip net. Point lace was developed from embroidery, and is made largely by needle and a single thread. Guipure lace is made by the crochet needle. It has a network ground on which patterns are wrought in various stitches in silk. The manufacture of gold and silver lace is associated with the ribbon trade. It has for a basis thin ribbons or flat bands, around which yellow and white threads of cotton are wrapped closely. In the lace industry France takes a very high position, no less than 250,000 persons being engaged in its manufacture in that country. Machine-made imitations of the finer laces are commanding a large sale and taking the place of the more expensive forms.

**LACHINE** (lă-shēn'), a town of Quebec, in Jacques Cartier County, eight miles southwest of Montreal, on Lake Saint Louis. It is on the Grand Trunk Railway and is popular as a summer residence for citizens of Montreal, with which it is connected by the Lachine Canal. This canal is maintained to avoid the Lachine Rapids on the Saint Lawrence. Extensive electric power works are maintained to supply Montreal. The chief buildings include several fine schools and churches. Lachine was settled and so named about 1669. Population, 1901, 5,561.

**LACHLAN** (lök'lan), a river of New South Wales, Australia. It rises in the Blue Mountains and has a length of 700 miles. Near Oxley it joins the Murrumbidgee, belonging to the Murray River system. A large part of the course is through a treeless plain, where it becomes almost dry during the dry season.

**LACHRYMAL GLAND** (lăk'ri-mal), a small almond-shaped body located in a depression in the upper and outer angle of the eye, between the bone and the eyeball. Its ducts, which secrete the tears, number from six to twelve and open on the inner surface of the upper eyelid, near the outer angle. The liquid is spread over the eye by the upper lid and passes to the inner angle of each eye, where it enters a small opening called the *puncta lachrymalis*. This is the commencement of the tear-canal. The short canals of the upper and lower lids meet in the nasal sack, from which the nasal duct conducts the tears to the lower part of the nose. The diseases which affect the lachrymal organs in-

clude an excessive secretion of tears, obstruction to their escape in the nose, and growths that affect the lachrymal glands.

**LACKAWANNA** (lăk-ă-wŏn'nà), a river of Pennsylvania, rises in Susquehanna County, and after a course of forty miles joins the Susquehanna near Pittston. The valley and basin of the Lackawanna River are productive coal fields and produce about one-half the anthracite coal obtained in the United States. Scranton, the largest city on its banks, is noted for its large factories and blast furnaces.

**LA COLLE**, a town of Quebec, in Saint John County, on the Grand Trunk Railway. It was the scene of an engagement on March 30, 1814, between a British force under Colonel Handcock and an American army under General Wilkinson. The British had a small garrison of 350 men, but they were reinforced during the battle by about 800, and the Americans made the assault with about 5,000. After two hours the Americans withdrew, and the project of clearing the way to Montreal was abandoned. General Wilkinson was relieved from command and tried by court-martial, but was acquitted.

**LACONIA** (lă-kŏ'nĭ-ă), a city and the county seat of Belknap County, New Hampshire, about 25 miles north of Concord, on Lake Winnisquam. It is on the Winnepesaukee River and the Boston and Maine Railroad. The chief buildings include the public library, the hospital, the opera house, the courthouse, and several public schools. It has manufactures of hosiery, machinery, railroad cars, woolen goods, and hardware. Electric lights, waterworks, and street railways are among the improvements. Laconia was settled about 1780 and incorporated in 1852. Population, 1900, 8,042; in 1910, 10,183.

**LACQUER** (lăk'ēr), a varnish composed of shellac dissolved in alcohol and colored with various substances, such as saffron, gamboge, and annatto. It serves as a protection from rust and improves the color of metals, especially brass, tin plate, and iron. Lacquer also is applied to wood and papier-maché for the purpose of giving improvement in color. The lacquer ware manufactured by the Japanese and Chinese is varnished by a product made from the juice of a species of sumac, called the varnish tree, which is native to that region of Asia. Vermilion is used in mixing this varnish for the purpose of making a reddish color, and different hues are secured by various other substances. The lacquer made from the sumac not only gives a firm surface, but is able to withstand considerable heat without damage, and it is due to this property that the lacquered vessels from those countries may be used to contain hot drinks and



soups. Lacquering among the Japanese is an ancient art and many of their designs are of much value, especially the specimens that were made by them in former centuries. Their silver and gold lacquer ware is among the finest now produced.

**LA CROSSE** (là-krôs'), a city in Wisconsin, county seat of La Crosse County, at the junction of the La Crosse and Mississippi rivers. It is on the Chicago and Northwestern, the Chicago, Burlington and Quincy, the Chicago, Milwaukee and Saint Paul, and other railroads. The surrounding country is agricultural and has extensive forests of hard-wood timber. Among the noteworthy buildings are the public library, the Federal building, the courthouse, the city hall, and the high school. It has an asylum for the insane, a marine hospital, and two fine parks. The manufactures include woodenware, flour, farming machinery, cigars, spirituous beverages, clothing, ironware, and lumber. The trade in grain and lumber is extensive. It has systems of waterworks, sewerage, and street pavements. The first settlement was made in 1841 and it was incorporated in 1856. Population, 1910, 30,417.

**LACROSSE** (là-krôs'), a game at ball which was originated among the Indians of North America. It is played similarly to football, differing from the latter in that the players endeavor to carry or throw the ball to their opponents' goal on a peculiar bat called *crosse*. The bat consists of a long staff, covered at the end, and has a network which reaches about halfway, becoming narrower as it approaches the hand. In lacrosse, as played at present, the *crosse* is five or six feet long and the widest part does not exceed one foot. The field is 125 yards long, at each end of which are two goals, which are surrounded by lines called the *crease*, drawn six feet outside the posts. Each of the two sides has twelve players. In 1867 the National Lacrosse Association of Canada was organized and the game has been steadily gaining in popularity. It is now classed among the international games.

**LACTEALS** (lăk'tê-ălz), the fine lymphatic tubes that take up fat from the intestines, so named in 1622 from their discoverer, Gasparo Aselli (1580-1626). They commence in the intestines, enter the mesenteric glands, and later unite to form large tubes, which terminate in the thoracic duct. During digestion they can be seen as milky lines across the mesentery. After a full meal, they convey a fluid which is milky in appearance, called *chyle*, and during intervals of fasting convey a yellowish lymph.

**LACTIC ACID** (lăk'tik), a product of the decomposition of sugar in solution, induced by

the presence of certain albuminous ferments. It is formed in milk when it turns sour, hence is found in buttermilk. The change of sweet to sour milk is called the *lactic fermentation*, and lactic acid is a product of this change. Scheele originally discovered this acid in sour milk, whence he named it lactic, but it is also obtained from the juices of many vegetables and from the fluids of the stomach and flesh of animals. The salts formed by this acid with bases are called *lactates*. The only one of importance is the lactate of iron, which is employed extensively as a tonic and a stimulant.

**LACTOMETER** (lăk-tôm'ê-têr), or **Galactometer**, an instrument to ascertain the comparative specific gravity and value of different samples of milk. It is a special form of the hydrometer, but a variety of these instruments has been originated. The one in common use consists of a glass tube, about twelve inches long, and is graduated into one hundred parts. The instrument is filled with fresh milk, and, after the cream has been fully separated by churning, the value is determined according to the graduated scale, depending upon the space occupied by the cream.

**LADOGA** (là'dô-gà), an extensive lake of northern Russia, situated northeast of Saint Petersburg. It is the largest inland lake of Europe. The length is 128 miles; breadth, 78 miles; and area, 7,115 square miles. Into it flow the waters from Lakes Ilmen, Onega, and Saima. It contains a number of rocky islands, the most important being Konevetz and Valaam, the two having an area of about 215 square miles. The lake is important on account of its fisheries, navigation facilities, and connection by several canals. Its discharge is by the Neva River into the Gulf of Finland.

**LADRONES** (là-drōnz'), or **Mariana Islands**, a group of islands situated in the Pacific Ocean, east of the Philippines and north of the Carolines. The group includes sixteen separate islands, of which Rota, Tinian, Saipán, and Guam are the most important. The area of the entire group is 418 square miles. They were discovered by Magellan in 1521 and were in the possession of Spain up to 1898, when Guam was ceded to the United States and the remainder of the Ladrões, together with the Caroline and Pelew groups, were sold to Germany in 1899 for \$4,875,000. At the time of their discovery they had a population of 60,000. However, at present the entire population is only about 10,500, of which the principal portion is on the island of Guam. The inhabitants were originally Chamorros, but are now constituted largely of Tagalas. The latter are allied to the Tagals who



constitute the chief inhabitants of Luzón. Properly the Ladrone Islands are divided into two groups, the northern of which is actively volcanic, while the southern group contains a greater area of fertile soil, though both have timber and tillable land. Agriculture and commerce are the principal industries, but neither is important. The climate is cooler than that of the Philippines and is quite healthful.

**LADYBIRD**, a class of small insects or beetles found commonly on plants and trees. They are noted for their various colors, such as yellow, red, and black and white variegated. The body is spherical and flat at the lower surface, and the legs and head are small. All of the many species are of utility in destroying plant lice. The eggs are laid on the under side of leaves. While both the larvae and the adults feed on plant lice, they also deprive vegetation of some of its juices.

**LADYSMITH** (lā'dī-smīth), a town of South Africa, in Natal, eighty miles northwest of Pietermaritzburg. It is important as a railway junction, being on lines that enter the Transvaal and Orange River colonies, and has a growing trade in live stock, cereals, and merchandise. The British made it a depot for military stores and supplies prior to the Anglo-Boer War. General White was besieged here from

November, 1899, until Feb. 28, 1900, when he was relieved by Lord Dundonald. Population, 1908, 3,150.

**LADY'S SLIPPER**, a genus of beautiful orchids native to the northern latitudes. Ten species are found in

North America. The pink lady's slipper and the showy lady's slipper are well known, the latter being about two feet high. The roots of the yellow lady's slipper yield medicine of value in cases of nervous affection. Most species bear beautiful flowers, which have a lip about two inches long, this being beautifully veined with rose purple.

**LAFAYETTE** (lā-fā-ēt'), a city in Indiana, county seat of Tippecanoe County, on the Wa-

bash River, sixty miles northwest of Indianapolis. It is on the Wabash, the Cleveland, Cincinnati, Chicago and Saint Louis, and other railroads. The surrounding country is agricultural and dairying. Among the chief buildings are the county courthouse, the public library, the high school, the Saint Elizabeth Hospital, and Purdue University. It has well-paved streets, electric street railways, gas and electric lights, and systems of sewerage and waterworks. The manufactures embrace carpets, safes, knit goods, flour, carriages, machinery, bicycles, and cooper products. Lafayette has an important jobbing trade and is a grain and live-stock market. It is located on the site of an old fort which was built by the French in 1720 and surrendered to the British in 1760. The first permanent settlement was made in 1820, when it was named in honor of General Lafayette, and was incorporated in 1854. Population, 1910, 20,081.

**LAFAYETTE COLLEGE**, an educational institution at Easton, Pa. It was chartered in 1826 and formally opened in 1832. In 1850 it passed under the control of the Presbyterian church. The departments include those of science, chemistry, language, philosophy, art, and engineering. It has a library of 30,000 volumes and property valued at \$1,250,000. The attendance averages 450 students.

**LAGOON** (lā-gōon'); a shallow lake connected with the sea or a river. Lagoons are of frequent occurrence, especially in Italy, Holland, and South America. In the summer time they frequently dry up or become stagnant pools. The term is applied to small ponds in some sections of the country, though chiefly in the western part of the United States.

**LAGOS** (lā'gōs), a city of Mexico, in the state of Jalisco, connected with the capital by the Mexican Central Railroad. The surrounding country contains extensive deposits of iron ore and opal. It has a large jobbing trade and extensive interests in smelting. In 1817 it was the scene of a battle between the Mexicans and Spaniards. Population, 1906, 14,048.

**LAGOS**, a British possession on the western coast of Africa, about 150 miles east of the Gold Coast and near the Bay of Benin. The colony has an area of 3,460 square miles, but to it is attached a protectorate of 28,350 square miles. Lagos, the chief town, is situated on an island of the same name, which has an area of about four square miles. It has exports of cotton, gum, palm kernels, and copal, and imports of tobacco, hardware, cotton goods, and machinery. The district was acquired by Great Britain in 1861, when it was governed from the Gold Coast, but an independent government was established



LADY'S SLIPPER.



for it in 1886. In 1901 it was made a colony. Population, 1906, 2,500,000.

**LA GUAYRA** (lá gwí'rá), a city of Venezuela, the principal seaport of that country, five miles from Caracas. It is situated on a narrow strip of land along the coast and is important for its harbor and railway connections. Among the structures of interest are two hospitals, a cathedral, and a statue of Vargas, a physician and native of La Guayra. The trade consists chiefly in coffee, hides, cocoa, and live stock. It was founded in 1588 and was blockaded by an English and German fleet in 1903, pending the adjustment of some claims against the government of Venezuela. Population, 1907, 9,125.

**LAHORE** (lä-hör'), a city of India, capital of the Punjab, on the Ravi River. It is connected by important railroads with many other trade emporiums. The older part of the city includes 640 acres and is surrounded by brick walls sixteen feet high. The walls are pierced by thirteen gates. Outside of these walls are the newer parts of the city. The streets in the older part are tortuous, narrow, and poorly graded. It has few modern improvements. Among the principal buildings are the fort, which occupies a prominent position, and the Punjab University, one of the most noted educational institutions of India. Other institutions are the Law School, Oriental College, Mayo Hospital, Medical School, and Roberts Institute. The Mongol Empire had its seat of government at Lahore, beginning with 1524, and during that period the city attained its greatest prosperity. It became the capital of the Sikhs in 1799, and in 1849 was made the capital of the Punjab. The inhabitants consist largely of Mohammedans, who maintain many fine mosques and several seminaries. It has an extensive trade in live stock, cereals, and manufactures. Population, 1906, 205,694.

**LAKE**, a sheet or body of water wholly surrounded by land, differing from a pond or lagoon in being deeper and larger. Lakes are very numerous in large bodies of land where rainfall is considerable, as in the equatorial region of Africa, the northern part of the United States, and the central part of Canada. The greater number of lakes receive and discharge streams of water, hence the water retained within their depressions is fresh. In many warm and dry regions the lakes have no visible outlet, hence the water is saline or salty, such as the Caspian Sea and the Great Salt Lake. Some lakes are fed almost entirely by springs. This class receive no inflow from streams and the outflow, though constant in most cases, is not materially large. Some small lakes receive no inflow and have no

outlet, the rainfall within the basin being practically equal to the evaporation. Lakes are important in that they supply a water surface for evaporation, thus affecting the rainfall. Some are highly valuable in their fisheries and as avenues for transportation.

**LAKE CHARLES**, a city in Louisiana, capital of Calcasieu Parish, on the Calcasieu River. It is on the Kansas City Southern, the Southern Pacific, and other railroads, and is surrounded by a fertile cereal and fruit-growing region. The city has a fine site on Lake Charles and is popular as a winter residence for people from the North. Among the noteworthy buildings are the Carnegie library, the county courthouse, the high school, and Arcadia College. It has manufactures of sugar, cigars, railroad cars, lumber products, and machinery. The city has electric lights, waterworks, and finely paved streets. It was settled in 1850 and incorporated in 1860. Population, 1900, 6,680; in 1910, 11,449.

**LAKE CITY**, a town of Florida, county seat of Columbia County, sixty miles west of Jacksonville. It is on the Seaboard Air Line, the Atlantic Coast Line, and other railroads, and is surrounded by a cotton-growing district. The manufactures include turpentine, cigars, phosphates, and lumber products. It is the seat of the State Agricultural College, has electric lighting, and contains several fine school and church buildings. In 1901 it received a new charter as a city. Population, 1905, 6,509; in 1910, 5,032.

**LAKE DISTRICT**, a region of England, embracing a portion of Cumberland, Westmoreland, and Lancaster counties, in which sixteen small lakes are situated. The region is a favorite resort for tourists, and has suggested many poetical gems to different writers of eminence. Coleridge, Southey, and Wordsworth, besides many others, took up their residence in the Lake Region, and became known as the "Lake School Poets," a name suggested by the *Edinburgh Review*.

**LAKE DWELLINGS**, the habitations built by ancient peoples on small artificial islands in lakes, or on piles in the shallow margins of lakes. These dwellings were mentioned by Herodotus, who described a Thracian tribe living in the year 520 B. C., in a small mountain lake of what now is included in Rumelia. The custom of constructing buildings of this character prevailed in Europe through many centuries. Among the best evidences of such structures are those found in Switzerland in 1854, which form the theme of a historic work by Dr. Keller, of Zurich, entitled "Lake Dwellings of Switzerland and Other Parts of Europe." Remains of this kind have been found in many lakes of Switzer-



land, but particularly in Lake Zurich, when the waters of that body materially receded during a drought. Similar remains of lake dwellings were discovered in Ireland in 1839, and, like those of Switzerland, contained specimens of earthenware, weapons of bronze, hatchets, ornaments of bone and minerals, implements of war, and coins containing Roman and Gaulish impressions.

The lake dwellings belong most commonly to the iron age, many of the shields, bridle bits, and implements found being made of iron. The dwellings described by Herodotus were approached by a narrow bridge and in the floor of each dwelling was a trapdoor whereby fishing from the domicile was facilitated. It is asserted that the fish were lured by feeding. Many of the remains throw light on prehistoric man and give evidence that pile buildings were used extensively for many centuries. It is noteworthy that lake dwellings still exist among barbarous tribes, being found in portions of the Caroline Islands, the Malay Archipelago, and New Zealand. In Lake Maracaybo, Venezuela, and in various parts of Russia lake dwellings are occupied by semicivilized people. Others occur in Central Africa, where they are occupied for convenience in fishing and as a means of defense against wild animals and savages.

**LAKE MALAR** (mä'lär), or **Maelar**, the largest lake of Sweden, situated immediately west of Stockholm. It is seventy miles long and from two to twenty miles wide. The surface is nearly level with the Baltic Sea, into which it discharges by several channels. It is noted for its navigation facilities and fisheries. Many castles adorn its shores. It contains about 1,200 islands, most of which are wooded.

**LAKE OF THE THOUSAND ISLANDS**, the name applied to an expansion of the Saint Lawrence River, extending from Lake Ontario about forty miles down the river. It contains about 1,750 islands. Wolf Island is the largest, being about twenty miles long and seven miles wide.

**LAKE OF THE WOODS**, a lake of North America, bounded by Minnesota, Manitoba, and Ontario, 190 miles northwest of Lake Superior. It contains a number of wooded islands, is about 65 miles long, and receives the water of Rainy River. The outlet is through the Winnipeg River, by which it is connected with Lake Winnipeg.

**LAKES, The Great**, five great fresh-water bodies of North America. They include lakes Superior, Huron, Michigan, Erie, and Ontario, of which the first named is the largest fresh-water lake in the world. The five lakes are connected with each other, the overflow being dis-

charged naturally by the Saint Lawrence River into the Gulf of Saint Lawrence. However, a portion of the outflow is now carried to the Mississippi through the Chicago Drainage Canal. Lake Michigan is wholly within the United States, and the other four form a portion of the natural boundary between that country and Canada. These lakes are of vast importance in the commerce of the two countries and are valuable for their fisheries. Chicago, the largest inland city of the world, is at the head of Lake Michigan. Other large cities on their shores include Buffalo, Cleveland, Detroit, Duluth, Milwaukee, Toledo, and Toronto. Following is a comparative table relative to size and elevation:

NAME.	AREA, SQUARE MILES.	ELEVATION ABOVE SEA LEVEL
Ontario.....	7,240	247
Erie.....	9,600	573
Michigan.....	22,450	581
Huron.....	21,000	578
Superior.....	31,200	602

**LAMAISM** (lä'mä-iz'm), the prevailing religion of Tibet and Mongolia, constituting a branch of Buddhism. It is so named from the lamas or priests, and was introduced in Tibet about the 7th century A. D. Buddha, who is considered the founder and the highest among the saints, is the chief object of worship. Lamaism is partly political, especially in Tibet, where the religious system is united with the temporal sovereignty of the country. Though the political authority is confined to Tibet itself, the chief official of the church, known as the *Dalai Lama*, is the acknowledged head of Lamaism. Adherents to this faith are quite numerous in Japan, China, and various parts of India. See **Buddhism**.

**LAMBAYEQUE** (läm-bä-yä'kä), a town in Peru, capital of the department of Lambayeque, six miles from the Pacific Ocean. It is surrounded by an agricultural country and has a considerable trade in tobacco, sugar, and cereals. The manufactures include clothing, boots and shoes, and cotton and woolen textiles. Population, 1906, 8,140.

**LAMBERTVILLE**, a city of New Jersey, in Hunterdon County, on the Delaware River, fifteen miles northwest of Trenton. It is on the Delaware and Raritan Canal and the Pennsylvania Railroad, and is connected by a bridge with Newhope, Pa. The manufactures include paper, rubber goods, flour, hardware, and machinery. It has electric lighting, waterworks, and a public library. The place was first incorporated in 1849. Population, 1905, 5,016.

**LAMENTATIONS** (läm-än-tä'shünz), **Book of**, a book of the Old Testament, written



by the prophet Jeremiah. -It treats of the destruction of Jerusalem, which it laments with much feeling, especially because the catastrophe was brought on by the sins of the Hebrews. The style of writing is poetic and the first five chapters are arranged in verses to correspond to the letters in the Hebrew alphabet, which circumstance has led some critics to believe that the fifth and last chapter may have been written by some contemporary of Jeremiah, instead of by the prophet himself.

**LAMMERGEIER** (läm'mër-gī-ër), meaning, in German, lamb vulture, the largest bird of prey native to Europe. The nativity of this vul-



LAMMERGEIER.

ture is in the lofty mountains of the southern part of Europe and Asia and the northern part of Africa. It forms a connecting link between the true vultures and eagles, measures ten feet between extended wings, and is from four to five feet long from the beak to the tail. The lammergeier feeds on both carrion and living prey, including such animals as kids, lambs,

chamois, and hares, which it carries to great heights in the mountains. It utilizes the bones of animals as a food by dropping them upon rocks from vast elevations, thereby breaking them into pieces suitable to be swallowed.

**LAMP**, a device employed for producing artificial light. The term is applied to vessels containing an inflammable liquid and a wick through which the liquid ascends by capillary attraction to feed the flame at the top, and likewise to any other contrivance for producing artificial light. In early times lamps were vessels of rude pottery or even the shells or skulls of animals, but later they were made of metal, glass, or porcelain, and became articles of ornament as well as utility. The substances used to produce light included fish oils and animal fats, but later vegetable oils, such as rape, were introduced. The flat wick was invented in 1783 and the round wick in 1784, the latter being known as the Argand wick from its inventor, Aimé Argand (1755-1803), a Swiss chemist.

The discovery of mineral oils and their preparation in the form of gasoline, kerosene, paraffin, petroleum, and crystal oil made it necessary to introduce oxygen into the burner in order that the carbon contents might be consumed properly. A lamp supplying this requirement was first made by the inventor Stob Wasser in Berlin, Germany, and the chimney of mica, porcelain, or glass was constructed to increase the draught and protect the flame of the lamp. This arrangement causes a powerful draught to be created, by which the flame is kept uniform, and there is a constant consumption of the gas that generates from the oil being heated. At present there are many kinds of lamps, including those known as gas, oil, and safety lamps and lanterns. Many lamps have come into use for electric lighting, such as the arc, flaming arc, and incandescent lamps. The wicks used in oil lamps are either single flat wicks, round wicks, or double wicks. *Lanterns* are either portable or fixed. They are used chiefly for lighting outdoors.

**LAMPBLACK**, the soot or carbon deposit obtained by the imperfect combustion of petroleum, tar, resin, and other substances containing carbon. In burning the substances for lampblack it is necessary to shut out the free flow of oxygen, when the flame becomes smoky and the soot may be accumulated on suspended surfaces. Lampblack is useful in the manufacture of printing inks, shoe blacking, and paint. The effect of it is to produce the various shades of brown or black. In preparing lampblack for printing it is commonly mixed with linseed oil. It is prepared for use in painting by adding linseed oil and white lead.



**LAMPREY** (lăm'prÿ), a genus of animals which occupy a place between the eel and fish, differing from the true fish in that they do not possess scales, paired fins, or jaws. In appearance they are eel-like, attain a length of nearly three feet, and have a mouth in the form of a sucker. Most species have a greenish-brown color. They inhabit both fresh and salt water bodies, occurring in the North and South Temperate zones, and feed on larvae and worms. They frequently attach themselves by the mouth to other fish to suck the blood. The fresh-water lamprey is smaller than the marine, but both have been used as food for many centuries, and are caught by traps baited with flesh or worms.

**LANCASTER** (lăn'käs-tēr), a city of England, capital of Lancashire, 45 miles northeast of Liverpool. It has a fine location on the Lune River and is connected by railway with Glasson Dock, its port five miles southwest. The manufactures include pottery, ironware, leather, cotton and woolen textiles, and clothing. It has a large market, slaughterhouses, public baths, electric lighting, and several technical schools. King John granted the first charter to Lancaster in 1193. Population, 1907, 43,308.

**LANCASTER**, a city in Ohio, county seat of Fairfield County, on the Hocking River and the Hocking Canal, thirty miles southeast of Columbus. It is on the Hocking Valley and the Cincinnati Valley railroads. The surrounding country is agricultural and produces coal and natural gas. Among the chief buildings are the county courthouse, the high school, the city hall, and the State industrial school for boys. The manufactured products embrace flour, woolen goods, shoes, agricultural implements, and machinery. The place was settled in 1800 and incorporated in 1831. It is the birthplace of General Sherman and John Sherman. Population, 1900, 8,991; in 1910, 13,093.

**LANCASTER**, a city in Pennsylvania, county seat of Lancaster County, on the Conestoga River, 35 miles southeast of Harrisburg. It is on the Pennsylvania and the Philadelphia and Reading railroads and has a network of electric railway lines. Besides other educational institutions, it contains Franklin and Marshall College, an institution for the higher education of men controlled by the German Reformed Church. This institution has a fine faculty of instructors, 400 students, and a library of 34,000 volumes. The noteworthy buildings include the county courthouse, a State normal school (at Millersville), the public library, the Saint Joseph's Hospital, the Stevens's Home, and many schools and churches. It has manufactures of paper, machinery, spirituous liquors, cotton and

woolen goods, leather, ironware, and caramel products. It was settled in 1718, when it was known as Hickory Town, and was incorporated in 1742. The Continental Congress met at Lancaster in 1777, while the British were occupying Philadelphia, and it was the capital of the State from 1779 to 1812. Population, 1910, 47,227.

**LANCASTER, House of**, a dynasty founded in England in the reign of Edward III. Blanche, daughter of Edward III., married John of Gaunt, and a royal charter settled the duchy upon him and his heirs. Henry IV., son of John of Gaunt, born in 1367, was the first king of the house of Lancaster. His son, Henry V., succeeded him on April 10, 1413, and with the death of Henry VI., son of Henry V., ended the dynasty, which occurred May 22, 1471, though Henry VI. reigned only until 1461. See **England**.

**LANCASTER SOUND**, a channel of North America, located between North Devon and Cockburn Island. It connects Baffin Bay with Barrow Strait. This channel was discovered by Baffin in 1616. It is about 65 miles wide and 248 miles long.

**LANCE**, a weapon for thrusting, designed to be used in the hand. It was used extensively by the knights of the Middle Ages, who employed it only when mounted, some of these weapons being twenty feet long. The modern lance is shorter, usually from ten to twelve feet, but the blade of steel, which is fitted on a handle of hollow steel or tough wood, is not more than a foot in length. Napoleon maintained several regiments of lancers, but the Russian Cossacks have the highest reputation for using this weapon, although it is now replaced in part by the saber. The German Uhlans carry the lance in addition to the carbine and saber. The use of modern firearms has displaced the lance to a large extent.

**LANCELET** (lâns'lët), a peculiar fish found in the temperate and tropical seas. The body is lance-shaped, slender, compressed, and transparent. It has no true jaws or skull, has colorless blood, and moves with considerable activity. Breathing takes place by admitting water through the mouth. The common lancelet is about two inches long. Six distinct species have been studied, including the wolf fish and the handsaw fish of the Pacific.

**LAN-CHOW** (lăn-chou'), or **Lanchau**, a city of China, capital of the province of Kan-su, on the Hoang-ho River. The streets are well paved, but the buildings are chiefly of adobe brick and wood. Among the manufactures are gunpowder, fireworks, and camel's-hair goods. It has considerable trade in grain, tea, vegeta-



bles, and silk textiles. Its commercial advantages are due to transportation on the Hoangho River and its location at the converging routes of trade with Tibet and Turkestan. Population, 1908, 500,000.

**LAND CRAB**, the name of many species of crabs that live on the land after they reach a mature state. The species are very numerous, but all of them are native to the warm countries. They are gilled animals, but breathe air in the adult stage. In general respects they resemble the aquatic crabs. Their food consists largely of the tender parts of plants. In some localities they do injury to cultivated plants, especially sugar cane. The natives of the West Indies consider the mountain crab, which lives largely in the woods and hills, a good article of food. Land crabs are abundant in Ceylon, many parts of India, and the West Indies.

**LANDGRAVE** (*länd'grāv*), or **Landgraf**, the title assumed by certain officers of Germany in the 12th century. It was frequently used in the simple form of *graf*. Sometimes it was preceded by certain words to indicate rank, such as *markgraf*, *burggraf*, and *landgraf*, meaning, respectively, marquis, burgrave, and landgrave. The whole empire of Charles the Great was divided into *graf* districts or counties, each presided over by a *graf*. Some of the princes likewise assumed the title at an early date, such as the landgraves of Thuringia and Lower Alsace.

**LAND LEAGUE**, an organization formed by Michael Davitt under a plan formulated by Parnell in 1879 by which land in Ireland was to be purchased for the Irish tenants. Funds for this purpose were subscribed largely in America, but the movement was suppressed in 1881. Subsequently the National League, a political and agrarian organization, was formed for the purpose of bettering the condition of Irish tenants and advocating home rule for Ireland. The measures advocated by this organization were at least in part met by the Land Purchase Act of 1903, as amended in 1905 and 1907, under which many holdings were purchased by the actual occupants.

**LANDSCAPE**, a tract of country, so called with reference to its appearance to the eye from some point of vantage. The term likewise has reference to what may be seen of nature in general, including the country with its groves and streams, as viewed in connection with a portion of the sky. In painting the term is applied to a picture that represents natural scenery, which may or may not include men and animals, though if any animate objects are shown they must appear as subsidiary. Landscape painting is comparatively more recent than that of figure

subjects, though a celebrated school of this class became renowned in China as early as the 12th century A. D. The development of this kind of painting did not gain importance in Europe until the 17th century, when Ruysdael and other Dutch painters gave the system of painting landscapes a notable impetus. Lessing of Germany and Innes of the United States are representatives of distinct schools of landscape painting, the former of the so-called Düsseldorf School and the latter of the Hudson River School.

**LANDSCAPE GARDENING**, the art of laying out grounds so as to produce pleasing effects. It is concerned in arranging drives and walks, planting grass and flowers, constructing bridges and buildings, and setting shrubs and trees that the whole will form a harmonious combination and lend beauty to a lawn or park. This art has been practiced from times immemorable, and many references are made in history to the groves and villas provided by the ancients. However, landscape gardeners who make this work their exclusive business were not commonly employed until in the 19th century. At present many private lawns and parks, as well as public grounds in cities and those surrounding public buildings, are laid out with great care. Shrubs and trees are planted with the view of giving the most pleasing effects, viewed either at close range or from a distance, and various water courses, fountains, and artificial lakes are introduced.

**LAND'S END**, the most southwesterly cape of England, directly opposite Scilly Isles. About a mile west of Land's End are the Longships Rocks, on which a modern lighthouse is situated.

**LANDSLIDE**, or **Landslip**, the settling down of a considerable portion of earth from a higher to a lower level, which is frequently the cause of damage to life and property. Landslides are caused by the action of water undermining the banks, which fall by decay of supporting strata, and sometimes as a result of slight earthquake disturbances. In many instances traffic on railroads has been delayed and in other cases entire villages were buried. A landslip occurred on the Isle of Portland in 1760, in which a tract equal to an area of a mile and a quarter suddenly spread over the lower level. Other instances include a landslide at Rossberg, Switzerland, in 1806; at Glarus, Switzerland, in 1881; and at Zug, Switzerland, in 1887. Another noted landslide occurred in the Himalayas at Naini Tal in 1880, when about 230 persons were killed.

**LANDSTURM** (*länt'stöorm*), a term applied in Germany to the local militia, which is utilized



only in case of actual invasion, and is constituted of men who are too old for the landwehr. This system has been adopted in many countries, notably in Austria, Greece, and Japan.

**LANDWEHR** (länt'vār), the military force of Germany, Austria, and other nations of Europe. It is called out only for occasional training in time of peace, but in war it takes its place in the regular army of defense and offense. The landwehr differs from a militia in that all landwehr soldiers have previous military training. In Germany this system is thoroughly developed. There the landwehr constitutes a powerful organization, and supplements the regular forces without material expense.

**LANGUAGES**, the aggregate of those articulate sounds, called words, that are used to express perception and thought, and which are accepted by and current among the different communities. At present more than 1,000 different languages are spoken. They are more or less closely allied to each other, but differ to such an extent that people of different classes cannot successfully communicate with each other by means of speech. The tongues that are allied, but still differing from the principal languages, include many thousands. Some ancient writers think that language was originally revealed from heaven and that the form was Hebrew. These writers assume that all other languages originated from the Hebrew, but others think that Hebrew, Chaldee, and Arabic are only dialects of the original tongue.

Many scholars, among them Horace, Lucretius, and Cicero, expressed the view that language is of human invention, and that the sounds and words uttered by the primitive peoples under a process of evolution extended into the first languages. From the beginning accessions were made as education and discovery provided new requirements, such as still occur at the discovery of every new principle and the invention of new devices. This constant addition is exemplified in those that resulted after the invention of the telephone, telegraph, and improvement in electrical machinery, all of which added hundreds of words to the languages of civilized nations. Besides, it is evident that the more advanced the educational arts of a people, and the higher their civilization, the greater becomes the need for an extensive vocabulary and enlarged lexicons.

The three general groups of modern languages include the Chinese; those derived from the Aryan, or Indo-Germanic; and the Semitic. The *Chinese language* has many dialects. Its origin is unknown. That it existed for many centuries is apparent, being spoken as far back

as any traces of Chinese history extend, and to-day it is the most widely used of all the languages. The *Aryan*, or *Indo-Germanic*, group of languages, is the most important in that it embraces the language of the best literature and of the most cultured nations of the world. It is classed in seven great branches: The Hindu or Indian, Iranian or Persian, Greek, Italic, Celtic, Slavonic, and Germanic. Each of these has many subdivisions; thus, the Germanic branch includes the German, English, Scandinavian, and Icelandic branches. The German language is an outgrowth of the Old Germanic, when it included the Gothic, Lombardic, Saxon, and many other dialects. The English language is principally an outgrowth of the German, but many words have been added from the Latin, French, etc. Besides, many original terms have been incorporated with it. The *Semitic* family of languages is next in importance to the Aryan group. It embraces the Arabic, Syrian, Assyrian, Babylonian, and Canaanitish dialects, and includes the more important Hebrew and Phoenician.

It is difficult to give an accurate statement of the exact number of people speaking the different languages for the reason that in some countries the dialects are mixed greatly and are changing constantly with various effects. It is reasonably certain that the Chinese is spoken by 410,000,000 people, while the Japanese is spoken by 50,000,000. The principal classes of the Aryan or Indo-Germanic group of languages are spoken in practically the following order: Hindu, 200,000,000; English, 118,000,000; German, 115,000,000; Russian, 112,000,000; French, 50,000,000; Spanish, 50,000,000; and Italian, 35,000,000. See **Aryan**.

**LANSING** (läns'ing), a city and the capital of Michigan, county seat of Ingham County, on the Grand River, 88 miles northwest of Detroit. It is on the Michigan Central, the Grand Trunk, the Père Marquette, and the Lake Shore and Michigan Southern railroads. The noteworthy buildings include the State capitol, the county courthouse, the high school, the public library, the city hall, the Michigan School for the Blind, and the State College of Agriculture, the last named having 1,200 students and a library of 35,000 volumes. An abundance of water power for manufacturing is obtained from the Grand River, which has a fall of eighteen feet. The surrounding country produces coal and timber and is noted for its fertility. Among the manufactures are condensed milk, flour, stoves, wagons, pressed stone, steam engines, and machinery. It has extensive systems of waterworks, sewerage, pavements, and electric street railways. The place was settled in 1837, became the cap-



ital in 1847, and was incorporated in 1859. Population, 1904, 20,276; in 1910, 31,229.

**LANSINGBURG**, a former village of Rensselaer County, New York, on the Hudson River, annexed to Troy in 1901. A substantial bridge across the Hudson connects it with Cohoes and Waterford. It was founded by Abraham J. Lansing in 1771. Population, 1900, 12,595.

**LANTERN FLY**, an insect which is allied to the cicadas. The genus includes about twenty species, some of which are widely distributed in the tropical regions of both hemispheres. Many are large and highly colored. Some are remarkable because of the forehead being formed in the semblance of a bag. Most of the species are about three inches long and five inches across the wings. They move about most commonly during sunshine and feed on herbs and grasses.

**LAODICEA** (lâ-öd-i-sē'â), the name of several ancient cities of Asia Minor, the most important of which was situated near the Lycos River in Phrygia. It was founded by Antiochus Theos and named after his queen Laodice. As a center of philosophy, art, and science it took high rank and became the seat of two important ecclesiastical councils, one in 363 A. D. and the other in 476. Its importance in the primitive history of Christianity is accounted for by the large number of Jews that settled there at the beginning of the Christian era. It is now entirely in ruins and is known as Eski-Hissar.

**LAOS** (lä'ōs), or **Laotians**, a distinct class of Mongolians who occupy the northeastern portion of Siam, regarded the original Siamese race. Formerly they constituted a powerful kingdom, but in 1828 were conquered by the Siamese, and since then have been subject to them. The Laos are divided into two main divisions, the so-called White Paunch and the Black Paunch. The two branches occupy different regions, but they are related more or less closely and agree in the support of Buddhism and in their semicivilized government. They are peaceable, industrious, and fond of music. These people engage chiefly in fishing, rice and vegetable culture, and poultry and stock raising. They have schools, temples, and fixed homes. Their total number is about 1,500,000. The region occupied by the Laos, known as Laos, has an area of 116,000 square miles. Since 1893 it has been a French protectorate.

**LA PAZ** (lä páz'), a Mexican town and seaport, situated in Lower California, capital of the state of Baja. The harbor on La Paz Bay is commodious. It has a large trade in pearlfish and minerals. In its vicinity are extensive stock ranches and orchards. Population, 1906, 7,044.

**LA PAZ**, a city of Bolivia, capital of a de-

partment of the same name, on the Chuquiaqu River. It is thirty miles southeast of Lake Titicaca, in a fertile valley, and has an elevation of 11,950 feet above sea level. The city contains some excellent buildings, has a public school system, and is the seat of a seminary, college, medical school, cathedral, and university. It is the residence of a bishop and has a number of convents. It has an extensive trade in alpaca wool, tobacco, copper, lumber, gold, and silver. The manufactures include textiles, furniture, machinery, clothing, and vehicles. The inhabitants consist largely of mixed races and Aymara Indians. Population, 1906, 67,235.

**LAPIDARY** (läp'ĩ-dâ-rÿ), one skilled in the art of working in stones, especially precious stones. The lapidary art was developed by the ancients. Remains of stone implements found in cave dwellings and other habitations are among the earliest examples of the art. Assyrian workmen invented the drill for penetrating hard substances prior to the year 760 B. C. Beautiful specimens of seals and engraved rings made by the Greeks as early as 600 B. C. attest their advancement along this line. It is thought that the Hindus and Chinese were acquainted with the cutting, engraving, and polishing of small stones very early in history, but the art was not developed as it applies to diamond cutting in Europe until 1475, when Charles the Bold of Burgundy had the first expensive diamond prepared in Europe. Formerly this class of work was done by hand, when it was effected by the powder of a harder stone being rubbed against a softer one, but subsequently different tools were adapted to machine use. The machinery consists of very accurate appliances. In the process three stages are necessary: cutting or slicing, grinding, and polishing. The cutting is done to prepare the general outline of the product desired; the grinding, to bring it to its proper form and shape; and the polishing, to give it a beautiful surface finishing. Formerly polishing was done by a pewter with stone coating, but at present it is effected with a wheel covered with some substance suitable for polishing, such as walrus hide. The kind of tools used depends entirely upon the stone to be treated.

**LAPIS LAZULI** (lä'pĩs läz'û-lĩ), or **Armenian Stone**, a rich blue mixture of minerals, of which the principal component is lazurite. It was employed largely by the ancients for decorative purposes. It occurs principally in crystalline limestone in North and South America, Thibet, Russia, China, and many other countries. When powdered, it constitutes a durable blue paint called *ultramarine*, which was employed formerly to some extent, but it has been replaced



by an artificial preparation of similar composition that is equal in color and durability, and is now used extensively in the arts. Imitations of lapis lazuli are made of bone ashes colored with oxide of cobalt.

**LAPLAND** (läp'land), a large section of Northwestern Europe, the nativity of the Lapps, comprising an area of about 95,000 square miles. It is bounded on the west by the Atlantic, on the north and east by the Arctic, and on the south by the White Sea and by about the parallel of 66° north latitude. The region belongs partly to Russia, Sweden, and Norway. In the western portion it is quite mountainous, but in the eastern part is a plain with numerous rivers and lakes. The two seasons are designated as day and night, the night season being nine months and extremely cold, while the day season is three months of continuous day, of which about six weeks are quite warm and pleasant. Vegetation consists largely of mosses and small timber, including birch, fir, and pine. Few domestic animals are reared, aside from reindeers and dogs. Hunting and fishing are the principal occupations, though there are some developments in the culture of reindeer, vegetables, fodder, and rude manufacture. The lakes and coastal waters are rich in fish, particularly the White Sea and lakes Kuto, Kano, Enara, and Imandra.

The Lapps are classed as Turanians, belonging to the Finnic branch. They are small in stature, have a flat nose, high cheek bones, and a scanty beard. Most of these people are muscular and have red hair. The life of many is nomadic in the summer season, when they hunt and fish, laying by a portion of the necessary supply for winter. Nearly all the Scandinavian Lapps are Lutheran, while those of Russia affiliate with the Greek Church. So far as known they were subject to the Norsemen up to the 12th century, since which time they were conquered by and alternately subject to Norway, Russia, and Sweden. The nomadic tribes speak a variety of dialects. All have shown a marked obedience to their government. The total number of Lapps is 30,408, of which about half are in Russia.

**LA PLATA** (lä plä'tà), a city of Argentina, capital of the state of Buenos Ayres, 32 miles southeast of the city of Buenos Ayres. It is the converging center of several railroads and electric railways. The streets are regular and well paved with brick and stone. Among the noteworthy buildings are the public library, the capitol, the courthouse, the union railway station, splendid churches, an observatory, a college, and a museum. The manufactures embrace cotton

and woolen goods, machinery, clothing, furniture, ironware, soap, tobacco, leather goods, and utensils. A canal connects the city with its harbor, Ensenada, on the La Plata River. La Plata was founded in 1882 and owes its rapid growth to the large trade and various manufacturing enterprises. Population, 1906, 81,402.

**LA PLATA, Rio de.** See **Plata, Río de la.**

**LAPORTE** (lä-pört'), a city in Indiana, county seat of Laporte County, 12 miles from Lake Michigan and 58 miles from Chicago, Ill. It is on the Père Marquette, the Lake Erie and Western, and the Lake Shore and Michigan Southern railroads. The chief buildings include the county courthouse, the high school, the public library, and a number of fine churches. Among the manufactures are flour, carriages, engines, woolen goods, cigars, clothing, and machinery. It has well-graded streets, sewerage, and waterworks. The place was settled in 1830 and incorporated in 1832. Population, 1900, 7,113; in 1910, 10,525.

**LAPWING** (läp'wîng), a genus of birds of the plover family, native to the temperate parts of Asia and Europe. In autumn they move southward to spend the winter. They are about the size of a pigeon, frequent marshes and woodlands, and from their peculiar cry are frequently called *peewit*. Both the birds and their eggs are hunted for food, the eggs being laid largely in cultivated fields, marshes, and depressions on the plains. The length of the common lapwing is about twelve inches. The color is variegated, but usually brownish-red, and the male has a crest of feathers on the head, which is most prominent in the winter time. They were named lapwing from their habit of luring intruders away from their nest by appearing to be lame.

**LARAMIE** (lä'r'à-mě), a river of Wyoming, rises in the northern part of Colorado, and after a course of about 200 miles toward the northeast joins the North Platte River at Fort Laramie. The river passes through a country which is rich in minerals. It is not navigable, but is utilized for rafting lumber cut in the mountains.

**LARAMIE**, a city in Wyoming, county seat of Albany County, on the Laramie Plains, at an elevation of 7,122 feet above sea level. It is 56 miles northwest of Cheyenne, on the Union Pacific Railroad and on the Laramie River. The noteworthy buildings include the county courthouse, the State Agricultural College, the State University, the State penitentiary, and the State fish hatchery. It has electric street lighting, a public library, telephone connections, and waterworks. Besides extensive railroad and machine shops, it has manufactures of flour, soda, glass, soap, building stone, machinery leather,



and bottled goods. The place was first settled in 1868 and was incorporated as a city in 1884. Population, 1905, 7,601; in 1910, 8,237.

**LARAMIE MOUNTAINS**, a mountain range of North America, extending from the central part of Wyoming into Colorado. The formations are composed largely of carboniferous, triassic, jurassic, and cretaceous formations, with fossiliferous deposits in many localities. Coal is the principal mineral. Laramie Peak, 10,000 feet high, is the culminating point.

**LARCENY** (lär'sē-nŷ), the taking and removing of personal property belonging to another, with the intent of depriving the owner of what belongs to him. The crime of larceny is usually divided into two kinds, known as *petty* and *grand*, though the distinction is abolished in some of the states and nations. Where these terms are recognized, they are used to designate crimes punishable by different penalties. Petty larceny is the designation when the value of the property stolen is small and the criminal may be tried and punished in a lower court. A charge of grand larceny is subject to investigation by the grand jury and the punishment is imprisonment in the penitentiary at hard labor.

**LARCH** (lärch), a genus of deciduous trees, bearing leaves in clusters and having cones. The American species are commonly known by the name of *tamarack*, or *kackmatack*, and are native to the northern portion of North America, particularly in the Allegheny Mountains. Several species abound, most of which grow from 15 to 45 feet high and are valuable for the quality of their wood. The *common larch* native to Switzerland, Germany, and Italy is noted for the durability of its wood, while the *golden larch* of Japan is counted the most beautiful tree and attains a height of 125 feet. Many species, especially those of Asia, grow to a height of 60 feet and thrive fully 250 years. The wood is inclined to warp and does not easily decay, owing to the resinous properties. Some of the species yield bark for tanning and a gummy substance useful for cement and in medicine.

**LARD**, the product obtained from the fat of swine by heating to the boiling point and straining. Lard is composed chiefly of stearine and oleine, in proportion of 62 parts oleine to 38 parts of stearine and palmatine, and is used for various purposes in culinary arts. It enters largely into the manufacture of soap, pomades, and lubricating oil. The enormous production of pork in America led to the separation of the oleine and stearine, which is done by pressure at a low temperature. The former is used as lard oil for lubricating machinery and the latter serves in the manufacture

of candles. Much of the best quality of lard is secured from the fat that surrounds the kidneys, from which ointments are prepared.

**LAREDO** (lä-rä'dô), a city in Texas, county seat of Webb County, on the Rio Grande, 152 miles southwest of San Antonio. It is on the Mexican National, the International and Great Northern, and other railroads, and is connected by several bridges with Nuevo Laredo, Mexico. The chief buildings include the courthouse and jail, the Laredo Seminary, the Mercy Hospital, the Ursuline Academy, and the high school. It is the seat of extensive machine shops, is noted for its importance as a wool-shipping point; and within its vicinity are copper, lead, iron, zinc, and coal mines. The manufactures include machinery, earthenware, cigars, and utensils. It has modern municipal facilities, including electric railways and lights, city sewerage, and waterworks. Laredo was settled by the Spaniards in 1767 and became incorporated in 1848. Population, 1900, 13,429; in 1910, 14,855.

**LARES AND PENATES** (lä'rēz, pē-nā'tēz), in legends, the protecting spirits among the ancient Romans, associated with domestic protection. The Lares came to the Romans from the Etruscan religion and the Penates from their early ancestors. They were worshiped by the Roman people under the form of two youthful warriors, who were in later times identical with Castor and Pollux. In many of the homes small images of these deities were placed as decorations round the hearth, and in the mansions of the rich they occupied separate apartments. They were adorned with wreaths on joyful occasions.

**LARK**, a genus of birds of song, resembling the finches in many respects. This genus includes many species, various kinds being native



SKYLARK

SHORE LARK.

to all the grand divisions and many islands. Among the best known are the meadow lark, skylark, wood lark, and shore lark. These birds are migratory, passing early in the spring to the higher latitudes, where they nest in hollows and depressions in the ground. The common char-



acteristics include a forked tongue, a short bill, feathers covering the nostrils, and straight hind claws. The color is variegated, but is largely sandy-brown with marking of black and yellow. The song is shrill and quite rare, except in flight, the skylark being celebrated for its prolonged song of much beauty while on the wing. In many European countries larks do damage to cereal crops. At that season they are caught in nets and sold on the market for their delicate flesh. The food consists chiefly of insects, larvae, and seeds.

**LARKSPUR**, an annual plant found in the Temperate Zone, so-called because the petals are spurred. The flowers are prolific, generally blue, and many varieties of colors have been developed by propagation. Among the species are the branching larkspur, upright larkspur, and rocket larkspur. These species are grown extensively as garden flowers.

**LARVA** (lär'vå), a term applied to the first stage in the development of insects, in which the young, after issuing from the egg, undergo a change of form known as *metamorphosis*. At this stage they are very different from the adults. The larval stage is so called because the form of the young masks or conceals that of the adult. It differs from the early stage in animals whose young are similar in form to the parent, the term *foetal stage*, or *fetal state*, being applied in the latter case. The greater part of growth in insects is developed during the larval state, and the skin is shed from time to time as may be required by the enlargement of the growing body. The *tadpole* is the larva of the frog; the *maggot*, of the fly; the *zoëa*, of the crab; and the *caterpillar*, of the moth or butterfly. See **Beetle**.

**LARYNX** (lär'ĩnks), the special organ of voice, situated at the upper part of the windpipe, or trachea, and at the base of the tongue, immediately below the hyoid bone. The larynx forms a projection of cartilage, known as *Adam's apple*. It consists of a cartilaginous box, across which are stretched folds of mucous membranes. These membranes constitute the vocal cords, which, by their vibration, due to passing of air from the lungs, produce sound. The glottis is a cleft or opening between the vocal cords at the upper orifice of the larynx, while the epiglottis is a leaflike lid upon the back of the tongue, which closes the larynx when swallowing. See **Voice**.

**LASALLE** (lä-säl'), a city of Lasalle County, Illinois, on the Illinois River, 98 miles southwest of Chicago. It is on the Illinois and Michigan Canal and on the Illinois Central, the Chicago, Burlington and Quincy, and the Chicago, Rock Island and Pacific railroads. The sur-

rounding country is agricultural and dairying and contains deposits of bituminous coal and building stone. It has a public library, a fine high school, Saint Bede College, waterworks, and electric street railways. Among the manufactures are glass, hydraulic cement, bottled goods, ironware, and machinery. It has a large trade in produce and merchandise. Lasalle was settled in 1830, when it was named after La Salle, the explorer. Population, 1910, 11,537.

**LAS PALMAS** (läs pä'l'mäs), the largest city of the Canary Islands, on the northeastern shore of the island of Gran Canaria, in a fertile and productive valley. It has a fine harbor, which is fitted for the largest ships. The noteworthy buildings include the public library, the theater, the city hall, an academy of art, and several large churches. Among the manufactures are hats, wine, glass, clothing, and leather goods. It has a large trade in coal, fruits, and merchandise. The place was founded by Juan Rejon in 1478 and was the capital of the Canary Islands until 1833, when the seat of government was transferred to Santa Cruz de Tenerife. Population, 1906, 44,857.

**LASSO** (läs'sö), a long line with a running noose, used chiefly in Spanish America, Mexico, and the western part of the United States for catching horses and cattle. It is usually made of rawhide, but also of sisal rope and hair. One end of the lasso is attached to the saddle, while the other has a sliding noose formed by rings, which the horseman throws over the head or around the foot of the animal while in full gallop, and thus succeeds in catching the desired animal. In the United States it is frequently called a *lariat* and in Mexico a *la reata*.

**LAS VEGAS** (läs vä'gäs), a city and the county seat of San Miguel County, New Mexico, on the Pecos River, 42 miles east of Santa Fé. It is on the Atchison, Topeka and Santa Fé Railroad, has a large trade in wool and live stock, and is surrounded by a grazing and gold and silver mining country. The chief buildings include the public library, the Castaneda Hotel, the courthouse, and the New Mexico Normal University. It has extensive railroad shops, flour mills, machine shops, wool scouring works, and brick and cigar factories. In its vicinity are the Las Vegas Hot Springs, a popular resort, whose waters are noted for their curative effects. It was formerly called East Las Vegas, but was incorporated as Las Vegas in 1896. Population, 1908, 8,145.

**LATERAN** (lä't'er-an), a celebrated church in Rome, Italy, founded by Constantine the Great and by him dedicated to the Savior. It was rebuilt in the 12th century by Lucius II.



and dedicated to Saint John Lateran. The church was maintained in the original form up to 896, when it was destroyed by an earthquake, but was rebuilt shortly after and has been remodeled many times. The palace annexed to it served as the papal residence until the 14th century, but is now in possession of the Italian government. The Scala Santa, or Holy Staircase, which is reputed to have served in the house of Pilate at Jerusalem, and to have been trod by our Lord as he passed to judgment, is preserved in the piazza of Saint John Lateran.

**LATHE** (lāth), a machine for shaping materials by turning. The work is done through a rotary motion, which is obtained in most cases by steam or electric power. Many forms of the lathe are in general use, depending upon the work to be done, such as cutting and polishing flat, oval, or cylindrical objects of wood, metal, or ivory. Small lathes are run by foot power. Those used for cutting wood have a much higher speed than those used in turning metal. The turning tool is held by the workman or by a tool holder attached to a movable slide rest, and the material to be shaped is sustained by two heads or centers. The finest crucible carbon steel is used in making lathe tools. The largest lathes are used in finishing heavy ordnance and in turning marine engine shafts, and from these they grade down to the delicate forms employed in finishing the finer parts of watches and scientific instruments.

**LATIN LANGUAGE.** See Rome.

**LATINS**, or **Latini**, the inhabitants of ancient Latium, in Italy, and from whom the language of Rome was obtained. These people were of great antiquity and their distinguished leader, Ascanius, son of Aeneas, aided in building the town of Alba Longa, which was the most important of their cities. Since Rome was held as a colony of Alba Longa, the Latin language was adopted by the Romans.

**LATITUDE** (lăt'ī-tūd), in geography, the term applied to distance north and south from the Equator, reckoned in degrees, and measured along the meridians. Latitude at the Equator is the smallest or lowest and is marked 0°, and distance from it is designated *north* or *south* respectively as the locality is north or south from the Equator. Since there are only 360° in any circle, and the distance from the Equator to the poles is one-fourth of an entire circle, 90° is the greatest value of latitude a place can have, thus the poles are each marked 90°. There may be any number of parallel circles imagined drawn between the poles and the Equator, these being designated *parallels of latitude*, and, if their distance in degrees from the Equator is known, it is

not difficult to locate a place in latitude. When the longitude of a place is associated with its latitude, an exact locality on a sphere or map may be designated. See **Longitude**.

**LATTER-DAY SAINTS**, or **Reorganized Church of Jesus Christ of Latter-Day Saints**, a body of the Mormon Church, which stands in opposition to the Mormons that have their principal seat of activity at Salt Lake City. It dates from 1844, when a schism occurred in the church, immediately after the death of Joseph Smith, and its promoters claim succession from the original organization. Its chief institutions are at Lamoni, Iowa, where the principal officials reside and several fine educational institutions are maintained. The tenets of faith are founded upon the Bible and the Book of Mormons, both of which are held to be inspired, plurality in marriage is opposed, and strict discipline is enforced. There are 1,450 ministers, 650 churches, and a membership of 50,560. See **Mormons**.

**LAUDANUM** (lā'dā-nūm), the name applied to several tinctures of opium, containing about 33 grains of the soluble matter of opium, or 3.3 grains of morphine, to each fluid ounce of the tincture. Its strength is increased by exposure to evaporation, when it becomes quite thick. Laudanum is used to relieve pain, especially in cramps and diarrhoea, but, being poisonous, it should be taken only under the advice of a physician.

**LAUGHING GAS** (lāf'ing), the name of a chemical used as an anaesthetic agent, so called from the feeling of merriment which it sometimes produces when it is inhaled. The agents used for this purpose consist mainly of hyponitrous oxide, or protoxide of nitrogen, and are administered by dentists, either to deaden pain or produce unconsciousness.

**LAUGHING JACKASS.** See **Kingfisher**.

**LAUGHTER** (lāf'tēr), the expression of mirth, merriment, and satisfaction by laughing. It is a sound or succession of sounds produced by a deep inspiration, followed by vocalized expulsions of air in quick interrupted succession. Laughter is caused by things of an apparent or real ludicrous nature and by tickling. Sometimes it accompanies extreme grief and hysteria. Since there is an intimate connection between the muscles of the eyelids and some of the muscles of the upper lip, in laughing, as in weeping, the eyelids are more or less contracted.

**LAUREATE** (lā'rê-ăt), **Poet**, an honorary office maintained in England, in which the poet regarded official is invested with the title of *laureate* by the crown. The recognition of a poet laureate originated from various sovereigns who engaged singers. Among the early kings



employing singers were Henry I., Richard I., Edward I., and Edward II. The term laureate itself arose from the laurel wreath given at the universities for marks of excellence in study and to men of notable poetic ability. Such a mark of distinction was bestowed by both English universities upon John Skelton, who afterward called himself *Poeta Laureatus*. Originally the title implied service, as the writing of an ode for the king's birthday and on festival occasions, particularly those celebrated after noted national victories. However, special duties have not been connected with the office subsequent to the reign of George III. The following have been poets laureate since the definite establishment of the office: Edmund Spenser, 1591-99; Samuel Daniel, 1599-1619; Ben Jonson, 1619-37; William Davenant, 1660-68; John Dryden, 1670-89; Thomas Shadwell, 1689-92; Nahum Tate, 1692-1715; Nicholas Rowe, 1715-18; Lawrence Eusden, 1718-30; Colly Cibber, 1730-57; William Whitehead, 1757-85; Thomas Warton, 1785-90; Henry James Pye, 1790-1813; Robert Southey, 1813-43; William Wordsworth, 1843-50; Alfred Tennyson, 1850-92; Alfred Austin, 1896-. It will be noted that interims occurred in 1637, 1668, and 1892.

**LAUREL** (lə'rĕl), a genus of plants which range in size from a shrub to trees sixty feet in height. They are natives of Europe, Asia, and Africa, chiefly in the countries bordering on the Mediterranean, but have been acclimated extensively in different countries. Several species are cultivated as ornamental plants and for their fine aromatic fragrance. The leaves are lanceolate and evergreen, the flowers are yellowish-white, and the fruit is about an inch long and of a bluish-black color. The flavor of the leaves is utilized in culinary arts and as a stimulant and carminative in medicine. Several oily substances are extracted from the leaves and the fruit, such as oil of sweet bay and oil of laurel. Laurel water is obtained by distillation from the leaves. In America the name is given to several native plants, including those known as the cherry laurel and purge laurel, but of the true laurel there is properly but one species. The true laurel and the noble laurel are somewhat similar in their evergreen foliage, but differ botanically. Wreaths and crowns were made of laurel twigs in ancient times by the Greeks, as a decoration for the heads of poets and heroes.

**LAURENTIAN MOUNTAINS** (lə-rĕn'-shĭ-ən), the mountain range of British America that divides the Saint Lawrence basin from the watershed of Hudson Bay. These highlands separate the upper tributaries of the Mackenzie

from the streams flowing into the same bay. It extends in an irregular curve from Labrador to the Arctic, a distance of about 3,000 miles. The highest peaks are 4,000 feet, the average height is 1,500, and the principal rock formations belong to the archæan system.

**LAURIUM** (lə'rĭ-ŭm), a village of Upper Michigan, in Houghton County, fifteen miles northeast of Houghton. It is on the Mineral Range and the Copper Range railroads, and is surrounded by one of the richest copper-mining regions of North America. The industries consist chiefly of cigar factories, machine shops, and enterprises connected with the mining of copper. In the vicinity are several villages, including Red Jacket. The name formerly was Calumet, but it was changed to Laurium in 1895. Population, 1904, 7,653; in 1910, 8,537.

**LAUSANNE** (lō-zān'), a city in Switzerland, capital of the canton of Vaud, near the northern shore of Lake Geneva. It occupies a site about 500 feet above the level of the lake and is built mainly on the lower slopes of Mont Jorat. The chief buildings include a Gothic cathedral built in 1235, in which Farel and Calvin took part with others in famous disputations. It is the seat of a university, an academy for Protestant ministers, a school of agriculture, and several charitable institutions. The manufactures include tobacco, machinery, clothing, and jewelry. Lausanne is visited by many tourists during the summer, who find entertainment at numerous fine hotels. It is the seat of a bishopric, of the supreme court of the republic, and of the cantonal library with 125,000 volumes. The city was founded about the 6th century. Population, 1907, 54,460.

**LAVA** (lə'vā), a term generally applied to all molten matter thrown from volcanoes, whether flowing as a stream or being deposited after the movement has ceased. When moving in a molten state within the volcanic channel, it is properly called trap, and after being deposited it forms basalt, trachytic greenstone, or tufa, this depending upon the degree of rapidity with which it cools, the cooling action influencing the formation of hornblende, feldspar, augite, and various other substances. The stream cools and hardens more rapidly on the surface, which causes it to become honeycombed as a result of escaping gases from the interior, while the interior continues to flow in a liquid state for some time, but after the heat escapes it forms a compact mass. The lavas thrown out by Etna and in Labrador are largely feldspar, those of Vesuvius are principally green augite and basalt, and those of the Peak of Teneriffe consist chiefly of trachytic masses.



**LAVAL** (là-vál'), a city of France, capital of the department of Mayenne, 45 miles east of Rennes. It has railroad and electric railway facilities and contains a cathedral which was begun in the 12th century. The manufactures include linen goods, leather, clothing, and marble products. It has a brisk trade in merchandise and cereals. Population, 1906, 32,563.

**LAVAL UNIVERSITY**, an institution of higher learning at Quebec, Canada. It was created in 1852 by the Quebec Seminary and granted a royal charter in December of the same year. By virtue of its royal charter, the Visitor of the Laval University is the Catholic Archbishop of Quebec, who has the right of veto over all the rules and nominations. The superior of the Quebec Seminary is *de jure* the rector, or principal, of the University. The council of the university is composed of the directors of the Quebec Seminary and of the three senior titular ordinary professors of each faculty. It maintains the four faculties of theology, law, arts, and medicine. The professors of the faculty of theology are named by the Visitor and all the others are named by the council, but they can be disposed at will. The degrees which the students may obtain are those of bachelor, master or licentiate, and doctor. Good conduct is an essential condition for obtaining degrees.

Laval University, in order to be ranked as a Catholic institution, was bound to be acknowledged and canonically erected by the Holy See. This solemn and final erection was granted by Pope Pius IX. in a bull dated in April, 1876. By virtue of this bull, the university has for its protector at the Holy See his eminence the cardinal prefect of the propaganda. The supreme direction of faith and morals is vested in a superior council composed of the most reverend and right reverend archbishops and bishops of the Province of Quebec, under the presidency of his grace the archbishop of Quebec, who is also apostolic chancellor of the university.

A decision of the propaganda, dated in February, 1876, authorized the establishment in Montreal of a branch of the Laval University, and it is affiliated by a system of seminaries throughout the Province of Quebec. The university has a library of 145,000 volumes. Instruction is given by a faculty of 54 instructors. The institution is attended by about 400 students.

**LAVENDER** (láv'ën-dēr), a genus of plants native to Southern Europe and Western Africa, but now widely naturalized and cultivated. They grow as shrubs from two to four feet tall, have hoary leaves and grayish-blue flowers, and are

prized for their fragrant, volatile oil contained in the flowers and used in perfumery. The oil has a bitter principle, is of a pale yellow color, and is obtained by distilling the flowers with water. Besides its use in perfumery, oil of lavender is employed successfully as a stimulant in colic, hysteria, and other affections. Lavender water is a toilet preparation and is secured by dissolving oil of lavender with musk, cloves, attar of roses, bergamot, and other oils in spirits. The spirit of lavender is obtained by distilling fresh flowers in rectified spirits. A species of broad-leaved lavender yields an oil used in preparing varnishes and ornamenting porcelain products. The American perfume known as Florida water is prepared largely from lavender. Lavender is cultivated most largely in Europe, where it is used for the distillation of its essential oil and for marketing the flowers. Considerable quantities are grown in the United States, particularly in Pennsylvania, New Jersey, and the states of the Pacific coast.

**LAW**, the collective body of regulations adopted by the government to regulate human conduct. The system of law which is enforced in a particular state or nation is known as its *municipal law*, while the system of rules acknowledged to be obligatory upon the nations is termed *international law*. Municipal law is divided into civil and criminal law. *Civil law* embraces all the provisions that regulate or protect the members of a community, except those that relate to the definition and provide for the punishment of public offenses, which constitute the code of *criminal law*. The acts of Congress and of the general assemblies, as defined by the decision of the courts, comprise the *written law*, while maxims and customs in use from time immemorial are known as the *common law*. Those portions of the law which are expressed in statutes and constitutions are denominated, respectively, *statute law* and *constitutional law*. *Administrative law* includes the regulations which limit and define the duties of the officials of the government and provide penalties for violations of the same. *Canon law* has reference to matters of ecclesiastical jurisdiction. The constitution of a nation is the supreme law of the land. To it are subject the constitutions of the various states and provinces, which are likewise limited by a constitution of their own. A law that is not in harmony with the constitution of the nation, or of the state or province in which it is enacted, is said to be *unconstitutional*.

**LAWN MOWER**, a machine designed to cut grass in parks and on lawns. Many forms of this machine are sold on the market, designed to be pushed by hand or propelled by a



gasoline engine or by horses. The principal part consists of a set of spiral knives with cutting edges, which revolve rapidly as the machine is moved along, cutting the grass as it comes between the cutting edges and a stationary knife. This machine is designed to cut only where the grass is short, hence is not serviceable in tall grasses.

**LAWN TENNIS**, a game of ball played on a ground, called the *court*, by either two or four persons. The balls used are of India rubber, a little less than three inches in diameter, and covered with white cloth. The requirements for the game are the balls, a net and posts, rackets, and a level surface of grass. Usually sides are chosen by a toss or spin of a racket, and the winner chooses the service or the preferable side. The server begins the game by striking the ball with his racket so that it passes over the net, which is hung across the court from the posts. The ball served must drop in the space which is diagonally opposite to him on the other side of the net, this being bounded by the net, the side line, the half-court line, and the service line. His adversary, called the striker-out, must return the ball before it touches the ground a second time, and the server must similarly return it. The ball must be passed back and forth in this way consecutively. When one player fails to do this he loses a stroke, which the adversary is deemed to win, and it is added to the score of the latter. The court should be 78 feet long and 27 feet wide for two players, or 36 feet wide for four players. Much skill and activity are required, hence the game is one of the many that furnish vigorous and healthful exercise. Several national and international lawn tennis associations are maintained, and contests in these and in local associations are quite numerous.

**LAWRENCE** (lə'rɛns), a city in Kansas, county seat of Douglas County, on the Kansas River, 28 miles southwest of Leavenworth. It is on the Union Pacific and the Atchison, Topeka and Santa Fé railroads. The surrounding country is agricultural. It is noted as an educational center, having fine facilities for instruction. Among the noteworthy buildings are the county courthouse, the University of Kansas, the Haskel Institute, the high school, and the city hall. The manufactures embrace barbed wire, cigars, carriages, furniture, earthenware, flour, shirts, paper, and machinery. The general facilities include a public library, street railways, pavements, and waterworks. It was settled in 1854, after the Kansas-Nebraska Bill was passed, and was a center of influence of the Antislavery party. Population, 1910, 12,374.

**LAWRENCE**, a city of Massachusetts, in Essex County, on the Merrimac River, 26 miles northwest of Boston. It is on several branches of the Boston and Maine Railroad and on many electric railways. The city has a public library of 50,000 volumes and is the seat of the Essex County Truant School. Other buildings of note include the townhall, the Lawrence Hospital, and many schools and churches. It has a large trade in merchandise, fruits, and cereals. The manufactures include boilers, furniture, car wheels, cotton and woolen goods, steam engines, boots and shoes, clothing, paper, hats, and machinery. Immense water power is obtained from the Merrimac, which has caused its manufacturing establishments to rank among the largest in the world. The vicinity was first settled in the latter part of the 17th century. Lawrence was formed in 1845 by uniting parts of Andover and Methuen. It was incorporated in 1853. Population, 1905, 69,939; in 1910, 85,892.

**LAWRENCEBURG**, county seat of Dearborn County, Indiana, on the Ohio River, eighty miles southeast of Indianapolis. It is on the Cleveland, Cincinnati, Chicago and Saint Louis and the Baltimore and Ohio railroads. The surrounding country is agricultural. It has a high school, a courthouse, and many fine churches. The manufactures include musical instruments, spirituous liquors, machinery, flour, furniture, coffins, and pumps. It was settled in 1817 and incorporated in 1847. Population, 1900, 4,326.

**LAZZARONI** (lăz-zà-rō'nī), a name applied to the fishermen and boatmen of Naples, Italy, but formerly used to designate all persons destitute of visible means of support. The name became connected with those occupying the hospital of Saint Lazarus, an institution of refuge. Formerly they included a large class who were prominent factors in the revolutionary movements of Naples, and under their leader conducted a prominent revolt against the Duke d'Arcos on July 7, 1647.

**LEAD**, a highly useful metal. It is bluish-white in color and possesses a brilliant luster when newly cut, but after exposure to the air becomes dull on account of taking on a coating of carbonate of lead. Lead possesses both ductility and malleability, but the former is less than that of all other ductile metals, while the latter is considerable. It is flexible, soft, inelastic, melts at 615° Fahr., and has a specific gravity of 11.37. The lead of commerce is mostly obtained from the native lead sulphide, which occurs in veins. It is extracted from the native ore by roasting in a furnace with one-twentieth part of lime and allowing the free access of



air. Lead occurs as a constituent of many minerals and in a native state is associated with others.

In separating lead from other metallic substances, the ore passes through several stages in heating and the sulphurous constituents are finally yielded up. If the lead still contains silver, copper, and antimony after the process of reduction, it is run off and repeatedly crystallized, a treatment under which the silver is concentrated. Antimony is the principal impurity and is burned off by a process of roasting in a reverberatory furnace. The lead of commerce is often nearly pure, and it can be obtained in a perfectly pure state by the reduction of the pure nitrate. Lead is used for type metal, plumber's solder, pewter, water pipes, gutters, and for forming various alloys. Owing to its being the softest of metals, it is rarely used in the pure state, except for special purposes. In manufacturing type metal it is alloyed with antimony. Pewter is a hard alloy, consisting of four parts of tin and one of lead. Tin is alloyed with lead in preparing solder, as well as in making britannia metal and various others.

Lead is obtained in North America to a large extent from the argentiferous ores, that is, from the ores bearing silver, and is produced largely in Colorado, Utah, Idaho, Montana, British Columbia, and Mexico. Extensive lead mines are worked in the Mississippi valley, where it occurs with deposits of zinc. The production of the United States aggregates annually 382,450 tons, which was the output in 1908, of which about one-fourth is exported. Lead is one of the most widely distributed of the metals and occurs in all the grand divisions, but the products of Europe are the most important aside from those of North America. Most commonly lead is found in galena ore. Carbonate and other salts of lead are unmetallic in appearance and occur in primitive and secondary rocks.

Lead has many oxides, such as *red oxide* and *plumbic oxide*, which serve useful purposes in the arts. *Litharge* is a protoxide and is produced by burning lead in a current of air. *Dioxide* or *brown oxide* is obtained by subjecting red lead to diluted nitrate acid or chlorine water. *White lead* is derived from carbonate of lead and is a basis for pottery glazes, cement, and white oil paint. *Carbonate of lead* and *salts of lead* are poisonous and give rise to so-called lead poisoning. That lead is one of the earliest known metals is evidenced by the fact that it is mentioned in the Books of Moses. It is spoken of by Pliny. Many of the articles made by the ancient Romans, Greeks, and Phoenicians still preserved in museums, such as rings, portions

of pipes, and weights, contain lead or are made wholly of lead.

**LEAD** (lēd), a city of Lawrence County, South Dakota, situated in the Black Hills, about three miles south of Deadwood. It is on the Chicago and Northwestern and the Chicago, Burlington and Quincy railroads. Extensive deposits of gold are worked in the vicinity. The chief buildings include the Hearst Library, the high school, the Lead Coliseum, a business college, and many schools and churches. It has manufactures of cigars, utensils, machinery, and jewelry. The municipal improvements include electric lighting and systems of sewerage and waterworks. Lead was settled in 1876 and was incorporated the following year. Population, 1905, 8,052; in 1910, 8,392.

**LEAD POISONING**, a disease due to the presence of a considerable amount of lead in the system. The most common symptom of the disease is lead or painter's colic, which is attended by pain, constipation, and blue lines on the gums. All ailments due to lead poisoning are accompanied by a loss of color and a species of rheumatism. In the more severe cases the patient is affected by paralysis, delirium, and more or less severe convulsions. Opium is the chief medicine used, since it relieves the pain and overcomes the obstinate constipation of the disease. Sulphuric acid and cathartics are useful in the general treatment and iodide of potassium is given in chronic cases. Lead poisoning is caused by the use of lead pipes in conducting drinking water, by the application of cosmetics and hair dyes, and by frequent contact with white lead, as in the case of painters and employees of white lead factories.

**LEADVILLE** (lēd'vil), a city of Colorado, county seat of Lake County, near the source of the Arkansas River, 78 miles southwest of Denver. It is on the Denver and Rio Grande, the Colorado Midland, and the Colorado and Southern railroads. The surrounding country is rich in silver and gold deposits. Among the chief buildings are the county courthouse, the Carnegie Library, the Tabor Opera House, the high school, and a Federal fish hatchery. It has manufactures of ironware, machinery, cigars, and clothing. The site of the city is very beautiful and near it are many cañons and other natural formations of interest. Much has been done to improve the streets by grading and paving. Placer deposits of gold were discovered in California Gulch in 1860, but the rapid growth of the city began in 1877, when the rich silver mines were developed. It was incorporated in 1878. Population, 1900, 12,455; in 1910, 7,508.

**LEAF**, the organ of a plant that commonly



grows from the axis or stem, but sometimes from the root. Leaves are flat, thin, and green in color and constitute the foliage. They never develop into flowers, but exhibit an endless variety of forms in different plants, and constitute marks by which to distinguish easily the different species. A complete leaf consists of a blade or limb, a leaf stalk or petiole, and a pair of stipules at the base. Many leaves have no stipules, and some have no petiole. In the latter case the leaf is said to be *sessile*. Simple leaves consist of one piece, while compound leaves have more than one piece or blade. The leaves are composed of two kinds of material, woody fiber and cellular tissue, the former constituting the framework that gives strength to the blade, and the latter forming the green pulp of the leaf.

The framework of leaves spreads in various directions and constitutes the ribs, from which branch veins and veinlets, these serving to con-



ARRANGEMENT OF LEAVES.

Alternate.

Opposite.

vey the sap. One side of the leaf is turned upward to the sky and the other toward the ground, each being covered above and below with so-called surfaces or skins. The *stomates* or *pores* are on the lower surface and act as breathing organs to take in essential elements from the air, but the leaves also give out a purified air laden with oxygen, which serves a useful purpose in the maintenance of animal life. Plants of the same species have the same kind of leaves, and these are arranged in an exactly similar way on the stems, being an expansion of the bark and a node of the stem. The arrangement is either *opposite* or *alternate* on the stem, but it is greatly variegated in different species.

**LEAF INSECTS**, the name of numerous species of insects remarkable for their resemblance to the leaves of plants on which they feed. The similarity is not only in color, but

also in size and in the resemblance of their legs to the ribs and veins of the leaves. Insects of this character are most numerous in tropical countries, occurring in South America, Australia, and portions of Africa. Their main protection against enemies consists in their resemblance to the leaf forms about them, since they are almost incapable of flight. In most species the males have wings, while the females are wingless.

**LEAGUE** (lēg), a measure used for estimating length, both upon land and at sea. The nautical league is one-twentieth of a degree, or three equatorial miles, or 3.457875 statute miles. In England the land league is three statute miles. The French league has been used for different distances, as the legal post league, equal to 2.42 English miles, and the league of 25 to the degree, or 2.76 English miles.

**LEANDER** (lē-ān'dēr). See **Hero**.

**LEAP YEAR**, a year to which one day is added, being distinguished from others in that it contains 366 days. Every year exactly divisible by four is a leap year, except that only every fourth year ending a century is thus classed. This exception is made to correct the error arising from the addition of one day in four years to the year over the true length of the year. Thus 1800 and 1900 were not leap years, but 1200 and 1600 were and 2000 will be so classified. For a considerable time centuries divisible by 400 will be leap years.

**LEATHER** (lēth'ēr), the tanned, tawed, or otherwise dressed skin or hide of an animal. The process of tanning is applied to the skins of different animals for the purpose of making them tough and pliable and to prevent them from putrefying. Some sort of dressing was applied to the skins of animals very early in history, which was but the result of the practice of ancients in using skins for clothing and in the construction of tents, boats, and implements of war. The fact that the Egyptians developed much skill in the production of leather is evident from the remnants found among ruins, many of which appear to date about 1,000 years before the Christian era. That bark is serviceable for tanning was discovered, in all probability, by mere accident, but it has furnished the principal means and is still used quite extensively in many countries. Other processes are by tawing with bichromate of potash, alum, and various mineral salts, and by shamoying or treating the skins with oils.

Commercially *leather* is distinguished from *skin* and *pelt*, the former being the skin of an animal dressed with the hair or fur removed and the latter being untanned skin or hide. Leather



is made most commonly from the skins of cattle, though those of swine, horses, asses, sheep, camels, and goats are utilized. When shipped from a long distance, hides reach the tannery in a cured or salted condition, but some, especially in cold seasons, are transported without curing. The first process is to unhair the skins, which is done by means of lime, or by a process of sweating. In the latter case a partial putrefaction takes place and the hairs are removed without injuring the hide. In some tanneries the skins are unhaired by sulphide of sodium, sulphide of arsenic, and other alkaline sulphides. The loosened hairs are removed by scraping, but machines for unhairing have been adopted in the larger tanneries. The next process is to remove the loose flesh by scraping and brushing, after which the hides are separated according to the class of leather desired. After soaking in water and washing out all particles of hairs, lime, and other matters, the skins are placed in a tan pit, in which a weak tanning solution is confined. In this they are turned several times daily and afterward are removed to pits containing stronger solutions, until they are placed in the final pit, where they remain for about six weeks. After this process they are taken out and beaten to give them hardness, when they are oiled and prepared for the market.

The various grades of leather are prepared differently, being pared, rolled, and then given smoothness by treatment, the smoothing being effected under a process of oiling. This is true of *japanned leather*, which, in the process of manufacture, is stretched on wooden frames and successive coats of varnish are applied, each of which is allowed to dry and then is rubbed down with pumice stone. *Russia*, *morocco*, and *seal leather* are other grades of highly finished products, but none of these has any connection with the locality or name applied, except as a recognized grade. The skins of lambs, kids, sheep, and goats are tawed and are used for light shoes and gloves. However, the grade known as *kid* is properly made from goatskins. A waterproof leather known as *cordovan* is obtained from horsehide. Shamoying is applied to shamois skins, being done by oil, but the so-called *shamoy* of the market is largely split leather.

Electricity was first applied in tanning in Sweden. Under the electric process hides may be completely tanned in from forty to ninety hours. The plan is to suspend hides in tanning liquor between two copper plates and apply an electro-motive force of fifty volts and a strength of one hundred amperes. However, the time required for the process depends upon the strength

of the tan liquor, but it has been well established that sole leather cannot be prepared by rapid action for the reason that it requires a slow process to tan thick hides. Many more or less rapid tanning processes have been adopted, but the best results require considerable time.

**LEATHER, Artificial**, a manufactured material similar in appearance to leather, used extensively in the arts for purposes in which leather was formerly employed. This product has come into extensive use since 1849, when a product known as *leather cloth* began to be manufactured on a large scale in America. The introduction of this article is due to the scarcity of leather as compared to the demand. Many kinds of artificial leather are on the market at present and the uses for this product are very numerous, including the varieties used in the manufacture of furniture, books, and boots and shoes. One variety is made of the parings and shavings of leather, which are reduced to a pulp and afterward molded into various objects. *Keratol* is used extensively for binding books and in upholstering furniture and the seats in railway cars. Boots and shoes are made to some extent of what is known as *leather board*, which is made of hemp rope, manilla rope, jute, or linen canvas, to which are added leather straps, and it is treated with certain chemicals and a cement which makes it more impervious to water than leather. Vegetable leather is a product that consists largely of caoutchouc, the latter being reduced to a state of dissolution and spread over linen cloth.

**LEATHERBACK**, the name of a large turtle found in the ocean, so named because the back is incased by a leathery integument instead of a bony shell. Several species have been described, including both oceanic and fresh-water animals. Those found in the Atlantic Ocean range along the coast of the United States as far north as New York, and in Europe they extend southward from the English Channel. Some of the specimens have a length of from six to seven feet, the shell being a little more than four feet long. They weigh more than a ton at maturity. Their food consists chiefly of mollusks, fish, and crustaceans.

**LEAVENWORTH** (lěv'ēn-wŭrth), a city in Kansas, county seat of Leavenworth County, on the Missouri River, 25 miles northwest of Kansas City. It is on the Union Pacific, the Chicago Great Western, the Missouri Pacific, the Atchison, Topeka and Santa Fé, and other railroads. The surrounding country has deposits of bituminous coal and is a rich farming district. Among the noteworthy buildings are the county courthouse, the Federal building, the Cathedral



of the Immaculate Conception, the public library, and the public high school. It has the United States and State penitentiaries. The manufactures include glucose, furniture, wagons, engines, iron bridges, cigars, clothing, machinery, shoes, and earthenware. Near the city is the extensive military establishment of Fort Leavenworth, being immediately north of the city. The place was settled in 1854 and was incorporated the next year. Population, 1905, 31,857; in 1910, 19,363.

**LEBANON** (lĕb'á-nŭn), a city in Pennsylvania, county seat of Lebanon County, 26 miles east of Harrisburg. It is on the Cornwall and Lebanon and the Philadelphia and Reading railroads, in a valley between the Blue and South mountains, and is surrounded by a rich coal and iron producing region. Among the chief buildings are the county courthouse, the city hall, the high school, and the public library. It has electric lights and street railways, pavements, and systems of waterworks and sewerage. The manufactures include machinery, engines, railway cars, organs, cordage, furniture, and farming implements. It was settled by Germans in 1700 and incorporated in 1820. Population, 1900, 17,628; in 1910, 19,240.

**LEBANON MOUNTAINS**, the name of two mountain ranges in the northern part of Palestine. They trend in almost parallel lines from northeast to southwest and inclose between them the Nahr Litany valley, anciently known as the Coele-Syria valley. The western range is called Lebanon and the eastern Anti-Lebanon, but the former is known in modern geography as Jebel-Libnan and the latter as Jebel-esh-Shurky. However, the western range is the more elevated, its highest peak being El-Kazib, which attains a height of 10,020 feet above sea level. The Anti-Lebanon range is comparatively irregular, but has the most elevated peak of the two ranges, Jebel-esh-Sheikh being 10,985 feet above sea level. Snow and ice remain in the higher ravines throughout the year, though the slopes are fertile. The cedar forests are famed in history, but they have been almost entirely removed by careless forestry. A number of streams penetrate the valleys, among them the Jordan River, which has its source in the Lebanon Mountains. A class of Christians called Maronites occupy the northern district, and in the southern portion are the Druses. The principal occupations of these peoples are the culture of silk, the vine, and the mulberry tree, and the rearing of sheep and goats. Considerable quantities of wheat, rye, barley, millet, and tobacco are cultivated. Eastern manufacturing enterprises receive growing attention. The most

desirable land is possessed by the monks, who maintain Maronite monasteries, and are influencing the culture and manners of the region. Protestant missions are gaining a strong foothold.

**LECH** (lĕk), a river of Germany and Austria. It joins the Danube after a course of 175 miles, at Donauwörth. The Lech is a rapid stream, falling 4,600 feet in its course. It is historical because of the battles in which Tilly defended the passage of this stream against Gustavus Adolphus, in one of which the former was slain.

**LECOMPTON CONSTITUTION**, the name of a constitution adopted by the proslavery party of Kansas in a convention held at Lecompton on Sept. 5, 1857. It declared the legality of slavery in Kansas and prohibited the passage of emancipation laws by the Legislature. The entire constitution was not submitted to the people of the territory, but they were to vote only for the constitution with or without slavery. In the election the free-state settlers abstained from voting, hence the result was a large majority in favor of the proslavery party. Later the territorial Legislature ordered a vote on the constitution as a whole, when it was voted down by a large majority, and in 1859 an antislavery constitution was adopted.

**LEECH**, a class of suctorial worms found in bodies of water, marshes, and other moist places. Most of the many species inhabit sloughs and ponds of fresh water, but they are also found in marine waters. The group includes the common horse leeches, medicinal leeches, green leeches, and a number of other species. The body is composed of from 80 to 100 rings. Most species have a mouth furnished with toothed plates with which they make an incision for sucking blood from animals and many are parasitic on crustaceans and fishes. In Ceylon the land leeches live among damp foliage and are a common pest, attaching themselves to man and beast. In the colder climates the leeches hibernate during the winter by burying themselves in the mud at the bottom of pools and in marshy lands. The medicinal leeches formerly were used extensively for local extraction of blood in cases where the depletion of venous blood was thought advisable. These leeches are from two to four inches long, have a stomach with elongated pouches, and are capable of holding several times their weight in blood. When the stomach is filled, the leech has sufficient nutritious food for about a year, but may be made to disgorge the contents of the stomach by sprinkling salt on its body, when it is again ready for service. At present leeches are used only to a limited extent. They are employed principally



in the southern part of Europe and the western part of Asia.

**LEECH LAKE**, a lake of Minnesota, in Cass County. It is near the source of the Mississippi River, into which it discharges by a short outlet. The length is twenty miles and the breadth is fifteen miles. It is 1,296 feet above sea level.

**LEEDS**, a city of England, in Yorkshire, on the Aire River, twenty miles southwest of York. It is at the junction of several important railroads. Communication is furnished toward the west by the Leeds and Liverpool Canal, which was opened in 1816. The river is navigable to Leeds and adds materially to the transportation facilities. Among the noteworthy buildings are the Church of Saint Peter, Yorkshire College, the Leeds Infirmary, the public library, the royal exchange, and many schools and churches. About three miles distant are the remains of Kirkstall Abbey. It is noted for its manufactures of woolen goods, steel and iron products, boots and shoes, machinery, clothing, glass, cotton prints, earthenware, and tobacco. In the vicinity are rich deposits of iron ore. Many of the streets are finely paved and improved with grading and parkings. It has electric street railways and municipally owned waterworks and sewerage. The surrounding country produces large quantities of cereals, fruits, and vegetables. Leeds dates from the time of the Saxons, when it was an important place, and was incorporated in 1208. Population, 1907, 470,268.

**LEEK**, a biennial plant native to the southern part of Europe. It is related to the onion, but the bulb in the latter is replaced by a thickening at the base of the stem, which grows to a height of from ten inches to three feet. The leaves are about an inch wide, somewhat thick and fleshy, and grow in clusters near the surface. Gardeners bleach the lower part of the stem by earthing up, which has the effect of causing the edible part to enlarge. In flavor the leek is milder than the onion. Some species are grown as ornamental plants, and others furnish leaves that are used by the peasants for constructing the roofs of their cottages.

**LEEWARD ISLANDS** (lē'wērd), a group of the Lesser Antilles, situated north of the Windward Islands and southeast of Porto Rico. A part of the group is governed as the British colony known as the Leeward Islands. This portion has an area of 705 square miles. It includes the islands of Antigua, Saint Kitts, Nevis, Montserrat, Barbuda, Redonda, and Anguilla. Saint John, on Antigua, and Basseterre, on Saint Kitts, have good harbors and have a large

trade. About four-fifths of the inhabitants are Negroes, 5,150 are whites, and the remainder are mulattoes. The principal religions are Anglican, Wesleyan, Roman Catholic, and Moravian. Among the chief products are coffee, rum, sugar, tobacco, live stock, cocoa, and tropical fruits. Population, 1908, 133,046.

The islands of the Leeward group that do not belong to Great Britain include principally the following possessions: French—Marie Galante, Gaudeloupe, Désirade, and Saint Bartholomew; Dutch—Saint Eustatius and Saba; Dutch—Saint Croix. The Virgin Islands belong to Denmark and England and Saint Martin is a possession of the Dutch and French. Geographers now place the total area of the Leeward Islands at about 4,850 square miles. Guadeloupe is the largest and most important of these islands.

**LEG**, a limb or member of an animal, forming the lower extremity, used for support and locomotion. The larger animals have either two or four legs, and are called bipeds and quadrupeds respectively. Anatomists class the portion of the leg from the body to the knee as the thigh, which has one bone, and the part below the knee as the leg proper. The bone of the thigh is called *femur*. It is the largest and strongest bone of the body. At the hip it articulates with the hip bone by a ball and socket joint and at the knee with a hinge joint. The two bones below the knee are called the *tibia* and *fibula*, the former being the larger, but both are firmly attached by muscles. The calf of the leg is a muscular mass on the back of the human leg, below the knee, and furnishes ample means for standing and moving in an erect attitude.

**LEGACY** (lēg'ā-cy), a gift of personal property or money conveyed by will and differing from a devise, which is understood to be a gift of real property. In the United States a legacy may be unconditional, or may be subject to some uncertain event or condition. The laws of the different states are somewhat varied, but in most instances the testator may bequeath in general or specific terms. He may name an executor and make bequests in favor of relatives, friends, or charitable and public institutions. In most countries a limited amount of property may be willed orally in the presence of witnesses, but when the legacy exceeds in value the common limit a written instrument is required. Creditors have a prior claim to legatees.

**LEGAL TENDER**, the act of tendering payment at the time and place in full settlement of a claim, using such currency, or money, as the law authorizes a debtor to tender and requires a creditor to receive. The effect of a tender of



payment does not discharge the debtor, but it saves the tenderer from paying interest thereafter and from the costs of a suit for the debt, but the exact amount due must be offered. It is not sufficient to offer to pay, but the money must be actually produced and made acceptable to the creditor. The provisions that regulate a legal tender differ materially in different countries. Notes of the Bank of England are a legal tender in Great Britain for any sum above £5. Although gold coins are a legal tender, they are such only when not diminished in weight below the statutory standard, and silver coins are not a legal tender to exceed forty shillings. Gold coins, certain treasury notes, and the so-called greenbacks are a legal tender for debts of any amount in the United States. Fractional silver money is a legal tender not to exceed ten dollars, but silver dollars are a full legal tender, unless it is otherwise stipulated in the contract.

**LEGEND** (lěj'čnd), a term formerly applied to certain writings that were designed as lessons in the religious service of the primitive church. These writings contain biographies of saints and martyrs and stories of remarkable religious enterprises. They are intermingled with many valuable precepts, encouraging moral conduct and right living. The monastic institutions were prolific centers for the accumulation of these writings, at which it was not uncommon to read the histories of saints and martyrs on the particular days set apart for them. Most of these writings originated in the 12th century and spread alike among the Eastern and Western churches, serving the useful purpose of suppressing many of the writings of heathen origin. At present the term legend is understood to imply a narrative, usually entertaining, based on tradition with some intermixture of fact. Many of the popular readings are of legendary origin. They sprang up naturally among the different peoples and embody popular feeling in characteristic narrations.

**LEGERDEMAIN** (lěj-ěr-dě-mān'), a deceptive performance that depends upon manual skill or dexterity. The different feats of legerdemain are performed by sleight of hand, collusion with assistants, mechanical contrivances, or some combination of these. They appear simple and uninteresting when they are understood. In giving exhibits of a high character it is common to utilize optical illusions, chemical properties, or some elaborate scientific phenomenon.

**LEGHORN** (lěg'hôrn), a seaport on the Mediterranean, in the province of Tuscany, Italy, twelve miles southwest of Pisa. It has a safe and commodious harbor, important rail-

road connections, and modern municipal facilities. The streets are regular and most of the buildings are modern. It has manufactures of ships, machinery, clothing, hats, cheese, tobacco, salt, spirituous liquors, cotton and woolen goods, and oil. As a seaport it is one of the most important of Italy, both its import and export trade being extensive. Its general facilities include electric lights, waterworks, and electric street railways. The city has a number of beautiful parks, many statues of noted men, and various public buildings and churches. Among the noteworthy structures are the Church of the Madonna, the Royal Marine Academy, the public library, the gymnasium, and the Leghorn Hospital. In 1421 Leghorn was a small fishing village and became a possession of Florence. Its importance dates from the 16th century, at which time its harbor was improved and various manufactures were established. In 1835 a line of strong fortifications were constructed for its defense. Population, 1906, 99,805.

**LEGION** (lě'jŭn), a division of the army of ancient Rome, constituting at different times a body of men numbering from 2,000 to 6,000. When first organized, the legion comprised fifteen companies, each company containing sixty rank and file, two officers or centurions, and a standard bearer. Subsequently it was divided into ten cohorts, each cohort into three companies, and each company into two centuries. Romulus established the legion that contained 3,000 foot soldiers. At the time of the Second Punic War the legion numbered from 4,200 to 5,200, and from the year 100 B. C. to the downfall of the empire the number varied from 1,000 to 6,200. An eagle was the standard of the legion.

**LEGION OF HONOR**, a French order of merit established by Napoleon on May 19, 1802. It is maintained for the purpose of recognizing civil and military merit. Originally the decoration was a star bearing the portrait of Napoleon, surrounded by a wreath. On one side was the inscription "Napoleon Empereur des Francais," and on the opposite side it bore the French eagle, holding a thunderbolt and the inscription "Honneur et Patrie" in its talons. The constitution of the order has been remodeled at different times, but at present five ranks are recognized, those of grand crosses, grand officers, commanders, officers, and chevaliers or knights. By a constitutional provision the membership in each rank or class is limited to the following number: grand crosses to 70, grand officers to 200, commanders to 1,000, officers to 4,000, and chevaliers to 25,000. Membership is limited to those who have served in some military or civil capacity a term of 25 years, attained marked em-



inence in civil arts, or become noted for skill and bravery in war. The decoration now bears the inscription "Republique Francaise, 1870," while the opposite side has two flags and is inscribed "Honneur et Patrie" (Honor and Country). The president of France is the grand master of the order by virtue of his office.

**LEGISLATURE** (lěj'is-lā-tūr), the lawmaking body of a state or country. It has the power to enact, amend, and repeal laws and resolutions and is subject to the constitution. The chief executive, whether in a republic or a monarchy, has more or less influence upon the legislature, and under certain restrictions may veto its enactments, though in most cases laws and resolutions may be passed over the veto of the chief executive. Originally, as in ancient Greece and Rome, the lawmaking functions were vested in assemblies that were constituted of a large number of the citizens, but later, as the countries became more populous, these powers were delegated to a few representatives chosen by the people. Later the legislative and executive functions were combined in the king or emperor, as in the Middle Ages, but ultimately the commons were granted enlarged powers, and at present all of the leading civilized nations have legislative assemblies constituted wholly or in part of representatives chosen by the popular vote of those entitled to the right of franchise.

In England the body having national legislative functions is known as the Parliament. It is constituted of the House of Lords and the House of Commons. In this respect it corresponds to the highest legislative authority in the Dominion of Canada and the Commonwealth of Australia. Members in the upper house hold their position by heredity or appointment, while those in the lower house are elected by the people. In the United States the national legislature consists of the two houses of Congress, the Senate and the House of Representatives. Members of the former are elected by the legislatures of the states, and those in the latter are chosen by popular vote in the several states. All of the civilized countries have national legislatures corresponding to those in Great Britain and the United States, and in most cases they are composed of two branches. In some countries, as in England, the members of the upper house serve for life, and in others, as in the United States, the term is for six years, and the incumbents may be re-elected any number of times. All of the subdivisions of a nation, such as states and provinces, have legislatures or assemblies for the purpose of enacting laws of a more local character. These likewise consist in most cases of an up-

per and a lower branch. In cities the legislative authority is vested in the common council, and in counties it is exercised by the board of supervisors or the county commissioners.

**LEHIGH** (lě'hī), a river of Pennsylvania, rises in Wayne County, and after a course of 120 miles flows into the Delaware River at Easton. The country through which it passes is rich in anthracite coal deposits. In its course the Lehigh passes the cities of Allentown, Mauch Chunk, and White Haven. About seventy miles of its length have been rendered navigable by extensive improvements.

**LEHIGH UNIVERSITY.** See **Bethlehem.**

**LEICESTER** (lěs'tēr), a commercial and manufacturing city of England, in Leicestershire, on the Soar River, 98 miles northwest of London. It is the focus of several important railroads. The chief buildings include the free library, the Royal Theater, the public museum, the Trinity Hospital, and many schools and churches. It has manufactures of ironware, boots and shoes, woolen and cotton goods, thread, lace, utensils, and earthenware. The surrounding country is fertile and produces cereals, vegetables, dairy products, and wool. It is reputed that the city was founded by King Lear. Many relics of remote centuries have been found in its vicinity. It received the first charter from King John. The building of railroads and the growth of manufacturing establishments are the causes of its modern prosperity. Population, 1907, 236,124.

**LEIPSIC** (lip'sik), or **Leipzig**, a commercial city of Germany, in a fertile region of Saxony, on the Elster, 73 miles northwest of Dresden. Many railroad and electric railway lines converge here. It has well-paved streets, extensive parks, modern municipal facilities, and many historic buildings and churches. The old portion of the city has narrow streets, but those of the newer part are entirely modern. The town-hall, a large building in the Renaissance style, dates from 1556. Other noteworthy buildings include the stock exchange, the market house, the Imperial courthouse, the Church of Saint John, the public library, the Church of Saint Thomas, and the University or Pauline Church. It has a large museum, several theaters, a castle, and many memorials and statues. Among the monuments is a fine work of art dedicated to scenes in several wars, erected in 1888. The manufactures embrace machinery, cotton and woolen goods, musical instruments, spirituous liquors, ribbon, earthenware, leather, paper, clothing, and ships.

Educationally Leipzig is one of the most important cities of the world, containing a fine



public school system, several gymnasia, conservatories of music, business colleges, industrial schools, and the celebrated University of Leipsic. This great educational center was founded in 1408, represents property of much value, and is efficiently equipped with courses of study and apparatus. It has 300 professors, 4,000 students, and a library of 500,000 volumes. The city of Leipsic dates from the 11th century, when it was founded by the Wendish. It has been the seat of many historic conventions and battles. In the Reformation it suffered intensely, was besieged and taken five different times, and near it, at Breitenfeld, occurred the victory over Tilly by Gustavus Adolphus on Sept. 17, 1631. The so-called "Battle of Nations" occurred here on Oct. 16-19, 1813, between the allied forces of Prussia, Austria, Sweden, and Russia and Napoleon, in which the French were defeated and a step toward Napoleon's final overthrow was accomplished. In this battle Napoleon had an army of 180,000 men, while the allied forces numbered about 300,000. The annual jobbing trade of Leipsic is at present estimated at \$60,000,000. Population, 1905, 503,672.

**LEIPSIC, Battles of.** See **Leipsic.**

**LEITH** (lēth), a seaport of Scotland, on the Firth of Forth, a short distance north of Edinburgh. It has an important harbor, is connected by several railroads with other commercial centers, and engages extensively in the manufacture of sugar, engines, machinery, spirituous liquors, fabrics, cordage, and ships. In 1128 it was known as Inverleith. Robert I. granted the city, port, and mills of Leith to Edinburgh in 1329. As an export and import city Leith is of growing importance, its trade in coal being particularly extensive. Population, 1907, 78,804.

**LELAND STANFORD JUNIOR UNIVERSITY**, an educational institution at Palo Alto, Santa Clara County, California, 33 miles from San Francisco and 15 miles from San Jose, the county seat. It was founded in 1885 by Leland Stanford (1824-93) and Jane Lathrop Stanford (1825-1905), his wife, as a memorial to their only son Leland, who died in 1884 at Florence, Italy, in his fifteenth year. The corner-stone of the main building was laid in 1887 and the institution was opened for instruction in October, 1891, when it had 559 students and a faculty of 35 teachers. This attendance grew to 1,751 students in 1908, when the faculty included 150 instructors.

The university campus, containing 9,000 acres, the country estate of Senator Stanford, is beautifully situated at the foothills of the Santa Cruz Mountains, with the sweep of the Santa Clara valley and the Bay of San Francisco in

front of it and the Mount Hamilton range beyond. The plan of the buildings was adopted from the architecture of the old Spanish missions of California. An inner quadrangle of twelve one-storied buildings of buff sandstone with red tiled roofs and connected by an arcade of columns and arches opens on a paved court of four acres, diversified with beds of tropical plants. It is surrounded by a second quadrangle of fourteen buildings, most of them of two stories, flanked by another arcade of columns and arches. Some of the buildings were damaged by the earthquake of 1906, but they were restored at once. In addition to the Palo Alto estate, the university has a landed endowment of 75,000 acres of fruit and farming land. However, the principal endowment consists in interest-bearing securities which aggregate \$30,000,000. The university library has 100,000 volumes and is rapidly increasing.

A board of trustees of fifteen members, elected for terms of ten years, has general management. Academic matters are dealt with by the academic council, comprising the professors and associate and assistant professors. The departments include those of ancient and modern languages, law, economics and social science, engineering, history, botany, education, zoölogy, philosophy, geology and mining, applied mathematics, etc. The Hopkin's Laboratory of Natural History, at Pacific Grove, is affiliated with the university. Honorary degrees are not granted. The degrees include those of Engineer, Bachelor of Laws, Bachelor of Arts, and Doctor of Philosophy. The full course requires 120 hours of university work, 30 hours being an average year. David Starr Jordan, formerly president of the University of Indiana, was elected the first president, which position he is still holding.

**LEMAN, Lake**, a name frequently applied to Geneva Lake. See **Geneva, Lake of.**

**LE MANS** (lē-mōn'), a city of France, capital of the department of Sarthe, 132 miles southwest of Paris. It is well located on both sides of the Sarthe River, which is crossed by several bridges. Among the features are systems of sewerage and waterworks, paved streets, electric street railways, and numerous churches. The most noteworthy public building is the Saint Julian Cathedral. It has an important trade in farm produce and poultry. The manufactures include cotton and woolen goods, lace, candles, soap, and machinery. In 1871 it was the scene of a decisive battle, in which an army of 100,000 French was defeated by the Germans under Prince Frederick Charles. Population, 1906, 65,467.



**LEMARS** (lê-märz'), a city of Iowa, county seat of Plymouth County, on the Floyd River, 25 miles northeast of Sioux City. It is on the Illinois Central and the Chicago, Saint Paul, Minneapolis and Omaha railroads. The chief buildings include the public library, the county courthouse, and the Western Union College (Evangelical). It has manufactures of flour, cigars, clothing, brick, and machinery. The surrounding country is agricultural. Population, 1905, 5,041; in 1910, 4,157.

**LEMBERG** (lēm'bërg), a railroad and commercial city of Austria-Hungary, capital of Galicia, situated in a fertile region, 362 miles northeast of Vienna. It consists of the old and new parts, the latter having regularly platted streets and most of the prominent buildings. Many of the streets are paved with stone and asphalt. It has eight monasteries and many churches, and is the seat of Greek Catholic, Armenian, and Roman Catholic archbishoprics. Among the noteworthy buildings are the Polytechnic Institute, the city hall, the government house, the museum, and the archiepiscopal palace. The university was founded by Joseph II. In 1908 it had an attendance of 2,050 students. The university library has 175,000 volumes. Lemberg is a jobbing center and general market. It has manufactures of glass, clothing, furniture, jewelry, earthenware, and machinery. The inhabitants consist principally of Germans and Poles, for each of which separate gymnasia are maintained. Population, 1906, 163,108.

**LEMMING** (lēm'ming), a rodent quadruped found in the northern parts of America and Europe, particularly in Norway and Sweden.



LEMMING.

It is allied to the rat and mouse. Several species have been described, of which the *common lemming* of Europe is the best known. It is about six inches long and has a short tail. The general color is brownish, the limbs are short, and the head is large. It feeds on grass, reindeer moss, vegetables, and lichens. The favorite habitations are in burrows a short distance below the surface, in which the female brings forth several litters of young per year,

numbering from three to five at a birth. These animals are noted for migrating at certain periods, especially at the approach of winter, when they form an immense line and proceed in parallel columns. In their course they are preyed upon by flesh-eating animals, such as wolves, foxes, and bears, but they move across streams and mountains and even venture far into large bodies of water, where many lose their lives. The *banded lemming*, found in the vicinity of Hudson Bay, is the best known American species. It extends as far southward as the northern part of the United States.

**LEMNOS** (lēm'nös), an island in the Aegean Sea, the most northerly of the Grecian Archipelago, situated midway between Mount Athos and the Hellespont. The area is 160 square miles. It has several large bays, the extinct volcano Mosychlus, and a generally productive soil. The productions include cereals, wine, tobacco, and fruits. In 1657 the island passed from the Venetians to the Turks, since which time it has been a Turkish possession. Lemnian earth, a soft aluminum silicate, was first found in Lemnos, but occurs also in Russia, Bohemia, India, and other countries. It is caused by a decay of feldspathic rocks, has a fatty consistency, is reddish in color, and is used as a medicine in cases of dysentery and other diseases. Lemno, or Kastro, is the chief town. The inhabitants consist chiefly of Greeks. Population, 1907, 29,406.

**LEMON**, the fruit of the tropical or subtropical tree *Citrus Medica*, of the orange family, originally native to the tropical portions of Asia. It is quite certain that lemons were unknown to the ancient Greeks and Romans and that this fruit was introduced into Spain by the Arabs about the 12th century. The lemon tree has since been naturalized extensively. Many highly improved species have been produced by cultivation. The fruit is ellipsoidal, with a protruding point at each end, and from two to four inches in length. It has a bright yellow color, the skin is quite thick, and the internal pulp is very acid and juicy. From eight to twelve compartments are in the fruit, each containing several seeds. On account of their keeping property lemons are more profitable to grow than oranges. The tree is knotty-wooded, has oval leaves, and grows to a height of about eight feet. It bears very abundantly, many trees producing 3,000 lemons in a favorable season.

The fruit of the lemon tree is gathered while still green, wrapped in small papers, and shipped in boxes for consumption in the general market, the ripening taking place in transit or while kept in the store. Among the favorite species of



lemons are the sweet lemon, thin-skinned lemon, common lemon, and citron lemon. The principal uses are for the manufacture of oil of lemon, for flavoring in cookery, to make lemonade and other drinks, as a stimulant in medicine, and for perfumery. Oil of lemon is a volatile product and is secured from the rind by pressure. Lemon extract is made largely from the more im-



LEMON.

A, Flower; B, Section of Fruit.

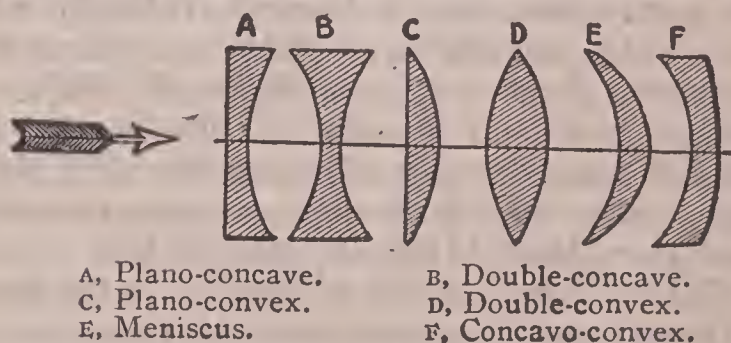
perfect fruit by squeezing, and, after removing all foreign properties, it is prepared with deodorized spirits and filtered. The most extensive production of lemons in the United States is in California and Florida, where large fields are cultivated successfully, and immense quantities are transported to all parts of America. They are grown in large orchards in the warmer parts of Europe and America, especially in the islands and countries of the Mediterranean. However, the Greek island of Andros and Sicily are particularly important in the culture of the lemon tree. In 1790 the cultivation of the lemon was introduced into Australia, where it is proving profitable.

**LEMUR** (lē'mūr), a family of mammals allied to the monkey, found mainly in Madagascar, but related species are common in Africa, Southern Asia, and the Philippines. The body, tail, and snout are long. A few species, as the *slender loris*, are tailless, but nearly all have a bushy tail which is about as long as the body. Most of these animals have longer hind legs than fore legs and are peculiarly odd in appearance. All are harmless and some build nests like birds. They inhabit forest districts, move about principally by night, and may be domesticated, when they become docile and play-

ful. The food consists of insects, vegetables, reptiles, birds, and fruits. Most of the species resemble the monkey in many respects, while others have foxlike faces and are about the size of a cat.

**LENA** (lyě'nà), one of the largest rivers in the world, rises near Lake Baikal, in southern Siberia, has a northeasterly course to Yakutsk, and thence flows nearly north into the Arctic Ocean. The entire length is 2,775 miles, the basin contains 950,000 square miles, and the delta is 250 miles wide. From May to October it is navigated, forming the most important transportation route of eastern Siberia, but the remainder of the year it is frozen. The valley is highly fertile, especially the upper part, where stock raising and farming are extensive industries. It receives the inflow from the Kuta, the Vitim, and the Kirenga.

**LENS**, a piece of transparent substance, usually glass, so called from the resemblance in form to the seed of a lentil, which is like a double-convex lens. A lens is shaped so as to afford two regular opposite surfaces, both curved, or one plane and the other curved, and designed to change the direction of rays of light, and for increasing or diminishing the apparent size of objects viewed through it. A lens that hollows or rounds inward is said to be concave; one that rounds outward, convex. The curved surfaces are usually spherical. Six distinct kinds of the ordinary lenses of this description are in general use. They are employed in the manufacture of telescopes, opera glasses, stereoscopes, spectacles, microscopes, lanterns, and other instruments and devices. The best grade of crown or



A, Plano-concave.  
B, Double-concave.  
C, Plano-convex.  
D, Double-convex.  
E, Meniscus.  
F, Concavo-convex.

flint glass is used in making lenses for microscopes and telescopes, and, since great accuracy is necessary in grinding and polishing, the lenses for the larger instruments represent much value. The six varieties of curved lenses include the double-convex lens, plano-convex, double-concave, meniscus, plano-concave, and concavo-convex. The *meniscus* are lenses in which the convexity is greater than the concavity, and the *concavo-convex* have greater concavity than convexity. See **Light**.

**LENT**, a fast of forty days, observed annually from Ash Wednesday until Easter by the



Anglican, Roman Catholic, and other churches as a season of special penitence and self-denial. It was instituted by the early Christian Church in commemoration of the resurrection of Christ, and to commemorate his fast of forty days in the wilderness. Originally the fast was but 36 days, the four additional being added in the 5th century, which change was generally accepted. Much rejoicing accompanies the close of Lent in Roman Catholic countries, and its beginning is preceded by the carnival. In many churches the fasting is left to the individual conscience of each member, but all are admonished to be diligent in prayer.

**LENTIL** (lě'n'til), a plant cultivated extensively in Europe and elsewhere for fodder and for human food. It grows to a height of about twenty inches, has numerous branches and whitish flowers, and bears seeds about as large as a pea. Garden lentil and field lentil are the two species commonly cultivated in Germany, France, Syria, and Egypt. Lentil straw is a wholesome fodder for stock. The seeds are used in cookery for soup, or are baked and prepared much like beans and peas. Formerly lentil was unknown in Canada and the United States, but its cultivation has been introduced into these countries.

**LEO.** See **Zodiac.**

**LEOMINSTER** (lěm'in-stēr), a town of Worcester County, Massachusetts, on the Nashua River, five miles south of Fitchburg. It is on the Boston and Maine and the New York, New Haven and Hartford railroads. The surrounding country is agricultural and dairying. It has electric street railways, public lighting, city waterworks, and a library of 18,000 volumes. The manufactures embrace musical instruments, linen and woolen goods, buttons, clothing, toys, and utensils. It was settled in 1725, but formed a part of Lancaster until 1740, when it was incorporated as a separate town. Population, 1905, 14,297; in 1910, 17,580.

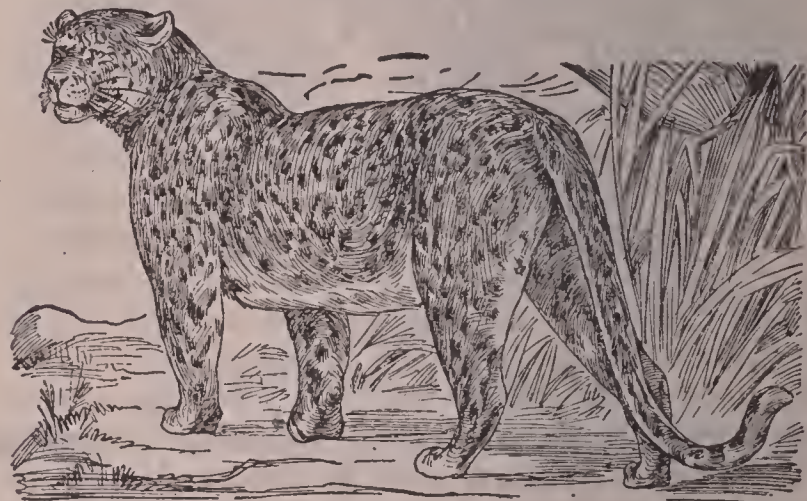
**LEÓN** (lă-ōn'), a city of Mexico, in the state of Guanajuato, 32 miles west of Guanajuato. The site is in a fertile plain, on railways and regular routes of travel. It has manufactures of machinery, cotton and woolen goods, and leather. Among the chief buildings are a library, the city hall, and a number of schools and churches. It has modern municipal facilities, including waterworks, sewerage, and a public park. The jobbing trade is extensive. Population, 1906, 64,632.

**LEÓN**, the principal city of Nicaragua, Central America, capital of the department of León, on the shore of Lake Managua, twelve miles from the Pacific. It is surrounded by fer-

tile plains, has good railroad connections, and is well improved with pavements and parks. León is the seat of an episcopal palace, several churches, and the College of Saint Ramon. It has a good public school system, modern municipal facilities, and contains a massive cathedral. The manufactures and commercial enterprises are important. It has a growing trade in live stock, cereals, fruits, and merchandise. Population, 1906, 48,402.

**LEÓN**, a city of Spain, capital of the province of León, 81 miles northwest of Valladolid. It is celebrated as the capital of an ancient kingdom of the same name. The city was founded by the Romans, who named it Legio. Population, 1906, 18,041. See **Spain.**

**LEOPARD** (lěp'ěrd), a ferocious, carnivorous mammal native to Asia and Africa. It is regarded by some writers as allied to the pan-



LEOPARD.

ther, by some as a species of it, and by still others as a distinct species. The color is largely a pale fawn spotted with dark brown or black in rosettes or broken rings. The lower part of the body is whitish, the tail is long, and the movements are graceful and rapid. It can leap over precipices with ease and readily ascend trees, from which it springs upon its prey with marked certainty. The leopard is bloodthirsty, often killing more than it can devour for the sake of the fresh blood, and steals from ambush upon its prey, such as poultry, deer, antelope, or any animals it can destroy. The favorite haunts are in the woods. Its size and strength are sufficient to overcome a man, but it rarely attacks human beings, except in defense or when in dire need of food.

**LEOPOLDVILLE**, a city of the Congo Free State, on the Congo River, at the outlet of Stanley Pool. It is connected by a number of important railroads, giving it decided trade advantages. The cataracts occupy a distance of 235 miles and are impassable by vessels, but



about 7,000 miles of the Congo River and its tributaries above Leopoldville are navigable, hence the importance of the city as a trade and commercial center. The streets are platted at right angles. It has electric lights, waterworks, and several fine schools and churches. The city was named from Leopold, King of Belgium. Population, 1906, 21,785.

**LEPANTO** (lě-păn'tō), or **Naupaktos**, a seaport of Greece, on the north coast of the Gulf of Corinth, or Lepanto. Anciently it was of vast commercial importance. It came into possession of the Athenians after the Persian wars. The Venetians fortified it in 1477 and improved its harbor. On Oct. 7, 1571, a memorable battle occurred near Lepanto between the fleet of the Turkish Sultan and the allied fleets of Philip II. of Spain, Pope Pius V., and the republic of Venice. Prince Don John of Austria commanded the allied fleets, while the Ottoman fleet was under the command of Ulutch Ali of Algeria, Ali Pasha, and Mohammed Sirocco of Egypt. The battle raged four hours and terminated in the destruction of the Ottoman fleet of 200 galleys and sixty other vessels. From the Battle of Lepanto dates the decline of Turkish power in Europe.

**LEPROSY** (lěp'rō-sŷ), a chronic skin disease characterized by ulcerous eruptions and successive scaling off of dead skin. Those affected show symptoms that include thickening of the skin, loss of hair and feeling, offensive perspiration, ulceration, and death of parts. Two forms are generally recognized, known as tuberculous and nontuberculous, or anaesthetic. In ancient times many skin diseases were regarded as leprosy, but it is now generally restricted to *elephantiasis*, the name applied by the Greeks, and designated *lepra* by the Arabs. Leprosy is hereditary. It is regarded contagious, being caused by a minute organism, a bacillus, which may be conveyed to those not affected, and after a time develops the worst forms known. In former times the disease was prevalent to a vast extent, but was found more frequently in men than in women, and prevailed principally among the people who were excessively exposed to filth, poverty, and cold damps. At present it prevails most extensively in Iceland, the Pacific islands, the Hawaiian Islands, the West Indies, Madagascar, the Greek archipelago, in the vicinity of the Mediterranean, and the East Indies.

Increased efforts have been made within recent years not only to limit the spread of leprosy, but to provide adequate care for those afflicted. In Louisiana is a plantation for lepers, on which several hundred receive treatment,

while similar provisions have been made in a number of the other states. One of the largest colonies of lepers now within the domain of the United States is on the island of Molokai, one of the Hawaiian group, where about 1,250 persons are confined, about one-third of whom are females. Visitors have access to the colony, but the lepers are separated from others by wire fencing. A semiofficial estimate published in 1908 placed the number of lepers in the Philippine Islands at 30,000, most of whom are in the Visayas. Japan has 200,000 registered lepers. An estimate places the number in India and China at 500,000 for each country.

**LESBOS**, or **Mytilene**, an island in the Aegean Sea, formerly a possession of Greece, but now a part of Turkey. It is situated near the coast of Asia Minor, has a triangular form, and includes a total of 675 square miles. The surface is generally mountainous, but there are large tracts of fertile coast and valley lands. Among the chief products are pine timber, live stock, cereals, and tropical fruits. Aeolian colonists settled the island at an early period and built cities upon it. The poets and literary men of Lesbos included Sappho, Theophrastus, Arion, Pittacus, and several others famous in the history of Greece. Since 1462 it has been a possession of Turkey. The inhabitants consist almost entirely of Greeks and Turks, but the former are in the majority. Population, 1906, 128,403.

**LESINA** (lěs'ě-nä), an island in the Adriatic Sea, near Dalmatia, belonging to Austria. It is thirteen miles long and has an undulating surface. The principal town is Lesina, which has a good harbor, and exports fruits and cereal products. Population, 1906, 15,236.

**LESSER ANTILLES.** See **Leeward Islands; Windward Islands.**

**LETHE** (lě'thě), a stream mentioned in Grecian mythology, which flowed gently and silently in a secluded vale of Elysium. The waters of the Lethe had the property of dispelling care and producing utter forgetfulness of former events. The Pythagorean doctrine of the transmigration of souls implied that after the mortals had inhabited Elysium a thousand years they were destined to animate other bodies on earth, and, before leaving Elysium, they drank of the waters of the River Lethe in order that they could enter upon their new career without any remembrance of the past.

**LETTER**, as commonly understood, the name applied to a written message or communication. Previous to the rapid transit of intelligence by railway, steamboat, telephone, and telegraph, letters served a quite different purpose



than they do at present in that they assumed the form of epistles. These writings now constitute a large part of the literature that has come down to us through the centuries. Many of the letters of Cicero, Pliny, and Seneca are included in ancient literature. The epistolary writings of the early Christians, including the epistles of the New Testament, belong to this class. Among the literary men of more recent times are many writers who delighted to contribute messages of friendship and intelligence to others, and for this purpose wrote letters, sometimes of a private, but frequently of a public, character. We find in the literature of all languages men who were especially noted for extraordinary ability in letter writing. Such, for instance, were Walpole, Cowper, and Gray among the English; Goethe, Humboldt, and Schiller of the Germans; and Voltaire and Madame de Sévigné among the French.

**LETTERS OF MARQUE AND REPRISAL**, a commission issued by a state or government authorizing the bearer to pass beyond the boundaries of his own country for the purpose of capturing prizes of the enemy, consisting of their persons or goods. The term *letters of marque* signifies a license from the government to pass beyond the limits or jurisdiction of one's own country. On the other hand, *reprisal* signifies taking in turn.

**LETTS** (lěts), a people inhabiting portions of Russia, largely in Livonia, Courland, Kovno, and Vitebsk. They are Slavonic, closely allied to the Lithuanians, and number about 1,000,000. In 1586 the Lutheran Catechism was translated into the Lettic language. Many literary products of the Letts have much value, but many of the race have been Germanized. Most of these people are Protestants. The total number is about 1,350,000.

**LETTUCE** (lět'tis), an annual plant of the order *Compositae*, cultivated in gardens as a salad. Many species are grown, most of which attain a height of two feet, bear yellowish flowers, and have variously formed leaves. The plant is in its best state when from four to six inches tall, when it is tender and best adapted as a food. Lettuce has been cultivated in gardens since very early times, but does not grow spontaneously in any country. It includes both greenish and purplish species. Some have heads resembling those found in several kinds of cabbage.

**LEUCADIA**, or **Santa Maura**, an island off the west coast of Greece, in the Ionian Sea. The area is 109 square miles. It is traversed by hills, but contains a fair proportion of fertile soil, and produces cereals, fruits, and wine. In

the southern part is a line of white cliffs, the highest of which is about 2,000 feet, known as the Leucadian Rock, or the Lover's Leap, so called from despairing lovers throwing themselves from it. Amaxichi is the chief town. The inhabitants are chiefly Greeks. Population, 1906, 34,982.

**LEUCTRA** (lūk'trà), a village of Greece, in Bocotia. It is famous as the place where the Thebans under Epaminondas defeated the Spartans under Cleombrotus, in 371 B. C. Sparta had exercised an influence over Greece for several centuries, since the close of the Peloponnesian War, in 404 B. C., but it was terminated by the Battle of Leuctra.

**LEUTHEN** (loi'ten), a small town of Germany, in Lower Silesia, celebrated on account of a battle fought there on Dec. 5, 1757, by which Prussia recovered most of Silesia. The



CABBAGE LETTUCE.

Prussian army consisted of 35,000 men under Frederick the Great, while 90,000 Austrians were under Prince Charles of Lorraine, but the former won a decisive victory.

**LEVANT** (lě-vănt'), an Italian term, meaning the East. It is applied in a restricted sense to the Asiatic coast of the Mediterranean, from Constantinople to Alexandria, Egypt, but in a more general sense to the regions from Italy to the Euphrates and the Nile.

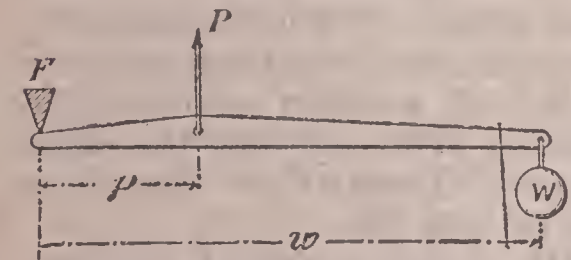
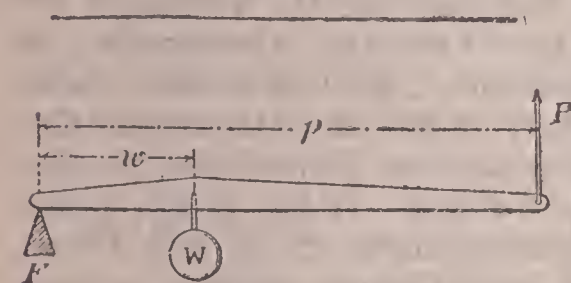
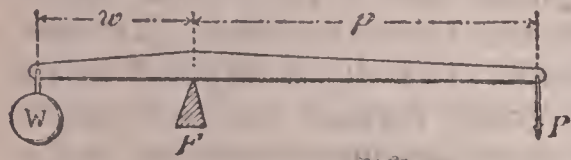
**LEVEE** (lěv'ê), a French term applied to embankments constructed to prevent water from overflowing level tracts of land, but now used in a similar way in the English and other languages. The most important levees of America are those of the lower Mississippi, which border the river for a distance of 1,200 miles. These levees are now almost continuous from Cairo, Ill., to the Gulf of Mexico, a distance of 1,000 miles. They serve to confine the stream to its natural channel. Other levees of vast extent are those of the Ganges River in Asia, of the Po



River in Italy, and those of Holland, the latter being more commonly called dams.

**LEVEL**, an instrument for indicating a horizontal line, for determining the true level, or to ascertain the difference of elevation between two or more places. It is used in engineering, architecture, surveying, drainage, and in many other arts. The devices used for such purposes are numerous, including those in which the horizontal line is determined by a bubble of air floating in a fluid contained in a glass tube, as in a spirit level; those in which the horizontal line is determined by the surface of the fluid at rest, as in the water and mercurial levels; and those of the simpler forms used by carpenters and masons, in which the vertical line is determined by a plumb line and the horizontal by a line perpendicular to it. The action of gravity is the principle upon which all levels are based.

**LEVER** (lē'vēr), an inflexible bar or rod moving upon a fixed point called the *fulcrum* or *prop*, and having the *weight* to be moved and



THREE CLASSES OF LEVERS.

the *power* to move it applied at two other points. The lever is one of the mechanical powers. It includes three classes, being numbered according to the relative positions of the fulcrum, the points of application, and the force of the weights. In levers of the *first class* the fulcrum is between the force and the power, as in a pump handle, in which the hand is the power, the water lifted is the weight, and the pivot is the fulcrum. Levers of the *second class* have the weight between the fulcrum and the force, as an oar, in which the hand is the power, the boat is the weight, and the water is the fulcrum. In levers of the *third class* the power is applied between the fulcrum and the weight, as in the treadle of some grindstones, in which the front end resting on the ground is the fulcrum, the foot is the power, and the force is transmitted

by the rod to the weight, the wheel above. In the lever advantage is gained mainly at a loss of time, that is, a heavy weight may be lifted by a small power passing through a greater distance. The force being smaller, it passes through a greater distance than the weight, and for that reason is able to overcome material resistance. The power is increased by a system of compound levers, as in an ordinary farm scale, in which a heavy load may be balanced by a slight touch of the hand.

**LEVIS** (lā-vē'), or **Point Levi**, a city of Quebec, capital of Lévis County, on the Saint Lawrence River, opposite Quebec. It is on the Grand Trunk and the Intercolonial railways, has extensive docks, and is connected with Quebec by one of the largest cantilever bridges in the world. The chief buildings include the county courthouse, the high school, and many fine churches. Among the manufactures are woolen goods, boots and shoes, furniture, machinery, and soap. It has a large domestic and foreign trade. The place was settled in 1647 and incorporated in 1861. Population, 1901, 7,783.

**LEVITES** (lē'vīts), the descendants of Levi, who were selected as the guardians of the sanctuary of Israel and ministers of worship. When the lands of Palestine were divided, the three divisions of Levites, the descendants of the three sons of Levi, Gershon, Kohath, and Merari, received no territorial possession, but were given tithes of the agricultural products. There were properly two classes of Levites, the entire tribe considered collectively, and those who were designated the sons of Aaron. Forty-eight cities of Canaan were assigned to the tribe of Levi, of which the priests were to occupy thirteen. The duty of preserving and interpreting the law was assigned to the Levites in connection with their other duties, and at the feast of tabernacles they were to read the law before the people once every seventh year. They lost their importance after the revolt of the ten tribes, but their lineage has been kept up more distinctly than that of any other, and even to the present time there are those who claim to be pure descendants from Aaron.

**LEVITICUS** (lē-vī'ĩ-kūs), the third book of the Old Testament. It contains the laws and regulations concerning the Levites and the ceremonies of worship. The offering of sacrifices, the distinction of things clean and unclean, the consecration and authority of priests, the feast of atonement, the sabbatical and jubilee years, and the prohibition of theft, perjury, and idolatry are treated in the book. It is of Mosaic origin.



**LEWIS AND CLARK EXPOSITION**, an international exposition held at Portland, Ore., to celebrate the centennial of the exploration of the Oregon country by Lewis and Clark. The gates were opened June 1, 1905, and closed Oct. 15, 1905, a period of 137 days. In point of attendance it ranks fourth among American expositions, being exceeded only by those held at Chicago, Saint Louis, and Buffalo, and the large receipts made it a financial success. Official reports place the attendance at 2,545,509. The exposition represented an expenditure of \$7,500,000, of which Portland contributed \$400,000 and Oregon \$450,000. The cost and dimensions of the principal buildings were as follows:

	DIMEN- SIONS, FEET.	COST.
Forestry Building .....	206x100	\$30,165
Oriental Exhibits Building .....	308x160	55,425
Agricultural Building .....	460x210	69,130
European Exhibits Building .....	462x100	51,720
Machinery, Electricity, and Trans- portation Building .....	500x100	28,540
Festival Hall (Auditorium) .....	108x120	12,534
Mines and Metallurgy Building ..	200x100	14,320
Arts and Varied Industries Build- ing .....	240x375	38,216
Fine Arts .....	*25x175x150	10,000

\*L-shaped.

**LEWISTON** (lū'is-tūn), a city of Idaho, county seat of Nez Perces County, on the Snake and Clearwater rivers, 144 miles south by east of Spokane, Wash. It is on the Oregon Railroad and Navigation Company Line and the Northern Pacific Railroad, and is surrounded by a productive agricultural and mining country. The industries include flouring mills, grain elevators, and sawmills. It has a growing trade in live stock, fruit, and merchandise. Waterworks and electric lighting are among the public facilities. It is the seat of the State normal school and maintains fine public schools. On the opposite side of the Snake River is the town of Clarkston, Wash., with which it is connected by a steel bridge. Population, 1910, 6,043.

**LEWISTON**, a city of Maine, in Androscoggin County, on the Androscoggin River, opposite Auburn, 35 miles north of Portland. It is on the Maine Central and the Grand Trunk railroads and several electric interurban railways. The noteworthy buildings include the townhall, the public library, and Bates College. The last named institution was founded in 1863 and endowed by Benjamin E. Bates and others. It has a fine public park and an auditorium. The river has a fall of about fifty feet, by which immense water power is secured through a canal as a means to promote industrial enterprises. The manufactures include cotton and woolen goods,

clothing, machinery, leather products, belts, hats, brooms, and utensils. The surrounding country is agricultural, giving the city an important trade in cereals and live stock. It was settled in 1770, when it became known as the Plantation of Lewiston, and was incorporated in 1795. Population, 1900, 23,761; in 1910, 26,247.

**LEWISTON**, a village of New York, in Niagara County, on the Niagara River and the New York Central Railroad. It is the terminus of navigation on Lake Ontario and is visited regularly by steamers from Toronto. It has a public library, and is visited by tourists during the summer months. The French located a blockhouse on its site in 1720. In 1814 it was occupied by the Americans under General Riall, who was defeated by a force of British and Indians under Colonel Tucker, and the place was burned. Population, 1905, 708.

**LEXINGTON** (lēks'ing-tūn), a city in Kentucky, county seat of Fayette County, twenty miles southeast of Frankfort. It is on the Southern, the Queen and Crescent, the Baltimore and Ohio, the Louisville and Nashville, and other railroads. The city is situated in the celebrated blue grass region, has well-paved streets, modern municipal improvements, and is the center of a large commercial trade. Among the noteworthy buildings are the Hamilton Female College, the Kentucky University, the Sayre Female Institute, Saint Catherine's Academy, the State Agricultural and Mechanical College, the Kentucky Reform School, and the McClelland Female College. It has a fine public library, a commodious high school, and Woodland Park. The manufactures include cordage, spirits, copper products, saddlery, hemp and cotton goods, clothing, carriages, and machinery. It has a large trade in Bourbon whisky, tobacco, cereals, and fine stock. A fine monument to Henry Clay is among the interesting structures that adorn the city. It was first settled in 1779, was incorporated in 1782, and was the capital of Kentucky from 1792 until 1793. Population, 1900, 26,369; in 1910, 35,099.

**LEXINGTON**, a town of Middlesex County, Massachusetts, ten miles northwest of Boston, on the Boston and Maine Railroad. It is celebrated as the site of the first battle of the Revolution, which occurred here April 19, 1775. The British had secretly dispatched a force from Boston to seize the military stores collected at Concord, the news of which was spread by Paul Revere. Accordingly, the call to arms was sounded and the militia was armed. When Major Pitcairn reached the village with British troops he found minutemen drawn up on the green. Finding that they refused to disperse at



his command, he promptly ordered his men to charge, but the militia held its ground until the British were reënforced, when they fell back and Major Pitcairn moved on to Concord. On returning from Concord, the British were attacked at Lexington and pursued by a galling fire from all sides. Exhausted by their march of eighteen miles and their fast of fourteen hours, the British fell into a disorderly flight and would probably have been destroyed, if Lord Percy had not come forward with heavy reënforcements from Boston. The British lost 273 men, the Americans lost 93 men. This engagement so aroused the colonists that within a week 16,000 men were besieging General Gage in Boston. Lexington contains a monument erected in 1799 to commemorate the battle. Population, 1905, 4,530; in 1910, 4,918.

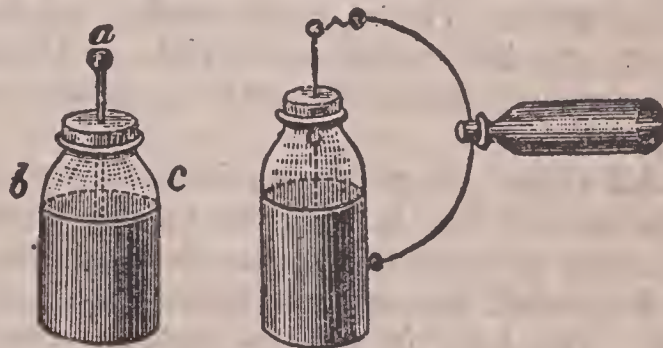
**LEXINGTON**, county seat of Lafayette County, Missouri, on the Missouri River, forty miles east of Kansas City. It is on the Missouri Pacific and the Atchison, Topeka and Santa Fé railroads. The principal buildings include the Baptist Female College, the Central Female College, and the Wentworth Military Institute. Large quantities of coal and farm products are obtained in the surrounding country. It has manufactures of earthenware, clothing, and machinery. The place was first settled in 1825 and incorporated in 1830. At the time of the Civil War, in 1861, it was the scene of several engagements between the Federals under Colonel Mulligan and the Confederates under General Price. Population, 1910, 5,242.

**LEXINGTON**, county seat of Rockbridge County, Virginia, on the North River, in a fertile agricultural and stock-raising country. It is on the Baltimore and Ohio and the Chesapeake and Ohio railroads and is the western terminus of the James River and Kanawha Canal. The manufactures include flour, machinery, and ironware. Besides a good public school system, it has the Washington and Lee University and the Virginia Military Institute. It is historic because of being the burial place of Thomas J. Jackson and Robert E. Lee, the two most distinguished generals of the Confederate army. Population, 1900, 3,203.

**LEYDEN** (lī'den), or **Leiden**, a city of Holland, on the Old Rhine River, 22 miles southwest of Amsterdam. It is the oldest city in Holland. In 1640 it had a population of 100,000, but gradually declined until the beginning of the last century. Since then the city has gained considerably in population and importance. It has manufactures of cotton and woolen goods, earthenware, machinery, clothing, and musical instruments. The noteworthy buildings include

the Church of Saint Peter, the townhall, the municipal museum, the union railway station, and the public library. It is the seat of the University of Leyden, founded in 1575, which has a fine library and 975 students. The municipal facilities are modern, including electric lights and street railways, stone and asphalt pavements, and systems of sewerage and waterworks. The colony at Plymouth, Mass., was founded by the Pilgrims, who sailed from Leyden. Population, 1906, 57,095.

**LEYDEN JAR**, an electric accumulator introduced in 1746 by Musschenbroek of Leyden, Holland. It is constructed by coating the inside and outside of a glass jar with tin foil, for about two-thirds of the height, as shown in the accompanying illustration at *b* and *c*. The inside coating is connected with a metallic rod, *a*, having a brass knob at the top. To charge the jar the knob is brought near the conductor of an electric machine, and a number of sparks are passed into the jar. The inside coating is charged positively and the outside negatively, and, if one hand be placed on the outer coating and the other on the knob, a discharge passes through the body and gives a more or less



LEYDEN JAR.

severe shock. Several jars connected with one another, having their inner and outer coatings respectively in contact, constitute a battery of Leyden. In such a battery it is possible to collect a quantity of electricity equal to the sum of the charges from each jar, which may be passed through a number of persons joined hand to hand, while by a very large battery it is possible to melt metallic wires, rupture bad conductors, and otherwise utilize its force.

**LHASSA** (hläs'sä), or **Lassa**, the capital and principal city of Tibet, on the Upper Brahmaputra River, surrounded by elevated mountain ranges. It has been held sacred by the Buddhists for many centuries, is a commercial center of considerable magnitude, and has a diversity of manufactures. It is the seat of several noted monastic establishments, to which people from Tibet and Mongolia are attracted in great numbers. Formerly it was walled and fortified, but the fortifications were destroyed



by the Chinese in 1742. The inhabitants include, beside the native Tibetans, many Chinese, Hindus, and Arabs. Population, 1908, 32,575.

**LIANA** (lî-ā'nà), or **Liane**, the name applied by French travelers to a large variety of twining and climbing plants of tropical forests, but now commonly used by travelers of all nations. Most lianas have woody, ropelike stems and climb to the tops of trees, but sometimes run very far along the ground. Some species, such as the clematis and honeysuckle, are found in colder climates. In many tropical countries, where rainfall is unusually large, the lianas grow to the tops of the highest trees, often entwining the trunks with such force as to suppress life, and in other instances bearing heavily upon the branches, even breaking down large trees by their heavy vines and foliage. In some localities a dense network is formed among the forest trees, making it almost impossible to penetrate them without cutting passages, while animals keep open narrow paths by continuous use, or pass from bough to bough along the heavier vines. Many species bear beautiful flowers, others possess medicinal properties, while some are used in the manufacture of baskets and small wooden ware. The Amazon valley of South America, the lake region of Africa, and tropical Asia present notable districts in which lianas thrive.

**LIAS** (lî'as), in geology, a formation situated at the base of the Jurassic or Oölitic deposits. It consists principally of thin beds of blue or gray limestone, becoming light brown when exposed. The Lias formations contain abundant marine fossils, among them those of fishes, reptiles, and mollusks. They are likewise rich in numerous remains of plants.

**LIBAU** (lê'bou), a fortified city of Russia, on the Baltic Sea, in the province of Courland. It has well-improved streets, a naval school, a public library, and several hospitals and gymnasia. The manufactures include furniture, flour, machinery, and clothing. It has a large domestic and export trade in petroleum, cereals, and live stock. The Knights of Livonia fortified it in 1301. It has been a possession of Russia since 1795. Population, 1906, 66,894.

**LIBBY PRISON**, a large building formerly located in Richmond, Va., used as a Confederate military prison during the Civil War. Prior to that time it served as a tobacco warehouse and was so named from the owner. The first prisoners were confined there after the first Battle of Bull Run and at times it contained 1,200 prisoners. In 1864 a tunnel about fifty feet long was excavated by the prisoners, when 109 of those confined made their escape, but

half of them were recaptured before they reached the Federal lines. The structure was taken apart and removed to Chicago in 1888 and was there opened as a museum. Later it was taken down for its material.

**LIBEL** (lî'běl), the act of making an attack in writing, printing, or by signs, upon the character or reputation of another. It differs from slander, in that the latter constitutes a similar injury by spoken words. While liberty of speech and the press is recognized in all the states, both are restricted to an extent whereby the good name and character of all are protected. If statements that are true as an entirety be published against an individual, the act of publication is justifiable. However, in some states it has been held necessary to show that the publication was made for justifiable reasons and with good motives. Several important cases for libel were brought in the United States against a number of prominent publishers of newspapers, including Joseph Pulitzer of the *New York World*, in 1909, owing to charges of irregularities on the part of President Roosevelt and others in connection with the Panama Canal.

**LIBERAL REPUBLICAN**, a party which left the regularly organized Republican party in the presidential campaign of 1872. It declared in favor of tariff reform, civil service reform, universal amnesty and suffrage, and absolute opposition to Kuklux Klan disorders. Carl Shurz and other Republicans of Missouri were the first leaders in the movement. The party united with the Democrats in supporting Horace Greeley for the Presidency. Subsequently they reunited quite generally with the Republicans.

**LIBERALS**, those who advocate progressive views in politics, and who, through agitation and legislation, seek to secure a more liberal application of the principles of democracy in government. Political parties who make liberalism the basis of action are well organized in the leading countries of Europe. The Liberal party in Great Britain is usually the minority party in England, but generally has a majority vote in Wales and Scotland. It is the lineal successor of the Whigs and had its greatest modern champion in W. E. Gladstone, who, in 1886, incorporated the purchase of land through government aid and the Irish Home Rule bill as party tenets. This led to the formation of the Liberal Union party. The Liberals were out of power until 1906, when, under the leadership of Campbell-Bannerman, they gained a great victory on the issue of free trade. The Liberals are opposed to the Conservatives. The Radicals, although a branch of the former, demand more radical and sweeping reforms.



**LIBERAL UNIONIST**, a party formed in England in 1886, under the leadership of the Marquis of Hartington, in opposition to the policy of Gladstone. It was designed by the latter that the lands in Ireland be purchased and ultimately owned by the tenants, which the Liberal Unionists opposed, and the movement likewise contended against Home Rule. The party was represented by leagues in all parts of Great Britain. It supported about 250 branch organizations, elected 94 members to Parliament, and subsequently merged into the Conservative party.

**LIBERIA** (lĭ-bĕ'rĭ-à), a republic of Africa, on the northern coast of the Gulf of Guinea, extending northeast from Cape Palmas. The southeastern boundary is formed by the Cavally River and the northwestern by the Manua River. It extends inland from the coast a distance of about 250 miles. The coast line is 400 miles long. It has an area of about 35,000 square miles. The republic was formed in 1821 by liberated slaves from America, who at present number about 60,000, including American descendants, and the independence of the country was recognized by the United States and other governments in 1847. The government is under a constitution modeled after that of the United States. Under it the executive authority is vested in a president, who is elected for two years. He has the assistance of a cabinet, including the departments of state, justice, interior, finance, war, marine, and ports.

The legislative power is vested in a congress of two branches, the senate and the house of representatives. The former consists of eight senators, who are elected for four years, and the house of representatives is constituted of fourteen members, these being elected for two years. No standing army is maintained, but all able-bodied male citizens are members of the militia and are liable to be called upon when necessary. The government maintains a number of small gunboats. Slavery is prohibited, religious worship is entirely free, internal improvements are encouraged, and a system of elementary schools are supported by taxation. Many of the natives have little advancement in educational arts, but in the main the republic has not been a disappointment. Its influence has been extending locally. In 1899 there was some discussion of a protectorate by the United States, Germany, and Great Britain, under which it was hoped to increase native obedience to law, and intercept the encroachment of the French upon its territory. However, the republic is still entirely free from European claimants.

The coast regions of Liberia form an undulating plain, but through the interior are mountain ranges, with considerable elevations in the northern part. It is drained by numerous streams, possesses fertility of soil, and has some valuable mineral deposits, though mining has not been developed extensively. The principal exports include sugar, coffee, palm kernels and oil, cocoa, ivory, rubber, and hides. Hardware, earthenware, cotton goods, machinery, and utensils are imported. The import trade is chiefly with Germany, but there are growing commercial relations with the United States, Great Britain, Holland, and France. Monrovia is the capital and principal seaport. Other cities are Buchanan, Edina, Harper, and Robertsport. Population, 1908, 1,840,500.

**LIBERTY, Statue of**, a celebrated bronze statue in the harbor of New York City, located on Bedloe's Island. It was executed by Felix Bartholdi, a French sculptor, and presented by the people of France to the United States to commemorate the 100th anniversary of its independence. It was placed in position in 1885 and was dedicated the following year. It is the highest statue in the world, being 306 feet above mean tide. The female figure, from the base to the top of the head, is 111 feet high, and to the top of the torch, 151.41 feet. The inside of the head, in which forty persons can stand, is reached by a stairway within the statue, and a branch staircase extends for some distance up the right arm. An electric light is in the torch. The statue is known as Liberty Enlightening the World.

**LIBERTY BELL**, a famous bell of the United States. It formerly hung in Independence Hall, Philadelphia, Pa., and rang as the news of the signing of the Declaration of Independence was made known on July 4, 1776. It was brought from England in 1752, but was twice recast in 1753 because of becoming cracked. In 1835, while being tolled in memory of Chief Justice Marshall, it was again cracked. It has been exhibited at several expositions, but is kept at Independence Hall, Philadelphia. The bell has the inscription, "Proclaim liberty throughout all the land, unto all the inhabitants thereof" (Lev. xxv., 10).

**LIBERTY PARTY**, a political organization of the United States, formed in 1839 to oppose slavery. Though it did not attain a large membership, it effected much in the way of forming public opinion. Among its members were such eminent men as Salmon P. Chase, Louis Tappan, and Samuel Lewis. James G. Birney was its candidate for President in 1840, receiving 7,059 votes. He was likewise its presidential candi-



date in 1844, when he received 62,300 votes. John P. Hale was nominated for President in 1848, but he withdrew when Martin Van Buren was nominated for the same office by the Free Soil party, which ultimately absorbed the Liberty party.

**LIBRA** (lĭ'brà). See **Zodiac**.

**LIBRARY** (lĭ'brâ-rÿ), a term used to designate a collection of books and pamphlets kept for reading and consultation, and to describe a building containing such a collection. The different classes of libraries include such collections of individuals, municipalities, public and parochial schools, higher institutions of learning, and those of states and nations. In treating this subject particular attention is directed by most writers to the larger public libraries, but it is certain that private libraries are by far the most numerous and as a whole constitute collections of books and manuscripts representing a comparatively large value. However, statistics relating to private collections are not generally available and many of such libraries, either in whole or in part, are merged from time to time with public collections.

**HISTORY.** The earliest public library of which we have any knowledge was founded by the Assyrians in the 8th century B. C., but it is known that libraries were maintained in Babylon, Egypt, and other ancient countries at a very early date. According to Strabo, the first private library was that of Aristotle, in the year 334 B. C., but public libraries existed from times much earlier. A public library was founded at Athens about 540 B. C. by Pisistratus. The celebrated Alexandrian library, established about 298 B. C. by Ptolemy I., was greatly damaged in the Egyptian campaign of Caesar, in 47 B. C., and was finally destroyed in 640 A. D. by Caliph Omar. The libraries established under the ancient civilizations, though voluminous, differed largely from those of the present in that printing had not been invented. At that time writings of the different classes were preserved by inscriptions on skins, papyrus, and stone. In Persia, at the time of its greatest prosperity, vast libraries were established. The Hebrews likewise exercised much care in the collection of books in secure archives.

The King of Pergamus, Eumenes II., established a library of 200,000 volumes, which passed to the care of Eumenes III., and later this collection came into the possession of Mark Antony, who transported it to Alexandria as a present to Cleopatra. Julius Caesar was particularly anxious to build up a vast public library containing all the more valuable works of Greek and Latin writers, but his early death left the

project to be carried out by Octavianus Caesar. The two libraries established by the latter were the Palatine and the Octavian, the former existing up to the time of Pope Gregory I., but these and other libraries suffered extensively by the invasion of the Huns, Goths, Vandals, and other semibarbaric tribes, much of their contents being mutilated or destroyed in the conflicts of war. Constantine collected a vast number of books devoted to Christianity that had been preserved notwithstanding the spirit of unrest during the period of persecution under Diocletian. This library, being enlarged at different times, included fully 120,000 volumes, but in the 8th century a large part of it was destroyed. However, many valuable books and other writings of the ancient libraries have been preserved. It is in this way that former civilizations contribute to the extension of knowledge and culture, since all succeeding generations draw upon the experiences and writings of scholars who labored in the past. The civilized countries of all the grand divisions have libraries of a greater or less number of volumes. Additions are made to these collections from time to time as the communities develop and new discoveries are made in the arts and sciences.

**FRENCH.** The Bibliothèque Nationale at Paris, France, is at present the largest library in the world. It was instituted in the reign of King John and since then has been enlarged from time to time. Although an exact count has not been made since 1791, the number of books is placed at 3,500,000 volumes. It likewise has many manuscripts and pamphlets. France is noted for its numerous libraries, both public and private. The public libraries belong largely to learned societies, educational institutions, and the state. Libraries of more or less value are attached to all the public schools, being maintained by public taxation. Paris has a number of other libraries, aside from the great national library, such as the Arsenal, the Mazarin, and the Library of Sainte Geneviève. Other noteworthy collections are located in Rouen, Lyons, and Bordeaux.

**GERMAN.** German-speaking countries, including Germany, Switzerland, the Netherlands, and large parts of Austria, Belgium, and Russia, are noted for their many large libraries, in which respect they stand first among European countries. The want of political unity of various cities and provinces has made this condition possible. In Germany proper are several thousand excellent libraries, all of which are open to the public for study and research. The most important of these include the national library at Berlin with 1,000,000 volumes; Breslau, 400,000;



Darmstadt, 400,000; Dresden, 400,000; Heidelberg, 350,000; Leipzig, 750,000; Munich, 1,200,000; Strassburg, 525,000; Stuttgart, 450,000; Tübingen, 250,000; and Würzburg, 300,000. Those of Austria are not so numerous, but likewise represent a vast value, the largest being in Vienna, where the national library has 500,000 volumes. The most noted library of Switzerland is the one at Basel, having 150,000 volumes; in Belgium, the Brussels library has 375,000 volumes; in Holland, the library of The Hague has 225,000 volumes.

**BRITISH.** The libraries of Great Britain include those of the United Kingdom and the colonies. Attention was first given to the collection of vast libraries in England in the 17th century, since which time they have steadily increased in size and value. The most extensive library of Great Britain is the one in connection with the British Museum, which contains 1,500,000 volumes of books, 50,000 manuscripts, and 45,000 charters. Other noted libraries include the one at Cambridge University with 225,000 volumes; Edinburgh, 275,000 volumes; Bodleian Library, Oxford, 500,000 volumes; Glasgow, 130,000 volumes; Trinity College, Dublin, 200,000 volumes; and Birmingham, 115,000 volumes. At present the most extensive libraries in British colonies are in Australia and Canada, but there are many fine collections in India. The largest of Australia is at Melbourne, containing 125,500 volumes, and of Canada is at Ottawa, having 220,500 volumes.

**OTHER COUNTRIES.** The libraries of Italy are especially valuable in that they contain many rare manuscripts of antiquity and products of Italian masters. Among the extensive collections are the Florence library with 425,000 volumes; the Vatican library at Rome, 250,000 volumes; Padua, 160,000 volumes; and Venice, 275,000 volumes. The largest library of Denmark is at Copenhagen, having 500,000 volumes; the largest of Sweden, at Stockholm, with 275,000 volumes; the largest of Spain, at Madrid, with 425,000 volumes; the largest of Russia, at Saint Petersburg, with 1,200,000 volumes; the largest of Greece, at Athens, with 155,000 volumes; the largest of China, at Shanghai, with 15,000 volumes; and the largest of Japan, at Tokio, with 75,000 volumes.

**UNITED STATES.** The library movement began in the United States at an early period by gifts of philanthropists and government aid, but its most potent impetus was not reached until the middle of the last century, since which time rapid strides have been made. Besides many private libraries of much value, there are fully 4,500 public libraries that contain 1,000 volumes

and upward, and these now aggregate 40,000,000 volumes. The congressional library building at Washington is the finest structure of the kind in the world. It contains ample accommodation for 4,500,000 volumes, but at present it has 900,000 books and about 250,000 pamphlets and manuscripts. Other great libraries include the large library of San Francisco, which has 215,000 volumes; Yale College, 200,000; Chicago public library, 310,000; University of Chicago, 400,000; Annapolis, 125,000; Peabody Institute, 120,000; Boston Athenaeum, 190,000; Harvard University, 590,000; public library, Boston, 750,000; Detroit public library, 115,000; Albany State library, 165,000; Brooklyn, 120,000; Astor library, 300,000; Columbia College, 260,000; New York Mercantile, 250,000; Cincinnati public library, 250,000; Philadelphia Library Company, 180,000; Philadelphia mercantile library, 175,000; University of Pennsylvania, 140,000; and Saint Louis library, 120,000. School libraries are supported by taxation in many of the states, a system under which library privileges have been carried not only to the smaller towns, but likewise to many rural districts. Solomon's adage, that "Of making many books there is no end," is emphasized with remarkable accuracy at the present time.

**LIBRARY OF CONGRESS,** the national library of the United States, an institution at Washington, D. C., established in 1800. It contains the largest collection of printed books and pamphlets in the Western Hemisphere, about 1,450,000 copies, besides 99,800 manuscripts, 64,980 maps, and 348,650 pieces of music. The building has a floor space of nearly 8 acres. The book racks have about 45 miles of shelving and the accommodations are sufficient to house about 4,500,000 volumes of books. It is located on a site of 10 acres, about 1,250 feet east of the capitol, and was completed in 1897 at a cost of \$6,347,000, exclusive of the land, which cost \$585,000.

The number of employees at the library is 450, of whom 68 are in the copyright department, 127 attend the disbursement and grounds, and 255 are engaged in the library proper. Admission to the building is free and the doors are open from 9 A. M. to 10 P. M. week days, except legal holidays, and from 2 P. M. to 10 P. M. on Sundays. The library is maintained by annual appropriations by Congress for various purposes, including the purchase of books.

**LICENSE** (lī'sens), in law, a document conferring a permission to do some act which would otherwise be unlawful. The object of issuing licenses is two-fold; that is, to raise revenue and to regulate the prosecution of certain trades.



and professions. The manufacture and sale of tobacco and intoxicating liquors are usually regulated by the issuance of a license, and this is true likewise of peddling and the management of theaters and other places of amusement. The Prohibition party, a political organization of the United States, is opposed to the issuance of licenses which authorize the sale of alcoholic beverages. Those who advocate a *low license* seek to raise revenue without the view of regulating the traffic, while those favoring a *high license* aim to obtain revenue as well as regulation of the liquor traffic. A license is required in many special cases, such as those necessary before marriages may be solemnized, but they are issued so as to maintain a record and prevent the marriage of persons who are not legally qualified to enter into such a contract, and the element of revenue is eliminated.

**LICHEN** (lĭ'kĕn), an order of flowerless or cryptogamous plants. All plants are classified as belonging to the *flowering* or the *flowerless* division, lichens being included with the latter. They are found native in all zones up to the



ICELAND MOSS.

REINDEER MOSS.

snow line. These plants are composed of loose cellular tissue, a slender white-celled portion now conceded to be a parasitic fungus, and a number of globular greenish or bluish cells upon which the fungus cells prey. They contain neither stems nor leaves, but form gray, brown, or yellowish crustlike patches on trees, fence rails, rocks, and the ground, but derive their nourishment entirely from the air. In the most northern portions of the Arctic regions to which any form of vegetation exists, they constitute important means for sustaining animal life, especially the reindeer. *Iceland moss*, a kind of lichen found in the Arctic region of both hemispheres, yields dyes and contains medical properties. Some species furnish a nutritious jelly and other forms of food.

**LICHTENBERG** (lĭk'tĕn-bĕrk), a city of Germany, in the province of Brandenburg, within the limits of Berlin, the national capital. It is practically a part of Berlin, being popular as a residential center, but has had a separate city government since 1907. The place has extensive communication by steam and electric railways. Many of the streets are paved with stone and asphalt, but the larger number are macadamized. The chief buildings include the city hall, the central railway station, an insane asylum, and many churches. It has a large trade and manufactures of clothing, chemicals, and machinery. A large majority of the inhabitants are Protestants. Population, 1905, 55,391.

**LICK OBSERVATORY**, an institution of the University of California, built with a fund given by James Lick. It is situated 25 miles east of San José, Cal., on one of the summits of Mount Hamilton, and contains an object glass of 36 inches in aperture. In making the gift it was provided that the instrument "should be superior to and more powerful than any telescope ever made." It is now surpassed in size only by the telescope at the Yerkes Observatory, near Chicago, in which the objective lens has an aperture of 40 inches. The remains of Lick were placed in the vault at the base of the 30-foot pier that supports the great telescope.

**LICORICE** (lĭk'ō-rĭs), or **Liquorice**, a class of leguminous plants found in Europe, Asia, and Africa. They are cultivated for the juices found in the roots, which serve in preparing a medicine of value in the treatment of throat and catarrhal diseases. The plants include several species, attain a height of about four feet, bear violet-colored flowers, and have roots growing about three feet into the ground. Their leaves are alternate and pinnate, and the plants have few branches. The juices are pressed from pulp prepared by crushing the roots of plants having at least three years' growth, the liquid portions are evaporated by heating, and the solid parts are made into sticks, such as are commonly purchased in the market. They are packed for shipment with bay leaves. The medicinal qualities arise from the property of the licorice in aiding expectoration and its healing influence upon the irritated portions of the mucous membrane. Licorice in a pure state has decided medical virtues, but there are many adulterations. The only species of licorice found in America is a plant known as *Glycyrrhiza lepidota*, which thrives in portions of the Mississippi valley, especially in Missouri.

**LICTOR** (lĭk'tŏr), in Rome, a public officer appointed to attend upon the chief magistrates. The ancient kings were always preceded by



twelve lictors, who bore the *fasces*, or a bundle of rods with an ax. The rank of the magistrates determined the number of lictors. A praetor had two; a propraetor, six; a consul, twelve; and a dictator, twenty-four. The lictors inflicted punishment on condemned Roman citizens.

**LIECHTENSTEIN** (lēk'ten-stīn), an independent principality in Europe, which formed a part of the German Confederation until 1866. It is bounded on the northeast and east by the Austrian possession of Vorarlberg, south by the Swiss canton of Grisons, and west by the Rhine River, by which it is separated from the canton of Saint Gall. The area is 65 square miles. Vaduz, or Liechtenstein, is the capital and chief town. The surface is quite mountainous, but generally fertile, and considerable interest is taken in agriculture, fruit growing, stock raising, and mining. The language is German. Several fine schools and institutions of higher learning are maintained. The Prince of Liechtenstein, who has his chief residence in Vienna, is at the head of the government. He is assisted by a diet of fifteen members, three of whom are appointed by the prince and the remainder are elected by the people. It has no standing army and is joined to the customs union of Austria. The Prince of Liechtenstein belongs to the Este family, an old family of Europe, which was raised to sovereign rank in the 17th century. A large majority of the inhabitants are Roman Catholics. Population, 1906, 10,875.

**LIEGE** (lē-āzh'), a city of Belgium, capital of the province of Liège, at the confluence of the Meuse and Ourthe rivers. It is surrounded by a rich agricultural and mining country. Many railroads and electric railways center here, giving the city a fine outlet for its large trade. Coal and zinc are mined in the vicinity. The manufactures include machinery, cotton and woolen goods, clothing, locomotives, steam machinery, steamboats, ironware, and furniture. Among the important buildings are the Church of Saint James, the Cathedral of Saint Paul, the municipal theater, the railway station, the Palais de Justice, and the University of Liège. The last named institution has 1,200 students and a library of 200,000 volumes. Other institutions include the museum, the zoölogical and botanical gardens, and many schools and hospitals. The city has modern municipal facilities, including waterworks, sewerage, and electric railways, but contains a number of narrow streets and illy ventilated sections. In 1691 it was conquered by the French. It had a varied existence during the succeeding centuries, and

in 1831 became a part of the kingdom of Belgium. Population, 1906, 172,039.

**LIEGNITZ** (lēg'nīts), a city of Germany, in the province of Silesia, 145 miles southeast of Berlin. It is noted as a commercial and railroad center. The noteworthy buildings include the townhall, the gymnasium, and the Church of Saint John. Among the manufactures are cotton, woolen, and linen goods, musical instruments, hardware, saddlery, and machinery. Liegnitz was the scene of a great battle in 1813, in which the French were defeated by Blücher. This engagement is sometimes called the Battle of the Katzbach. Population, 1905, 59,706.

**LIFEBOAT**, a boat constructed for special use at sea in times of shipwreck and storms. Lifeboats, to be of the highest utility, must possess extra buoyancy and have means for the self-discharge of water. They must be self-righting, possess speed, have storage room, and be strong of build. In 1785 the first lifeboat was patented by Lukin in Great Britain, but it did not prove of sufficient utility, on account of which a prize was offered for the best model of a new structure. In the contest that followed, in 1789, the premium was awarded to Henry Greathead. However, his invention did not possess the property of righting itself and discharging water, hence it proved unsatisfactory, especially in an accident on the Tyne, in 1849, when a number of persons lost their lives by endeavoring to use this lifeboat in saving persons from drowning. Accordingly, the Duke of Northumberland offered a prize to the person who would supply the best model of a lifeboat. In the competition that followed James Beeching was awarded the premium. However, similar boats were constructed in various countries, combining all the necessary elements of a first-class lifeboat, and the credit cannot be claimed by any one country or individual.

**LIFE BUOY.** See **Buoys**.

**LIFE INSURANCE.** See **Insurance**.

**LIFE-SAVING APPARATUS**, the devices designed for the purpose of saving lives in case of shipwreck. Many classes of life-preservers have been introduced at various times, all of which have served a more or less valuable purpose. Those of modern manufacture are of especial value in that they take advantage of many methods demonstrated by experience to be of practical value. Among the different kinds may be mentioned the devices made of India rubber and inflated with air. These are constructed in several compartments with a view of insuring safety if a rupture should occur in one or more of the parts. Lifeboats have been efficient life-preservers, especially since a form of ballasting



has been devised by which they right themselves, if they are upset in the water. Mattresses stuffed with cork, jackets of inflated rubber and cork, life buoys, trousers and suits with cork, looped life lines, and many other devices are among the preservers now in use. All ships are provided with a supply of these for the safety of passengers and the crew.

**LIFE-SAVING SERVICE**, a public system maintained for the purpose of giving succor and assistance to seafarers, when they are subject to danger or shipwreck upon the sea and inland waters. All civilized nations have made provisions whereby the danger of loss of life at sea may be greatly lessened or entirely overcome within certain distances from the land. The life-saving service of the United States is among the most efficient in the world, although it was not established in its present form until 1871. It is under the control of the Treasury Department and a general superintendent, who has several assistants. About 10,000 miles of seacoast have been divided into districts. Besides the life-saving service concerned with the sea, there is a service corps which has charge of the inland waters. In the first thirty years of the operations of this department 16,112 lives were saved by the coast and inland services.

The coast service of both Canada and the United States is divided into a number of districts, each of which has one or more stations. These stations are supplied with life-saving boats and various forms of life-preservers. Experienced surfmen are constantly employed, who patrol a certain beat every night and during foggy days for the purpose of watching for vessels in danger and distress. The house provided for surfmen has a station outlook at the top, from which constant observations are made, and at night lights are displayed. Flare lights are used to indicate that those in danger have been observed. Lifeboats are sent to the points of danger, when a shipwreck occurs, carrying various life-preservers, and in many instances life lines are thrown to the stranded vessel by rocket or mortar. In this way persons in danger may be safely towed to shore, or prevented from sinking until they can be rescued. At each station is an adequate supply of provision and restoratives, by which to minister to the wants of those in need, or restore to consciousness and activity in cases of apparent drowning. Lighthouses located at various shoals and breakers are maintained to guard against dangers and overcome losses at sea.

**LIGAMENT** (lĭg'ă-ment), in anatomy, the short bands of strong, white, glistening fibers by which the bones are connected at the joints.

They serve to strengthen the attachments and keep in place various organs. Capsular ligaments surround all the joints, but the structures holding the tendons of the ankle and wrist are called annular ligaments. Distinct names are applied to the many different ligaments in the human body, whereby it is made possible for anatomists to locate and describe them with facility.

**LIGHT**, the form of radiant energy that acts on the retina of the eye and renders visible the objects from which it comes. It has a heating and chemical action of prime importance to plant and animal life, and neither can exist without its influence. The importance of light upon vegetation is seen by the fact that plants growing in places from which light is partially excluded are abnormal and of little vigor. Animals likewise lose much of their vitality and energy when wanting its influence. It has been shown successfully that sunlight is an important factor in the sanitary regulation of cities. It materially affects the growth of children and the recovery of patients in hospitals, darkness causing failure and even death. The sun is the most important of the self-luminous bodies. Other objects giving out light include fixed stars, certain meteors, nebulae, and bodies in a state of phosphorescence or incandescence, though nearly all of the earth's light comes from the sun.

**THEORY.** The undulatory theory of light is now generally accepted. According to it, radiant energy is propagated in waves that vary in length, and only those that affect the eye are known as light, the others being regarded as chemical rays or dark heat. Light and energy are transferred from one place to another by means of these waves, and pass with rapidity through the luminiferous ether that fills all space. The velocity of light, according to Foucault, Cornu, and Bradley, is 186,427 miles a second, but the rapidity depends somewhat on the medium through which it passes. To affect the eye and produce the sensation of light, the waves must have a frequency between 392,000,000,000,000 and 757,000,000,000,000 per second, and, since the frequency of the ether waves is so great, their wave lengths must be correspondingly small. Ether waves produce three classes of effects on ordinary matter, called heating effects, luminous effects, and affinic effects. To produce these the waves must be correspondingly rapid, and the molecules of the body must move to and fro with a sufficient frequency, otherwise none of the effects will be manifest. Different bodies are variously affected by rays of light.



**PROPERTIES.** The three most important classes of bodies are called transparent, translucent, and opaque. A *transparent body* is one through which the light passes in such a manner that the outlines of other bodies can be seen through it, as clear glass and water. A *translucent body* permits light to pass through in such a manner that we cannot see through it the outlines of other bodies, such as oiled paper and ground glass. An *opaque body* does not allow any light to pass through it, as wood and iron. A single line of light taken in the direction in which it is moving is called a *ray*, a number of parallel rays constitute a *beam*, and a number of converging or diverging rays form a *pencil*. A pencil is said to be converging, when the rays all move toward the same point, and diverging, when all are moving from the same point. Bodies are not visible unless they throw off light in all directions; therefore, both luminous and illumined bodies are visible. A body that regularly reflects light cannot be seen, as a clear glass placed in a doorway, which may be mistaken for an open doorway. Light, like sound, moves in straight lines, and varies inversely proportional to the square of the distance from the point. This may be demonstrated by placing an object near a light, where it receives the effects more intensely than when removed several times the distance from the luminous object.

**REFLECTION.** Light is said to be reflected when a portion of the quantity falling on the surface of a body is thrown off from it. The two recognized laws of reflection are: the angle of reflection is equal to the angle of incidence; and the incident ray, the perpendicular at the point of incident, and the reflected ray, all lie in the same plane. Ordinarily the amount of light reflected depends upon the kind of material forming the surface, on the degree of polish of the surface, and on the angle at which the light strikes the surface. Glass and highly polished metals are excellent reflectors of light, though considerable light is lost even from the surface of the best reflectors. Transparent substances reflect the greater amount of light the more obliquely it falls upon their surfaces, as is the case with glass and water, and when the light falls on such surfaces at nearly right angles most of its quantity passes into or through the body. This is demonstrated clearly by the sun shining at noon on a water surface, when we may look at its image without being dazzled, but shortly before sunset the image becomes quite dazzling and too powerful to be looked at steadily. The reverse is true of opaque bodies, since they reflect the greatest

amount of light when it falls the most directly on the surface.

**REFRACTION.** When light falls on a water surface, a part of the light is reflected and part of it enters the water. It moves onward in

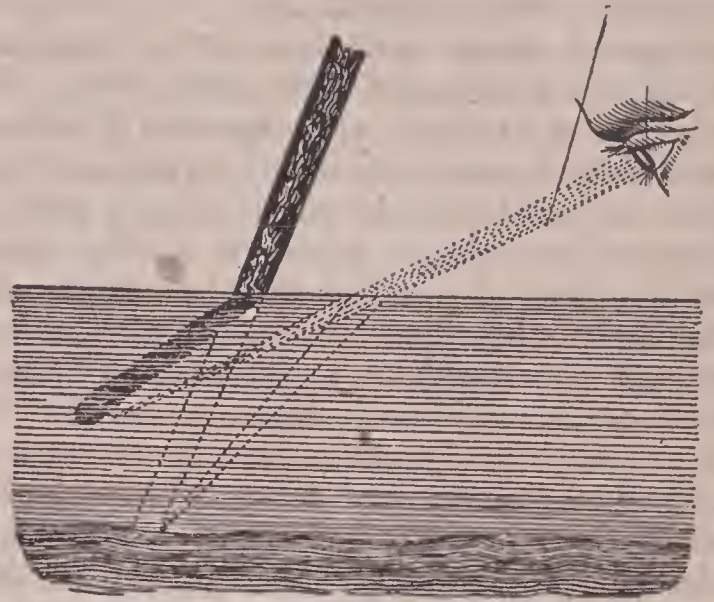


FIGURE 1.

straight lines, both in the air and in the water, as shown in Figure 1, but the direction of the light in the water is not the same as in the air, the light being bent or refracted as it enters the water. Refraction of light always occurs when it passes obliquely from one medium to another of different density, but when it falls perpendicularly on the surface it is not refracted. Refraction may be illustrated by the double-convex lens, as shown in Figure 2. The eye at F sees the candle PQ, not at its actual place

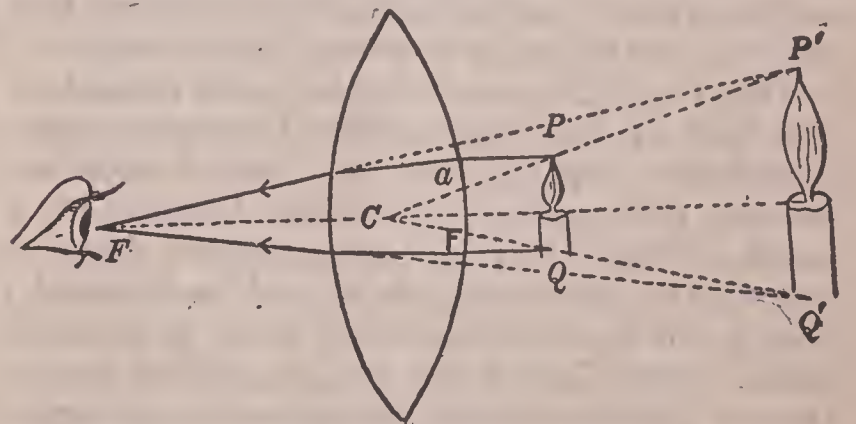


FIGURE 2.

or in its real size, but the image at P'Q' is larger and more distant, owing to the bending of the rays. The accepted rules of refraction are: first, the incident ray, perpendicular at the point of incidence, and the refracted ray all lie in the same plane; second, between the same two mediums the value of the index of refraction remains constant, whatever may be the angle of incidence; third, the light is bent or refracted toward the perpendicular at the incident surface, when the ray enters a denser medium, and from the perpendicular, when it



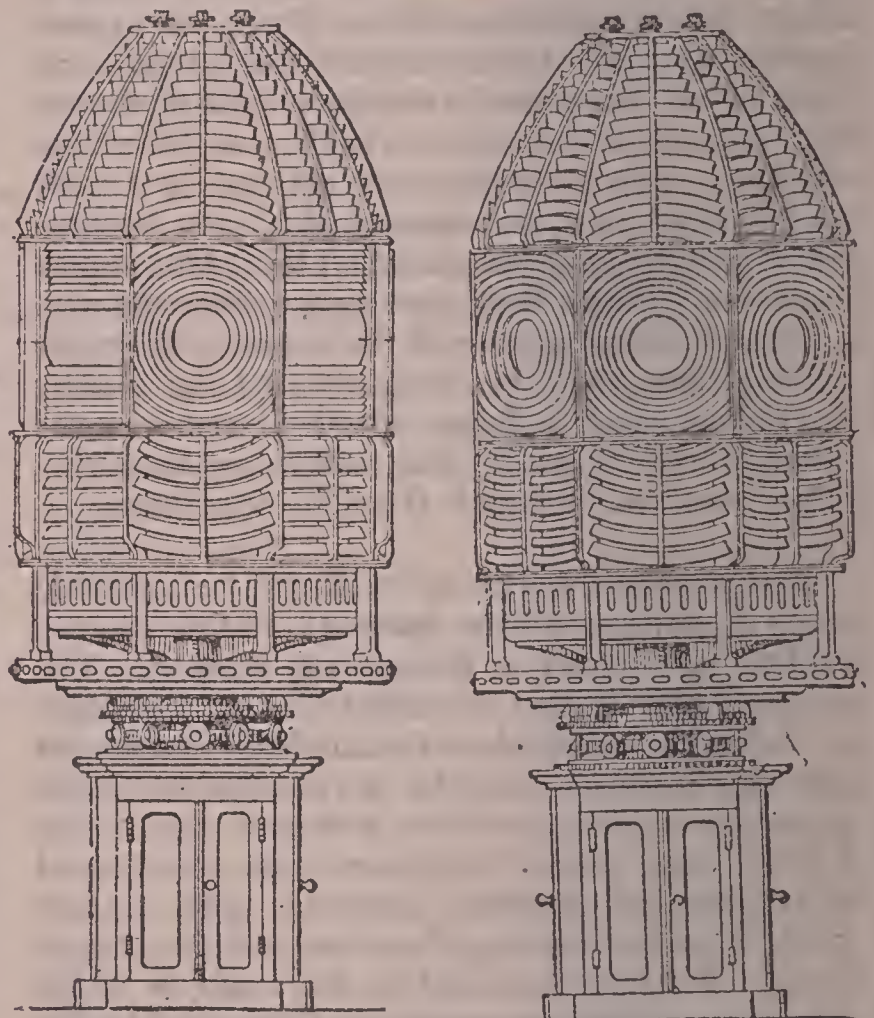
enters a rarer medium. *Optics* is the science that embraces the application of mathematics to the laws of reflection and refraction. It treats of the formation of images by mirrors and lenses, the eye, cameras, telescopes, microscopes, and other optical instruments.

**HISTORY.** It was well known to the ancients that light is propagated in straight lines. They discovered the laws of reflection, a fact attested by an ancient fable, according to which Archimedes set fire to the Roman ships of Syracuse by means of concave mirrors. Kepler discovered the law of the intensity of light. The telescope was invented by the Dutch about 1608, Jensen, Lippersheim, and Metius each claiming the honor, but it is reasonably certain that Galileo perfected it by making a number of improvements. The law of refraction was discovered by Snell in 1621, and by its aid Descartes explained the rainbow. A half century later Newton accidentally discovered the decomposition of light by a sunbeam coming through an opening in the window shutter and, instead of noticing a light spot, he saw the seven colors—violet, indigo, blue, green, yellow, orange, and red. This discovery led to the invention of the spectroscope, an instrument by which rays of light may be decomposed and analyzed, and the body from which the light is emitted may be classified as to its constituents. That the seven principal colors of the solar spectrum produce the white color of light was first demonstrated in the 19th century by painting them on a top and whirling it rapidly, when it was shown that they unite and make a white appearance.

That the different colors of objects depend on the kind of light they reflect is another comparatively recent discovery. Thus, a body reflecting only yellow rays when touched by a beam of light is said to be yellow; when it reflects the green rays, it is said to be green; and, when it reflects none of them, it is called black. Newton was the first to publish an extensive treatise on the decomposition of light. Étienne Louis Malus (1775-1812), in 1808, discovered the elementary phenomena of the polarization of light, by which it was found that a single ray of light may be divided into two rays, and, when so divided, they possess properties not common to ordinary rays of light. In 1896 Roentgen announced the discovery of the X-ray, by which it became possible to pass rays through substances opaque to ordinary light, and to make photographic views of objects in the interior, such as the bones within the living body.

**LIGHTHOUSE**, an elevated structure or tower placed near a seaport or some headland

for the purpose of protecting vessels at night by warning navigators of danger. In some instances such a structure is maintained as a general landmark. The first building of this character of which there is authentic record was erected at Alexandria, Egypt, about 300 B. C., and is reputed to have been elevated 550 feet above the sea. It was built by Ptolemy Philadelphus on a small island named Pharos, and this name was used subsequently to designate various structures of a like character. The most celebrated lighthouse of the present time is situated near the mouth of the Garonne, in France. It has a height of 198 feet and is noted for its excellent architecture. This structure was completed in 1610, but in 1727 many alterations and improvements were made. The



Arrangement of fixed and revolving lights.

Arrangement of an alternating light.

first lighthouses were lighted with fires, but those of modern construction are lighted with oil, gas, or electricity, the power of the light being increased by the employment of glass reflectors, lenses, and prisms.

All modern maritime nations have a system of lighthouses on their coasts, and many maintain a similar system to aid in the navigation of interior waters. In Canada this department of the government is under the direction of the Lighthouse Board. The Congress of the United States passed the first act for the establishment of such a system in 1789. In 1852 it authorized



a lighthouse board, with the Secretary of the Treasury as ex-officio president. Under this act the coasts of the Atlantic, the Pacific, the Gulf of Mexico, and the Great Lakes were divided into lighthouse districts, each of which was placed under the supervision of an officer of the army or navy as inspector, and the general superintendents became subject to presidential appointment. In 1874 a lighthouse district which includes the Ohio, Missouri, and Mississippi rivers was added, and since then provisions have been made for maintaining lighthouses or signals in the Hawaiian Islands, Guam, and other regions under the jurisdiction of the United States.

Elevated coast points served as convenient situations for early lighthouses, but, since a lighthouse some distance from the shore is more effective, engineers began to plan the construction of the larger lighthouses some distance off the coast. To make them proof against waves and tides, as well as the storms frequent at sea, they must necessarily be built on solid rock, of which the Eddystone Lighthouse (q. v.) is a notable example. Besides, the elevation above sea level is a material factor, since the mariner's eye is able to see the more elevated at greater distances, while the character of the light is likewise material. The principal classes of lights comprise the catoptric, dioptric, revolving, intermittent, and alternate. A *catoptric light* is one in which reflectors are formed into a parabolic curve. The *dioptric light* has a central lamp and the rays are transmitted by bending or diverging them through a combination of lenses. A *revolving light* alternately increases and decreases gradually at equal intervals. An *intermittent light* appears and disappears suddenly, but remains visible when at its brightest stage for some seconds. The *alternating light* throws out different colors, such as red and white, at equal intervals. In most countries, as in Canada and the United States, the lighthouse service includes electric and gas buoys, fog signals, whistling buoys, unlighted beacons, post lights, light-ships, etc. The lights used are classified according to the different candle power.

**LIGHTNING**, the dazzling light emitted by a discharge of electricity, when passing from one cloud to another, or from a cloud to the earth. Atmospheric electricity is essentially the same as that produced artificially. It is caused by friction due to dry air coming in contact with moist air, by evaporation, and various other causes. More or less electricity is always present in the air. It is largely positive electricity during a clear sky, but takes on the nega-

tive form in cloudy weather. The discharge of lightning occurs when the two—positive and negative—come in contact with each other, but when a cloud charged with electricity comes near the earth, where it is charged with the opposite kind, the electric discharge passes into the earth's crust. In the lower regions of the atmosphere electricity is white and in the upper strata it is somewhat violet, as is the spark of an electrical machine in a vacuum.

Five general kinds of lightning may be mentioned, those known as zigzag, heat, sheet, globular, and volcanic lightning. *Zigzag lightning* appears in irregular lines, often forked at the end. This form is thought to be due to the electric current darting among the particles suspended in the air, as those of dust and moisture, to places where the air is less dense. *Heat lightning* is not accompanied by thunder. It occurs during hot weather, near the horizon, and is thought to be due to the reflection of lightning below the storm. *Sheet lightning* is generally accompanied by thunder, appearing as an expanded flash, and by it the clouds are illumined. *Globular lightning* is of rare occurrence. It appears in the form of a globe of light, remaining stationary or moving slowly through the air, but its origin is not known definitely. *Thunder* is due to the circumstance that lightning vaporizes the raindrops and enormously expands the air, thereby producing a partial vacuum. When the surrounding air rushes violently into the vacuum, the familiar loud report is produced. Since light has a velocity of about 186,000 miles per second and sound travels through a medium with an ordinary temperature at about 1,120 feet per second, it is easy to understand why a flash of lightning is seen some time before the sound of thunder is perceived. It requires about five seconds for a thunder clap to be heard a distance of one mile. The danger is slight at a mile distant from the place of lightning, though a severe shock is sometimes perceived even at a greater distance.

**LIGHTNING ROD**, a medium designed to protect buildings against destruction or damage by lightning. The effect of a high-class lightning rod is to conduct electric movements from the ground to the sky, thereby neutralizing the contrary electricity of passing clouds, thus diminishing their liability to flash lightning. However, if the rod is not potent enough to do this and is itself struck by lightning, it conducts the electricity to the ground. Lightning rods have a top of gilded copper or platinum at a height of from six to ten feet above the roof, thence pass in the form of a wire or iron bar to the ground, terminating from twelve to



twenty feet below the surface. The lower end should extend into moist soil or be connected by an artificial conductor, else it is not effective in dispelling the danger. An area on the roof having a radius of twice the height of a lightning rod is protected. For this reason there should be a number of points on a building, all being connected with the main rod, and the latter should be protected by inclosures of glass, or some other nonconductor, to prevent a distribution of the current.

**LIGNITE** (lig'nīt), or **Brown Coal**, a compact, partially carbonized vegetable matter. It is an imperfect fuel immediately between peat and true coal. Lignite often retains its fibrous structure. It abounds in cretaceous and tertiary strata. The most extensive deposits of North America are found in the western part of the Great Plains, extending from the Gulf of Mexico to the central part of Canada. A good class of lignite consists of 33 parts of fixed carbon, 45 parts of volatile carbon, 12 parts of ash, and 10 parts of moisture.

**LIGURIA** (lē-gōō'rī-ä), an ancient country of Europe, now included in the northern part of Italy. It was bounded on the north by the Po, east by the Macra River, south by the Gulf of Genoa, and west by the Varus River and the Maritime Alps. Besides including the province of Genoa and the territory of Nice, it embraced a part of the region traversed by the Alps and the Apennines. The inhabitants, known as the Ligurians, were a warlike and enterprising people. In 125 B. C. they were subjugated by the Romans. Later Liguria formed the nucleus of the province of Gaul.

**LILAC** (lī'lak), a shrub of the olive family, cultivated extensively on account of its fragrant flowers and ornamental foliage. The species are numerous, most of which are native to the southern part of Europe and the western part of Asia, but they are now grown extensively in gardens, for hedges, and in parks. The flowers are variegated in color, being mostly different shades of lilac, but the white species are numerous. Among the favorite species grown for their flowers are the Persian, Charles X., and common lilacs. They have opposite leaves and flower early in spring. The common lilac, if carefully cultivated, grows to a height of twenty feet. It sends out numerous suckers.

**LILLE** (lēl), or **Lisle**, a city of France, in the department of Nord, on the Deule River, seven miles from the frontier of Belgium. It is connected with Paris, which is 155 miles from Lille, by railways. The place is strongly fortified. It has many beautiful streets and modern municipal facilities, including electric lights,

pavements, waterworks, sewerage, and electric street railways. Among the noteworthy buildings are the Church of Saint Catharine, the Church of the Notre Dame, the Bourse, the public library, two universities, the Pasteur Institute, the lyceum, the Palais des Beaux-Arts,



CHARLES X. LILAC.

and many schools and hospitals. The manufactures include woolen, cotton, and silk goods, thread, sugar, spirituous liquors, porcelain, oil, and machinery. It has a large trade in merchandise and produce. Julius Caesar built a castle on the site of Lille, but its history properly dates from 1007, when it was fortified by Baldwin, Count of Flanders. Within recent years the city has added materially to its wealth and commercial importance. Population, 1906, 205,602.

**LILY**, an ornamental plant of the genus *Lilium*, characterized by an erect stem from a scaly bulb, numerous narrow sessile leaves, and one or more large and erect or nodding flowers. About fifty species are native to the North Temperate Zone, of which five are common to the eastern part of North America. The white lily is native to the Levant, but has been cultivated extensively in Europe for more than three



centuries. It has been grown in America from its early settlement. Some of the native species of America are very beautiful, among them the golden-banded lily, wild orange-red lily, southern red lily, Turk's-cap lily, and Carolina lily. Those cultivated most extensively are the white lily, tiger lily, and golden lily. The Turk's-cap is found in marshes and attains a height of from five to eight feet, bearing orange-colored flowers with black spots. A white lily symbolizes purity and has been used in paint-



GOLDEN-BANDED LILY.

Plant and Bulb.

ing in connection with the Virgin Mary. It is mentioned frequently by poets and in oratory. Lilies are cultivated from the seed, by planting the bulblets, and by layers. The process of growing from the seed is slow.

**LILY OF THE VALLEY**, a genus of plants of the family *liliaceae*, native to the bushy places of America, Europe, and Asia. It has oblong leaves. The cup-shaped flowers are well known for their agreeable odor. Several species have medical properties of utility in cases of heart disease. The lily of the valley is a perennial and has slender rootstocks. The flowers are in a one-sided raceme. It blooms in May.

**LIMA** (lī'mà), a city in Ohio, county seat of

Allen County, on the Ottawa River, 71 miles southwest of Toledo. It is on the Pennsylvania, the Erie, the Cincinnati, Hamilton and Dayton, and other railroads, and is surrounded by a productive fruit-growing and farming country. Coal and petroleum are produced in the vicinity. It has a fine courthouse, a public library, Lima College, and many schools and churches. The manufactures embrace machinery, carriages, egg cases, oil products, clothing, furniture, locomotives, and utensils. Many of the streets are well paved with brick and asphalt. Other facilities include electric street railways, waterworks, sewerage, and several parks. It has a large local and jobbing trade. Population, 1910, 30,508.

**LIMA** (lē'mà), a city and the capital of Peru, on the Rimac River, connected with its port, Callao, and other centers by railways. The city is one of the most beautiful in South America, having a splendid cathedral, government buildings, public schools, and a university. Many modern municipal facilities have come into popular use, including electric lights, sewerage, waterworks, and rapid transit. The manufactures include cotton, silk, and woolen goods, clothing, soap, machinery, furniture, sugar, and earthenware. Its domestic and import trade is of growing importance. Pizarro founded the city in 1535. It was partially destroyed by an earthquake in 1746, and in 1881 capitulated to the Chileans. Population, 1908, 132,083.

**LIME**, a small tree of the orange family, native to the southeastern part of Asia, but naturalized in the tropical parts of America, the West Indies, and Europe. It attains to the height of about ten feet, bears a fruit resembling the lemon in appearance and character, but much smaller, and yields a bark of value in making mats and ropes. The wood is light and is used in the manufacture of baskets, boxes, and cradles. Large quantities of the fruit are grown to manufacture beverages and citric acid. The citric acid obtained from the lime is used largely as an antiscorbutic on long voyages at sea. It is produced in considerable quantities in Cuba and other West Indian islands.

**LIME**, a white earthlike calcium oxide widely diffused throughout the animal, vegetable, and mineral kingdoms. In nature it occurs in numerous forms, but is not found in a pure state. It may be produced artificially by calcining a mineral calcium carbonate, as marble, limestone, or seashells, yielding the anhydrous calcium oxide called *quicklime*, which, when moistened with water, forms *slacked lime*. Quicklime readily absorbs moisture from the air, forming *air-slacked lime*. The artificial manufacture of lime is conducted on a large scale by burning or cal-



cining different varieties of limestone in a kiln, but the product is not sufficiently pure to be utilized for chemical purposes. Pure lime is a white substance, and is obtained from pure carbonate of lime, such as Iceland spar or Carrara marble. This is effected by heating the pure carbonate, thereby expelling the carbonic acid and obtaining the lime as a residue. There are almost innumerable uses for chemical and commercial lime. The more common uses are for fertilizing, removing hair, fat, and other foreign matters in tanning, to prepare cements and mortars for building, to causticise alkaline liquors in soap making, to disinfect and destroy noxious insects and vegetable matter, and to purify coal gas. It is used for many other purposes in manufacturing. Lime is employed largely in medicine, serving as a tonic, as an antacid, and in diarrhoea and stomach complaints.

**LIME LIGHT**, an artificial light produced by directing an oxyhydrogen flame against pure quicklime by means of a blowpipe. The light produced in this way is very intense. It has been utilized as a signal light, for stage service, and in various optical instruments.

**LIMERICK** (lím'ēr-ĭk), a railroad and manufacturing city of Ireland, capital of Limerick County, on the estuary of the Shannon River, 120 miles southwest of Dublin. Among the principal buildings are the Anglican Cathedral of Saint Mary, the Roman Catholic Cathedral of Saint John, the city hall, the county courthouse and jail, and the military station. The manufactures include clothing, spirituous liquors, lace, flour, machinery, ironware, leather, and fishhooks. It is the seat of several large establishments for the manufacture of military clothing. The municipal facilities include sewerage, waterworks, electric lighting, and stone and brick pavements. It has extensive docks and wharves. The trade in cereals and live stock is important. Population, 1906, 40,045.

**LIMESTONE**, the general term applied to rock which are composed wholly or in part of calcium carbonate. The deposits answering to this description are very numerous, differing in composition and structure. They are widely distributed in all the geological systems, but occur most abundantly in the secondary rocks. In a pure state limestone contains about 43 parts of carbonic acid and 57 parts of lime, but the general intermixture of other minerals is very extensive. When containing magnesium carbonate, it is called magnesian; when clayey, argillaceous; when sandy, siliceous; and when the limestone is crystalline, it is termed marble. Among the principal varieties are compact, foliated, granular, oölitic, calcareous, peastone, and

statuary limestone. In many localities the name of the geological system in which it is found is applied to the product, such as Devonian, Silurian, etc. Iceland spar is a grade of limestone quite transparent and rich in lime.

**LIMOGES** (lê-môzh'), a railroad and manufacturing city in France, capital of the department in Haute-Vienne, on the Vienne River. The place is reached by a number of railroads and has communication by steamboats. Among the chief buildings are the Cathedral of Saint Etienne, the public library and museum, a theological seminary, and the observatory. It has sewerage, waterworks, public parks, and electric railways. The manufacture of artistic porcelain is the most important industry, but it has large manufactures of cotton and woolen goods, shoes, paper, clothing, and machinery. It is the seat of a bishop and has a large trade. Population, 1906, 88,597.

**LIMONITE** (lím'ön-ĭt), a common and important ore of iron, often called *brown hematite*. The deposits are not in continuous strata, but occur in the fissures and cavities of compact masses, or as a loose earth at and near the surface of beds of the carbonate of iron or iron pyrites. Limonite is of a brown or brownish-yellow color and, when pure or nearly so, has a submetallic lustre. Extensive deposits are found in the Appalachian region of North America and various parts of Europe, especially in England and Germany. An impure variety of limonite found in marshes is called *bog iron ore*. The limonite that gathers at the bottom of lakes and ponds from the drainage of regions that contain iron is called *lake ore*.

**LIMPET** (lím'pët), a genus of gastropod mollusks, more or less widely distributed. They are noted especially for their immense size in the tropical seas. Several well-known species occur off the Atlantic coast of America. The limpets commonly adhere firmly to rocks by means of the foot, which acts as a sucker. The shell is conical and has a more or less prominent apex, the latter turning slightly forward. The food consists of seaweed, which is rasped by the tongue. They are used for bait in fishing and for food. These animals are taken in large numbers as food by birds.

**LINCOLN** (lĭn'kūn), a city in Illinois, county seat of Logan County, 28 miles northeast of Springfield. It is on the Illinois Central, the Chicago and Alton, and other railroads, and is surrounded by a fertile agricultural country. Bituminous coal of a fine grade is mined in the vicinity. The noteworthy buildings include the county courthouse, the public library, the high school, and many churches. It is the seat of



the Odd Fellows' Orphans' Home of Illinois, the State asylum for feeble-minded children, and Lincoln University. The last named institution was founded in 1865. It has a fine library and is attended by 250 students. The manufactures include flour, cellulose, saddlery, caskets, clothing, and machinery. It was settled in 1835 and incorporated in 1854. Population, 1900, 8,962; in 1910, 10,892.

**LINCOLN**, a city and the capital of Nebraska, county seat of Lancaster County, on the Salt River, fifty miles southwest of Omaha. It is on the Union Pacific, the Chicago, Burlington and Quincy, the Chicago, Rock Island and Pacific, the Missouri Pacific, and the Chicago and Northwestern railroads. The surrounding country is fertile and devoted to agriculture, stock raising, and fruit growing. Among the manufactures are carriages, earthenware, clothing, cigars, canned goods, and machinery. The State capitol is a fine stone structure. It has a modern county courthouse and a United States government building. Other noteworthy buildings include the public library, the high school, Nebraska Military Academy, Union College, University of Nebraska, Nebraska Wesleyan University, Cotner University, Adventist and Episcopalian colleges, and several normal and musical schools. It is the seat of the State penitentiary and the State insane asylum. Electric lights and street railways, waterworks, pavements, and several fine parks are among the conveniences. It has a large local and wholesaling trade. The vicinity was first settled in 1859 and three years later the place was made the capital of the State. It was named in honor of Abraham Lincoln. Lincoln is the home of William J. Bryan. Population, 1910, 43,973.

**LINCOLN**, a city and the capital of Lincolnshire, England, on the Witham River, 130 miles north of London. It is surrounded by a rich agricultural country and is an important railroad center. The Lincoln Cathedral, one of the finest in England, is the largest building. It is 482 feet long and 80 feet wide. The tower is 300 feet high and contains the Tom of Lincoln, a famous bell cast in 1610. Other noteworthy buildings include the public library, the town-hall, the ruins of a Norman castle, and the remains of the palace of John of Gaunt. The site of the city is elevated, commanding a beautiful view of the surrounding region. The manufactures include flour, machinery, farming implements, clothing, and fabrics. It has modern facilities, such as telephones, electric lights, and rapid transit. Population, 1907, 53,672.

**LINCOLN CATHEDRAL**, one of the finest cathedrals in England, located in the city of

Lincoln, on the summit of a hill overlooking that city. It is in the early English style of architecture and contains the bell called Tom of Lincoln, which was cast in 1610. The building is 482 feet long, 80 feet wide, and the central tower is 300 feet high. Two other towers have a height of 180 feet. The cathedral is one of the finest specimens of architecture belonging to the Anglican church.

**LINCOLN'S GETTYSBURG ADDRESS**, a memorable address made by Abraham Lincoln at the dedication of the Gettysburg cemetery, Nov. 19, 1863. It is rightfully regarded a literary gem. The following is the address in its entirety: "Fourscore and seven years ago our fathers brought forth on this continent a new nation, conceived in liberty and dedicated to the proposition that all men are created equal. Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We have met on a great battlefield of that war. We are met to dedicate a portion of that field as the final resting place of the men who here gave their lives that the nation might live. It is altogether fitting and proper that we should do this. But in a larger sense we cannot dedicate, we cannot consecrate, we cannot hallow this ground. The brave men, living and dead, who struggled here have consecrated it far above our power to add or detract. The world will but little note, nor long remember what we say here, but it can never forget what they did here. It is for us, the living, rather to be dedicated to the unfinished work which they who fought here have thus far so nobly carried on. It is rather for us to be here dedicated to the great task remaining before us; that from these honored dead we take increased devotion to the cause to which they gave the last full measure of devotion; that we here highly resolve that these dead shall not have died in vain; that the nation shall, under God, have a new birth of freedom; and that government of the people, by the people, and for the people shall not perish from the earth."

**LINDEN**, a forest tree of Europe. The species native to America are commonly called *basswood* and *lime*. It grows to a great height, frequently from sixty to ninety feet. It yields a rather soft and light wood and bears sweet-scented flowers, growing in cymes and having the peduncle united to a leaflike bract. The wood is utilized by carvers and turners, for kindling purposes, and in the manufacture of powder. In nearly all the species the flowers furnish material for a tea and contain excellent qualities for honey. In many countries the



linden is cultivated near apiaries to supply food for bees. Many species are included in this class of trees, the European and American being quite similar. The linden is a favorite tree for gardens and house yards, having widespreading branches when isolated.

**LINDSAY** (lĭn'zā), a city of Ontario, county seat of Victoria County, on the Seugog River, 68 miles northeast of Toronto. It is on the Grand Trunk Railway and is surrounded by a farming country. The principal buildings include the county courthouse, the high school, the public library, and several churches. It has manufactures of flour, spirituous liquors, ironware, and lumber products. The municipality maintains systems of sewerage and waterworks. Population, 1901, 7,003.

**LINEN**, a fabric woven from the fibers of flax. Linen textile fabrics include many varieties, such as lawn, damask, cambric, sheeting, toweling, and ducks. The manufacture of this commodity dates from remote antiquity, a fact evidenced by Egyptian monuments and the embalmed dead found in the tombs, many of which are wrapped in linen products. Writers generally express the view that the Jews introduced its manufacture into Western Asia, and that it spread thence to Europe by way of Greece. It is probable that the Romans taught the art of making linen to the people of Western Europe, since the manufacturing establishments in those parts of the continent have been important for many centuries. The linens made in Belgium, Holland, France, Germany, and England are especially noteworthy, for the reason that the products are of a very high quality in fineness and the output is very large. Linen has been manufactured in the United States for many years, but the first extensive mill was built at Fall River, Mass., in 1834, since which time the industry has been gradually developing, though the finer products are still imported in large quantities.

When flax is received at the mill it has to undergo a line of preparatory operations before being spun into yarn for weaving. It is first heckled, by which the coarse parts are separated from the fine, and then is prepared for spinning, the latter being done by machinery. After being spun into yarn, the threads are woven into the different kinds of products by machinery, the apparatus depending upon the class of goods desired. However, the machinery does not differ materially from the devices used in the manufacture of cotton. The extensive production of cotton has affected the output of linen fabrics, especially in Europe, but linens have many advantages for various purposes.

Linen is much smoother than cotton, has a brighter luster, does not absorb moisture as easily, and is a healthful, clean, and cool material for sheeting and summer clothing. When bleached, starched, and dressed, it furnishes the beautiful material used for collars, shirt fronts, cuffs, and many other useful articles of apparel. It is stronger and heavier in weight than either cotton or yarn and, since machinery can be applied to every phase of its manufacture, it has assumed an important place among the textile fabrics. The common grades of linen are those used for bedding and plain clothing, while the heavy ducks enter into the manufacture of tents, sails, and coarse clothing.

**LING**, a species of sea fish found in the northern seas as far north as Iceland. It is allied to the cod family. The body measures from three to four feet in length, has a grayish back and sides, and the head is flat. The ling is very valuable as an article of commerce. It is caught most abundantly from February to May, when it is in the best condition, and begins to spawn in June. Split from head to tail and cured in salt brine and dried, it becomes known as *stockfish*. An oil is extracted from the liver, which is used as a substitute for cod-liver oil and for lighting purposes in lamps. Among the species are the common ling, the eel-shaped *blenny* found off Massachusetts, and the *gadoid* of Europe.

**LINNAEA** (lĭn-nē'à), a plant of the honeysuckle family. It is a small trailing evergreen herb, has round leaves, and bears fragrant flowers of a pinkish color. Only one species is contained in the genus. It is found in the northern regions of the Northern Hemisphere and occurs in mountainous places as far south as Maryland and California.

**LINNET** (lĭn'nēt), a singing bird of the finch family, native to North America and the northern portions of Europe and Asia. It is migratory, moving southward in autumn. The body is six inches long and the extended wings measure ten inches. Most linnets are yellowish in color with markings of brownish, but there are red, gray, and brown species. They change color somewhat according to the seasons of the year. Several species inhabit different parts of the Old World, those found in Egypt coming largely from the Levant to winter. The song is cheerful and lively and is distinguished by its pleasing notes, making the linnet a favorite cage bird.

**LINOLEUM** (lĭ-nō'lē-ŭm), an important product derived from linseed oil by the application of chloride of sulphur. It is useful for many purposes, its utility depending upon the



nature of the process to which the ingredients are subjected in preparation. In a common form it consists of thin sheets, which serve purposes quite similar to India rubber or gutta-percha. It is dissolved and used in preparing carpets, table covers, waterproof coats, etc. In a vulcanized form it serves for handles in cutlery and for moldings, and in other forms as a cement and for painting both iron and wood works.

**LINOTYPE** (līn'ō-tīp), a machine for producing stereotyped lines or bars of words as a substitute for typesetting. This machine uses matrices instead of type, each of these responding to the touch of keys, thereby falling into the proper place. When sufficient matrices to form a line have been set, they are moved automatically to the casting apparatus, where they are lined up, or justified, and molten metal is cast to form a solid line of type, after which the matrices are returned by the machine to their proper places by automatic action. The lines or bars containing the words are set up side by side to constitute a column. This machine was invented by Ottmar Mergenthaler (q. v.) and is one of the most practical inventions of the kind. Several styles of type, such as *brevier*, *nonpareil*, and *italics*, can be set at the same time by using different cases of matrices. See **Type**.

**LINSEED OIL**, an oil expressed from the seed of flax, which forms the type of the class known as *dry oils*, from their property of drying into a transparent, tough mass when exposed to the air. It is secured from the linseed either by heating to 200° Fahr. or by pressure without heating, the latter process being regarded the better, as the oil extracted by that method is less liable to chemical decomposition. If the raw oil is boiled until it loses about one-sixth its weight, it becomes of greater value, since it dries up more readily than in the fresh state and forms, when applied in painting, a turpentinelike mass which is scarcely soluble in oils. In that form it constitutes the basis of painters' and printers' varnishes. About 28 per cent. of the quantity of seeds pressed is the amount of oil secured, and the residuum constitutes a valuable product for domestic animal food, known as *linseed cake*. It is sold on the market either in solid cakes or as meal. The principal uses of linseed oil are for mixing paints, preparing varnishes, oil cloth, printers' ink, soft soap, and linoleum, an article used largely for covering floors. Linoleum is prepared by solidify-

ing linseed oil through the agency of chloride of sulphur.

**LINTEL** (līn'těl), a piece of timber or stone laid horizontally over a doorway or window for the purpose of furnishing support to the building. It is sometimes constructed in the form of an arch and sometimes as a short architrave.

**LINZ** (līnts), a city of Austria-Hungary, capital of the crown land of Upper Austria, 102 miles west of Vienna. It is located on the Danube River and is strongly fortified. The chief buildings include the cathedral, an armory, a public library, and a number of schools and churches. It has extensive railroad and electric railway facilities and is the seat of a large trade in tobacco, leather, cereals, and live stock. In the time of the Romans it was known as *Lentia*. Population, 1906, 60,872.

**LION**, a majestic carnivorous animal, the largest of the cat family. It is one of the most active of the large quadrupeds, has a yellow or tawny color, and measures from eight to ten feet in length. At the shoulder the height is about four feet. The tail is nearly four feet long, tufted at the end, and the male has a large, shaggy mane. In all species the lioness is smaller than the lion, but more impetuous and agile, and is destitute of a mane. The mane begins to grow at the age of three years, maturity is reached at about six years, and the average life is thought to be about twenty years. Lionesses bring forth from two to four young annually, and the whelps are nourished nearly a



LIONESS AND WHELPS.

year. While the favorite abode is an open plain, during the breeding season they remain secluded, and both parents give much evidence of energy in defending their young.

Like the cat, the lion is disposed to hunt its prey most commonly during the night, stealing upon it with great caution, and when at the proper distance it leaps with well-directed force and accuracy. The eyes are brilliant and the



body is muscular. The great strength of the lion has caused it to be called the *king of beasts*, though its noble appearance and kingly bearing no doubt contribute largely to this appellation. Travelers find it a protection to kindle a fire and keep it steadily burning, as the lion shuns flames, and rather avoids than attacks man unless induced to forceful means by hunger. Formerly lions were common to Europe, but the advent of civilization has caused their retreat to the wild regions of Asia and Africa. The African lions are by far the largest, and include a number of species. Those found in Asia are medium in size and in some species the males do not have a mane. The *puma* of America is often classed as a lion. If captured young, lions may be domesticated and trained to acts of skill, for which purpose they are frequently exhibited at exhibitions. At the time of the prosperity of Rome many exhibitions consisted of fights between lions and other animals, or even between lions and men. They were employed to some extent for the destruction of Christians and criminals.

**LIPARI** (líp'á-rē), or **Aeolian**, a group of seventeen islands, lying north of Sicily, but only six are of material size. The area is 58 square miles. It belongs to Italy and contains numerous ancient ruins and volcanic mountains. Earthquakes and storms are frequent. The industries include fishing, mining, and fruit raising. Pumice stone, soda, sulphur, niter, fish, wine, and tropical fruits are the principal products. Among the chief islands are Lipari, Vulcano, Filicuri, Salina, Panaria, and Stromboli, the celebrated intermittent volcano Stromboli being on the last named island. Lipari is the only island of the group that was inhabited anciently. Population, 1906, 20,806.

**LIQUEUR** (lê-kēr'), an alcoholic cordial sweetened and flavored with aromatic substances for the purpose of making it pleasing to the taste. Various products are used for the purpose, such as cumin and caraway seed in the preparation of kummel; cloves in preparing clove cordial; bitter almonds in making noyau; and aniseed in preparing aniseed cordial.

**LIQUID** (lik'wid), a substance whose parts retain no definite form, but change their relative position on the slightest pressure. The term liquids is applied to all fluids, but many fluids are not liquids, such as air and the gases. Water is the most common liquid. See **Hydrostatics**.

**LIQUID AIR**, the name applied to the product obtained by liquefying the so-called permanent gases, such as hydrogen, nitrogen, and oxygen. Though various gases were liquefied fully

a century ago, much attention has been directed to the process, particularly because of the invention of a new and more powerful apparatus. Faraday attained considerable success in liquefying nitrous oxide and ammonia, but renewed interest was directed to the process in 1898 by Chas. E. Tripler, of New York City, and subsequently by others. To liquefy gases two factors are necessary—pressure and cold. By the application of both these factors to a sufficient extent, any gas, so far as known, may be liquefied. The point at which liquefaction takes place is called the *critical temperature*, a term applied to both the temperature and the pressure at which a gas liquefies. These differ according to the nature of the gases. For instance, argon liquefies at the critical temperature of  $-250^{\circ}$  Fahr. and the critical pressure of 759 pounds; nitrogen, at  $-295^{\circ}$  and 525 pounds; and oxygen, at  $-245^{\circ}$  and 762 pounds. In an experiment it was found that liquid air freezes at a temperature of  $2,400^{\circ}$  below zero.

Besides Tripler, W. Hampson, of England, and Carl Linde, of Germany, have brought forth practical machines for producing liquid air. While different in many details, they are quite alike in general principles. Among the essential parts is an air compressor, by which air is compressed in a series of cylinders connected by automatic gauges, and the heat resulting from the compression is removed by intercoolers. The construction is such that the last of the series of coolers is in a large tank filled with running water, which serves to cool the air pipe, and the air is thence conducted through a separator to free it from moisture. It next passes to the liquefier, a device constructed of small pipe with many turns, which is surrounded by a heavy felt packing to protect it from external heat. When the pressure at the lower end of the coil becomes raised to a sufficient intensity, an expansion valve permits the cool air to pass between and around the coiled pipes.

As this operation is continued, it has the effect of gradually cooling the air until the critical point of temperature is reached, when portions of the air liquefy and the product falls into a receptacle, from which it may be taken and used for purposes intended. Formerly it was thought that liquid air would come into wide use, as for refrigeration, ventilating and cooling rooms, and divers hygienic purposes, such as the destruction of typhus bacilli and bacteria. Since it has a general temperature of  $312^{\circ}$  below zero, its usefulness for these purposes would seem practical, but the expense of producing and the difficulty of handling it have precluded its use, except in physical laboratories. Ice at  $30^{\circ}$  Fahr.



is as a furnace in comparison with liquid air, and, when placed on a block of it, liquid air boils in a manner quite similar to water affected by a hot fire.

**LIQUIDAMBAR** (lĭk'wĭd-ām-bĕr), a genus of trees found in Asia and North America. The common liquidambar is a tall tree, has lobed leaves, and is native to Mexico and the southern part of the United States. It grows to a height of 100 feet and is valuable for the timber, which is sometimes called *satin walnut* in the markets. Four species of these trees have been described, all of them more or less valuable in their production of fragrant resinous matter, called sweet gum, copal balsam, or liquidambar.

**LIQUORICE.** See **Licorice.**

**LISBON** (lĭz'bŭn), the principal seaport and capital of Portugal, on the Tagus River, about nine miles from the Atlantic Ocean. It has a very beautiful site, an important harbor, good railroad connections, and a number of modern municipal improvements. Among the public utilities are gas and electric lighting, stone and macadam pavements, sewerage, and an extensive system of electric street railways. The harbor is commodious and strongly fortified. It has a large export and import trade, especially with the colonies. The manufactures include cotton, woolen, and linen goods, jewelry, tobacco, hats, clothing, boots and shoes, machinery, earthenware and utensils. Some of the older streets are tortuous and have few sanitary facilities, but the newer parts are clean and well regulated.

Much of the architecture is of stone and brick. The principal buildings include the national library, the customhouse, the arsenal, the Church of Saint Rogue, the Monastery of the Heart of Jesus, and the national theater. The national library has 200,000 volumes. Many of the public places are adorned with fountains and statuary. The water supply of the city is secured through an aqueduct eighteen miles in length, which is regarded the most extensive bridge architecture in the world. Lisbon was founded by the Phoenicians and passed to the Romans, then to the Goths, and later to the Moors. In 1146 it was captured by Alfonso I. It became the capital of Portugal in 1422. In 1755 one of the greatest earthquakes on record visited the city, in which 35,000 persons were killed. Population, 1907, 359,044.

**LITANY** (lĭt'ā-nŷ), a solemn prayer or supplication addressed to God with the view of obtaining mercy and assistance. It is used chiefly on occasions of public calamity, especially in the case of prolonged drought and the prevalence of epidemics. The Kyrie Eleison (q. v.) is the

earliest and most simple form of litany and is repeated a number of times. Two other forms of litany are those known as the *Litany of Loreto* and the *Litany of the Name of Jesus*. The requirement to repeat the litany in the Roman Catholic church applies only on Rogation Days, or the Monday, Tuesday, and Wednesday before Ascension, and on Saint Mark's Day, but it is used by common consent at the time of great calamities and special occasions, such as consecrations and ordinations.

**LITCHFIELD** (lĭch'fĕld), a city of Montgomery County, Illinois, 43 miles south of Springfield, on the Wabash, the Illinois Central, the Chicago, Burlington and Quincy, and other railroads. The chief buildings include the public library, the high school, and a number of churches. It has waterworks, sewerage, and well-graded streets. Among the manufactures are threshing machines, earthenware, carriages, flour, and brooms. The surrounding country is agricultural and dairying. It has valuable deposits of coal, natural gas, and mineral oil. Litchfield was settled in 1853 and incorporated in 1859. Population, 1900, 5,918; in 1910, 5,971.

**LITER** (lĕ'tĕr). See **Metric System.**

**LITERATURE** (lĭt-ĕr-ā-tŭr), the written or printed productions of the human mind distinguished by vigor and elevation of thought. Our educational institutions and the general public are giving attention to home reading and the attainment of literary culture with an ever-growing interest. Never before has there been greater activity than at present among the American people to own and read good books. This desire is not confined to any particular class, and it exists with almost as much intensity in the country as it does in the cities and towns. Through the general diffusion of knowledge among the masses in the schools, the reading habit has become almost universal, and the school days, apparently stopping when the child leaves school, extend far into the adult life of the individual. The character of the reading is as diversified as the tastes of the human mind, and it covers topics in all departments of knowledge. In fact, there is no field left unexplored. Even in the same neighborhood may be found men and women pursuing subjects as widely separated as if they were inhabitants of two cities on opposite sides of the globe.

In the stricter and narrower sense literature belongs to the fine arts and embodies thought that is power-giving, or inspiring and elevating, rather than merely knowledge-giving. In this sense it excludes the writings that are merely technical or for a particular class, and embraces those that are of interest to man in an aesthetic



sense, that are characterized by an elevated tone and style, and shaped by the creative imagination or power of artistic construction. Literature may be divided into three classes, representative discourse, oratory, and poetry. *Representative discourse* embraces all the productions in which the writings are for the sake of the theme itself; *oratory*, where the representation is for the sake of the effect on another mind; and *poetry*, where it embodies in beautiful form the thoughts presented, largely for the sake of the form. Dean Stanley embraces in literature all those great works that tower above professional or commonplace uses, and take possession of the mind of a whole nation or a whole age.

"Literature in the higher sense" is a criticism of life, but it is usually defined as all that has been written that was worth reading years or centuries afterward. Not everything that has been written can be classed as literature. What there is that has "the potency of life in it" is for this reason worthy of consideration. Out of such material, either preserved in books or hidden away in diaries, true literature has been made. This is, in a large measure, the unwritten history of the people themselves, which in later years is gathered up and shaped into form. While the literature of this country is a vigorous offshoot from the parent stock, and is modeled largely after it, yet it possesses distinct national characteristics indicating the modes of thought and the persistent activity of the American people.

Coming from England, our ancestors brought some books with them, and the need of books written in the colonies was not felt at first, yet diaries were kept by some of the early settlers and from these jottings one is enabled to conceive with a very considerable degree of accuracy how the first settlers lived, worked, associated together, and what manners and customs they observed, and the general appearance of the country, the habits, modes of life, and the peculiarities and general traits of the savages with whom they came in contact. As the settlements prospered and their interests expanded in the different colonies and a wider acquaintance with the affairs of men in all parts of the world became necessary, attention was directed to other nations, their laws and institutions. However, the first settlers in the colonies had much hard work to do, but there were some men among them who had been liberally educated and their influence reached down among the masses in every settlement. There was then present, as there is now, an instinctive feeling among the masses to respect the man who

knows more in general than his fellows, and whose judgment is sound and whose opinions are based on a comprehensive view of a situation.

In the early history of the country, little time could be devoted to writing books that would now be worth reading, except to show how the people themselves lived. The younger living had to preserve the history of the older living for the benefit of the future historian, novelist, essayist, or antiquarian. Written thoughts live; oral tradition dies. Our ancestors were men and women of high and lofty purposes. They had cut themselves loose from all the old-world ties in order to carve out a mighty destiny under other skies, on an unexplored continent. Their higher thoughts were occupied with notions of divine and civil government. What was written then had a gloomy religious coloring, inherited from conditions that had in a large measure influenced them to leave the old world and to settle in the new. From 1607 to 1765, there were feeble attempts, as now judged, in writing some books chiefly on interpreting the Scriptures and the extent of the authority of kings and potentates. Our literature had its beginning during this period.

The literature of Canada and the United States is all of modern origin. None of it is three hundred years old. The study of American literature is the study of the best literary productions of the men and women who wrote them, and some account of the life of each. Books that have a permanent interest for all men, extending throughout all time, may be classed as literature in contrast with those writings that had only a temporary interest. Education along literary lines in recent years has invariably taken two directions—one is a return to the study of those productions which have stood the test of time, and incorporate the expressions of the race as well as the experience of the individual who reads such books for the first or the twentieth time; the other line is by absorbing the principles that are embodied in the highest forms of literary art, so that one is enabled, by superior tact, skill, judgment, and appreciation, to blaze out a line of work that in matter and form will command and hold the admiration of all who know how to appreciate and to enjoy the beautiful in literature.

However, it is most desirable to influence those who must do their reading chiefly at home, to read the best books and in the right direction. Home reading must furnish the essential basis for all extended education after one has finished his work in school and entered upon that broader sphere of activity in the in-



dustrial, commercial, or professional occupations of life. Men and women should be trained along two lines, and each should accomplish its purpose fairly well. The first has for its object the developing of the original powers of the mind so that the possessor shall be quick in observation, active in comprehending and in adapting himself to new and untried situations, clear and free in his thinking, and self-poised in his disposition. On the reflective side of life, he must fortify himself by gathering wisdom from the world's best books so that he may enjoy and participate in the experience of the race. Literature contains this knowledge, the invaluable lessons of human experience.

In reading the biographies of the most noted scholars and philanthropists, one is impressed with the important influence that some book had in shaping the character of each, or in directing his energies into a definite channel of investigation or action. An insight into the methods employed reveals how it was that one trained himself to become a naturalist, and another a writer of books, a linguist, a historian, a poet, a mathematician, or an astronomer. Studies of this kind have done more to stimulate the spirit of investigation, especially along the lines of research, than all other influences combined. It is consequently a matter of much greater importance to get a few of the right kind of books, than it is to have a good teacher whose influence may be only temporary. A book that teaches how a result was reached, indicating the steps in the discovery of a fact and the experiments made, will lead one to depend upon himself far more than when he is told how by a teacher. Such a book is stimulating, because it indicates clearly the entire process from the beginning to the end in the discovery of truth.

A library for home reading should contain different assortments of books—books that incite to reading and that arouse an independent, continuous spirit of self-activity. These books should treat chiefly of the spirit and methods of discovery, and of the processes of development to which each subject belongs. Where one is prepared to view the material world as an unfolding process, and that each fact in the process throws some light on every other fact in connection with the process, knowledge then begins to assume a scientific aspect in a classificatory form. The habit of study which leads to such classification of reading and investigation is invaluable to the young person who is beginning to form habits that will economize life's work. It is doubly important that the one who must map out his own course of reading should

adopt a plan that is somewhat scientific in its character and at the same time widening in its scope.

A simple method for gathering a library of books for home reading and progressive instruction is to select books grouped under a few general heads as follows:

*The First Division* should include history, biography, and ethnology. History and biography relate to the lives of nations and individuals; to the social lives of each; and to the collisions that the nation has had with other nations, or the individual with other individuals, or at times with the popular will. But the most interesting phase of national history is its peaceful relations with other nations in developing and extending commerce in times of peace; the forms of government, the modes of administering justice among the citizens, their manners and customs, social, political, and religious practices—all help one to see those of his own people in the light of others. In studying the less advanced peoples, one becomes familiar with the lives and habits of the backward races and he thus learns to understand their prejudices far better than he who holds himself aloof, and who would reform them by sheer force. One learns, too, how the will of the chief of the tribe or clan controls all those who belong to the tribe or nation. It is in this tribal will that the social will of a nation expresses itself and makes its power felt in books on ethics, social usages, laws, forms of government, and the public and private duties of the citizen. This division includes a large sphere of practical life, and embraces man's relations to his family, state, and humanity.

*A Second Division* is that of natural history, including nontechnical books on animals, plants, and descriptions of remarkable objects in nature, and especially descriptions of geographical localities, and particularly of travels in various parts of the earth on land and sea. This is one of the most inviting fields to the young, and work in any department of it leads to a wider view of organic nature under all of its phases. It is in this department, too, that the student is most apt to specialize in botany, biology, the weather, agriculture, horticulture, stock raising, or astronomy. He often becomes deeply interested in state and governmental publications of some phases of this large group of miscellaneous subjects.

*Third Division.* In this division should be embraced such books as treat of physics and chemistry. Under physics, attention should be directed to bodies in mass, whether at rest or in motion, thus giving the learner clear concep-



tions of statics and dynamics, or of the air, water, light, heat, electricity, and the properties of masses of matter in general. Such knowledge strengthens the reasoning faculties and leads out to a realization of some of the great problems in natural philosophy and astronomy. Chemistry will give a knowledge of those phases of organic and inorganic elements which enter into the structure of compounds, and the processes of combinations and analyses by and through which chemical knowledge has been built up into a great body of scientific information.

A last group of books that may be considered as a distinctive one is that relating to books of literature, and works that make known the beautiful in character, architecture, sculpture, painting, music, prose, and poetry. Literature and art exhibit human nature in the form of feeling, emotions, and higher and more beautiful ideals which terminate in a striving after the good, the true, and the beautiful in life. Such an influence refines human nature, enlivens and vivifies impressions, and results in clearer thought and more lasting impressions in shaping the life after higher ideals.

*For Home Reading* the student early in life should select his library books chiefly along the lines indicated for culture and general information.

Benjamin Franklin is the central figure in the early history of the United States. His writings are the very opposite, in many respects, of the somber theology of that age. He turned his attention mainly to practical life, dipping, as his time permitted, into scientific and curious subjects. He is associated with men who were destined to act through the Revolutionary period. They are, in the main, men of speech and action rather than authors who would sit down quietly and chronicle events. Yet there is a strong background upon which this striking national peculiarity is deeply engraved. Hallam has sketched the same characteristic in his "Constitutional History of England." It is the same life running down through the sturdy "House of Commons" from the time of James I. to the accession of William and Mary. It is preëminently the liberty-making period, and upon this very account the students of literature, and especially the readers of American history, should be perfectly familiar with *Magna Charta*, the *Petition of Rights*, the *Declaration of Independence*, and the *Constitution of the United States*.

This kind of literature has a firmer hold upon a people than the mere desire to do elegant writing, and the student of literature is impressed with the fact that the literary standard of one age is not the literary standard of all

ages, or for any other age, except that particular one in which it is written, unless it be a crystallized nation—and crystallization always means death to a living organism.

The political writings of the Revolutionary period were those chiefly of Thomas Paine, who exerted a tremendous influence throughout the colonies. He was preëminently a "war-arouser." Full of fire and enthusiasm, his blows fell with tremendous force. But for the inside thoughts of great men, notwithstanding the estimate of Von Holst, all literature affords no finer examples than the letters of Jefferson and John Adams after both had retired from public life. It is in these revelations that one learns to know these two great men.

"The Federalist" is the constitutional textbook of our country. In it one gets the best and clearest exposition possible of the Federal Constitution as it was understood by its authors. Strange, indeed, that two young men, Hamilton and Madison, one thirty and the other thirty-six, both slight in build, should come forward as the ablest champions of constitutional liberty in America! For an entertaining account of this period in our country's history, the reader is referred to that master work, "The Critical Period in American History," by Professor John Fiske.

During the constitutional convention various propositions were offered and discussed, adopted or rejected, after a session of four months behind closed doors, and as a result of their deliberations, the present Constitution of the United States was submitted for adoption by the people. When it was fairly before the people for ratification or adoption, then it was that men in every state began to pick it to pieces. Even in the convention where it was framed, it was agreed to finally "by a trade" between Massachusetts and South Carolina. The student of American history needs to know all these things before he is in a condition to understand clearly the sectional sentiments of the parties which sprang up in this country afterward. The slavery question was simply an inherited issue, and it was the entering wedge which widened the breach between the two sections more and more, till finally it was settled by the sword.

It is always decidedly refreshing to read a review of a noted man's character and services in which he is dissected skilfully, justly, and honorably. To throw the personal equation entirely aside and to judge of motives in the clear light of reason is a great step forward in ascertaining truth. One point will illustrate this statement. When the lamented Lincoln delivered his famous Gettysburg speech, it fell flat,



and so he felt it himself. But some years afterward an Englishman examined it, commented on its simplicity of style, its depth of meaning, and immediately it became classic as well as prophetic. Everybody knew it was a grand thing, then.

Real literature with us begins with Irving, Cooper, and Poe—three men so unlike, and yet, in a sense, two of them, at least, typical products of the country. What a curious contrast to the great men who had taken so active a part in forming the government. With the former it was the intelligence working through the will, actively employed in shaping into form the political, social, religious, legal, and commercial institutions of the country—a grand work from the will side of human nature. Opposite are set Irving, Cooper, and Poe, who work out from the intellect, taking in part of the feelings for a substratum. Each sets himself a different task. In studying each, it is necessary for the reader to put himself as nearly as possible in the place of each of these authors, yet this is rather a difficult task in the case of Poe. The smooth-flowing sentences of Irving, and the strong, deep insight of Cooper, have their charms as well as their pleasure; but who can describe, in a sentence, the wild and horrible, as prefigured in Poe's mind? Poe, as a writer, is much less read than either Irving or Cooper, yet, as a critic, he certainly occupies the highest rank.

N. P. Willis is another charming writer. He is one of the most unique characters in American literature. As a sketchy writer, few are known to excel him. His prose writings are delightful. Though his writings are partially forgotten, yet as a "hurrygraphist," he is without a peer in modern literature. Harriet Martineau, after listening to John C. Calhoun speak, said, "that he would make one believe in predestination." Carlyle, in his cynical way, called John Stuart Mill a "logic chopping machine," and no one can read "A Disquisition on Government" by John C. Calhoun without feeling the powerful force of his logic. He was not a great rhetorician, but a great logician. He and Jonathan Edwards, each in his own specialty, stand as the first logicians that our country has produced. Admitting their premises, their deductions are irresistible.

During the "statesman period," including Clay, Webster, Calhoun, Benton, and Cass, all notable men, the student of constitutional history will gain much from reading their speeches. There appears to be no doubt that so far as exact information was concerned, Benton was the "best posted one" of the galaxy. Literally, we might say—"There were giants in those days;" but

should an emergency arise, their equals would be found in the House and in the Senate again. The occasion has much to do in bringing out the latent energies of master minds. Along with this galaxy of statesmen and orators may be mentioned Phillips, Sumner, Choate, Everett, John Quincy Adams, Seward, Stephens, and Lincoln, whose speeches and state papers will always have a permanent value.

Among the earlier historians whose works are of a high order may be mentioned Bancroft, Prescott, Parkman, and Motley, and of the later, Fiske, Schouler, McMaster, and Rhodes. John Bach McMaster actually writes the history of the American people. But to understand fully how our institutions have impressed foreigners, the student should read "Democracy in America," by De Tocqueville, Von Holst's "Constitutional History of the United States," and Bryce's "American Commonwealth."

The development of poetry among the people of the United States has not followed the method of older countries of the world, and only a few poems of a high order have been produced; but a great deal on the average level. A great poem can be written only when the poet is inspired by a lofty ideal. Ideals rule the world of thought as well as of literature. We have a few great but short poems. Bryant's *Thanatopsis*, written at the age of eighteen, is his best poem. In this respect, he and Macaulay were both at their best early in life. Macaulay's first speech was as great or greater than any of the others delivered. On the other hand, Longfellow's growth was a gradual one. Halleck is known by one poem, "Marco Bozzaris," and George D. Prentice by "The Closing Year." This is one of the finest in our language.

Religion is one of the inherent elements in man's nature. The idea that it is an acquired faculty has no more truth in it than that a desire for food is an acquired appetite. The truth is, that the one is as natural as the other. As Kant puts it, there are three great questions in the world—God, nature, and immortality; or God, man, and immortality. The American mind is preëminently a speculative one, so far as it undertakes to reconcile nature and religion. Our literature is rich in speculative theology, and not a few persons have struck out new theories of doctrine when followers were not numerous and dogmas evoked little thought and less action. Hardly a religious idea has sprung up in any quarter of the globe that some one has not appropriated it here, and sought to found a sect. This movement goes on still. Our institutions invite these exotics, and when they are transplanted, they either take root or



die. So far, however, as pulpit literature and pulpit oratory are concerned, our country has produced some of the greatest men the world has ever seen. It is only a short step from religious and social issues to the realm of philosophy. At all times there were a few scholars in the United States who studied philosophical questions, but during the past thirty years the number has multiplied in every state.

In any treatise on American men of letters, Emerson is always destined to occupy a large space. The student turns to him instinctively for inspiration rather than for positive knowledge. He is always helpful, always suggestive. His charm lies in his sweetness, gentleness, and loveliness. To read Emerson is to make one better. His theology is the doctrine of manhood. Amos Bronson Alcott was another typical character. Whether the similarities be found between Plato and the Bible led him to his singular opinions concerning the instruction of the young is still a matter of debate. At any rate, he was a man of singular purity of character.

Charity keeps us from calling Thoreau a crank, and yet there are some traits in his character that one admires. He stood as a protest against the conventional side of life. He was a civilized man who never found a home in civilization. Margaret Fuller's life is one of inspiring interest to the girls of our country. Brains will tell. Her tragic death lends interest to her work. Channing, Dewey, Theodore Parker, Horace Bushnell, Henry Ward Beecher, Phillips Brooks, and other noted clergymen shed additional luster on our religious and political institutions. Their writings need to be studied in order to be thoroughly appreciated.

But the central figure as a writer of fiction is Hawthorne, *the elder*. Certainly Nathaniel Hawthorne occupies a unique place in fiction. He painted nearly as boldly as did Dante,—that the one who violates a law is plagued by the return of his own sins upon himself. The outcome of all this philosophy is that of personal freedom and personal responsibility. Just how much of one's writings can be set down as symbolic and how much as literal can never be quite definitely determined; yet Hawthorne seems to mix the two without a conscious effort. His mind was of that peculiar type that it specialized and generalized at the same moment. He had in the very fullest sense what philosophers call insight. He was much more than a clever writer, and yet he does not have that full sweep which takes in all humanity at a single stroke.

Passing to the "Autocrat of the Breakfast

Table," his versatility of mind has drawn all English-speaking people closely to him. To say that he is a profound writer on any subject would not be a correct estimate of his ability, but he is always interesting, always genial, never lags, yet, too, there is a ripple of mirth just beneath the surface of every pregnant truth he utters. He reaches the people, and he sets them into quiet, half-repressed chuckles. In reading Holmes one wants to get up every little while and walk across the floor and laugh. He lives in the hearts of the people more fully than any other American author. Every page of his quivers and thrills with human throbs. Going from Holmes to Lowell, the atmosphere changes—not that it is stinging cold or burning hot—but there is a sudden change. It is the difference between all of man's nature on one side and a distant, intellectual criticism on the other. The last element may be fitly described as massive power in repose, but illumined by bright, yet frigid sunbeams of the upper ether. Running down the list one comes to the poet Whittier whom everybody loves. He is one of the men whose influence has made the world wiser, better, and more human and spiritual.

There are many writers now in all departments of literary work, yet some have written well enough for their writings to live and to be read by future generations. Much that is now teeming from the press deserves an early death. A dialect literature can have only a momentary interest and an ephemeral existence. The permanent element of universality, that speaks to all people and through all time, is wanting in dialect writing. It runs in a limited channel, and it soon wears itself out. It starts in well, but dwindles away to nothing. Of course, those possessed of acute insight catch flavors of genuine greatness here and there in such author's productions, but the aroma is so delicate that it never reaches beyond a certain charmed circle. Such writers as Henry James and William D. Howells are not to be classed with those just described. As graceful, polished writers, these two men rank high. In a matter-of-fact way, they get at what they have to say. They may be properly classed as literary men of high working ability.

*Buying Books.* The person of ordinary means should keep all his school books and then first supply himself with a few choice reference books, and he should always buy books for the solidity of the matter they contain rather than on account of expensive bindings. Two or three of the very best books by recognized authorities on a subject are enough to give the average reader a clear and comprehensive in-



sight of a department of knowledge. One standard book is worth more than a dozen commonplace ones treating of the same topic. Books should be chosen with as much care and judgment as one ought to exercise in choosing his lifelong friends. See **American Literature; Canada, Sub-head Literature.**

**LITHARGE** (lith'arj), the general name of lead monoxide, made by moderately heating metallic lead in a current of air. It has a straw-yellow or reddish color. Litharge is used as a pigment, in making flint glass, and for glazing pottery.

**LITHIUM** (lith'i-ŭm), a rare metallic element discovered in 1807. It is widely distributed in nature, but does not occur in large deposits. Small quantities of it are found in certain mineral waters, in meteorites, in the leaves of certain plants, and with the rare minerals *petante* and *spodumenc*. It tarnishes quickly in the air, is one of the lightest of metals, and decomposes with much rapidity when placed in water. The properties of the citrate of lithis are similar to those of the carbonate, hence it is used to some extent by physicians. Compounds of lithium are useful in the manufacture of fireworks, since they give a characteristic red color to a flame. See **Chemistry.**

**LITHOGRAPHY** (lith'og'ra-fy), the art of producing printed matter from a flat stone on which an engraving or drawing has been made. The art was introduced by Alois Senefelder (1771-1834) in Germany about 1786, where the best so-called *lithographic stone* is obtained. This class of stone is almost the only one suitable for lithographic work, being a variety of fine limestone and having a light cream or gray color. It is formed into plates according to the size wanted, usually several feet square, and may be split easily into sheets of uniform thickness. Afterward it is cut and squared to the size required for a particular engraving. The artist prepares the design to be printed in various ways, but chiefly by engraving it on a prepared stone, by drawing it with a watery ink, or with a solid crayon, and by transferring from an inky design on paper by various means. The usual process is to cover the prepared stone with a greasy substance. This penetrates the stone, and can be removed only by cutting into it as deeply as the greasy substance has entered. The design is prepared by cutting in this manner, then filling with water the portions not covered by grease, after which an inky roller is passed over the stone with the effect that ink adheres to the greased parts, but is repelled by the portions moistened with water. In pressing the paper against the surface of the stone the

inky surface transfers an impression of the design drawn by the artist.

Boiled linseed oil is used commonly in preparing the greasy surface for lithographic work, and split diamonds are employed for preparing the script and finer lines, though these are made after the heavier designs have been engraved. The delicate tints and shades are obtained from fine parallel lines, numbering from 75 to 100 to the inch. Products similar to those secured by lithographing are obtained from zinc plates, when the process is called *zincography*. It possesses the advantage that plates prepared of zinc are less liable to breakage and are more easily portable than stone. *Chromolithography* is the art of producing lithograph pictures in the natural colors, which is done by making separate stones, there being as many different stones as tints desired, the number varying all the way from two to thirty. *Photo-lithography* is the process in which a photographic negative is transferred to the stone plate. This process is utilized in producing maps, plans, outlines, and various other matters.

Within recent years attempts have been made to utilize aluminum in lithography in place of the ordinary lithographic stone. It possesses the advantage of being lighter, takes drawings without much resistance, and, after being used, it may be melted and made to serve again by rerolling. The lithographic stone has been imported more or less by all countries from Solenhofen, Bavaria, on account of which the price has been quite high, thus supplying another reason why zinc or aluminum has been used to a larger extent than formerly. The United States is becoming a large producer of lithographic stone. It is found in Utah, Tennessee, Kentucky, and several other states, the production in Utah being the most important.

**LITHOTOMY** (lith'ot'ō-my), the surgical operation of cutting for stone in the bladder. Before resorting to so serious an operation the surgeon usually looks for evidence of stone in addition to the ordinary symptoms, which is done by a process known as *sounding* the patient. This consists of introducing a metallic instrument through the urethra, by which the stone may be heard and felt. The main operation, when properly performed, does not require more than three or four minutes. The wound in favorable cases heals in about thirty days. Operations of this kind are restricted almost exclusively to the male sex.

**LITHUANIA** (lith-ŭ-ā'nĭ-ā), a region of Europe, bordering on the Baltic Sea, now included in Russia and East Prussia. In the 11th century it constituted a grand duchy, but in the



14th century it was annexed to Poland. The first dismemberment of Poland, in 1772, caused the region to be divided and transferred to its present dependency. The area is about 100,000 square miles, of which all but 6,750 square miles belongs to Russia, and the latter portion is German territory, being a part of the kingdom of Prussia. The Lithuanians are classed with the Indo-Europeans. They are of a peaceable disposition, have fair features, blue eyes, light skin, and engage principally in agriculture and stock raising. In religion they are largely Greek and Roman Catholic. They are noted for their liberal support of schools and educational arts. In the beginning of the last century they began to acquire titles to land by purchase, being aided by government grants, and now own many fine stock, cereal, and dairying farms. The language spoken is related to the Old Prussian or Lettic. Their literature includes many religious works, some important history, and numerous popular songs and hymns. It is rich in legends and folklore. The legends are especially rich in primitive tales and fables. The entire Lithuanian race is estimated at 2,750,000, of whom about one-half speak the Lithuanian language.

**LITMUS** (līt'mūs), a vegetable color obtained from several species of lichen. It is used in chemistry to test the presence of acids and alkalies. Acid changes the blue color of litmus to red, and the read color is again changed to blue on being mixed with an alkali.

**LITTLE FALLS**, a city and the county seat of Morrison County, Minnesota, on the Mississippi River, 95 miles northwest of Minneapolis. It is on the Northern Pacific Railroad and is surrounded by a farming and lumbering district. The Mississippi River supplies an abundance of water power. Among the chief buildings are the county courthouse, the public library, the high school, an orphan asylum, and Saint Gabriel's Hospital. The manufactures include flour, paper and pulp, brick, machinery, and lumber products. It was first settled in 1849 and incorporated in 1889. Population, 1910, 6,078.

**LITTLE FALLS**, a city of New York, in Herkimer County, on the Mohawk River, 21 miles southeast of Utica. It is on the Erie Canal and on the West Shore and the New York Central railroads. Good water power is obtained from the river, which flows through a rocky defile and forms a number of cascades. It has a public library, municipal waterworks, pavements, and a city hospital. The manufactures include flour, woolen goods, bicycles, hardware, and machinery. It has a large trade in farm produce and merchandise. The first settle-

ment was made in 1782, but it was destroyed by Tories and Indians, and it was resettled in 1790 by a colony of Germans. Population, 1905, 11,122; in 1910, 12,273.

**LITTLE ROCK**, a city and the capital of Arkansas, county seat of Pulaski County, on the Arkansas River, 130 miles southwest of Memphis, Tenn. It is on the Southern, the Saint Louis, Iron Mountain and Southern, the Saint Louis Southwestern, and the Chicago, Rock Island and Pacific railroads. The site extends over a rocky bluff, about fifty feet above the river, and is noted for its beautiful and healthful location. Many of the streets are well graded and substantially paved with stone, brick, and asphalt. The principal buildings include the State Capitol, the Philander Smith College, the Arkansas Female College, a Roman Catholic academy, the Cathedral of Saint Andrews, the Federal building, the county courthouse, the Arkansas Military Academy, and many fine hotels and hospitals. Among the manufactures are cotton and woolen goods, furniture, cotton-seed oil, ironware, clothing, wagons, and machinery.

Little Rock is surrounded by a cotton and fruit growing district. It has a large local and wholesaling trade in merchandise and produce. The first settlement was made in the vicinity in 1814 and soon after it became the seat of the territorial government. It was incorporated in 1831. A Union army under General Steele captured it in 1863. Population, 1900, 38,307; in 1910, 45,941.

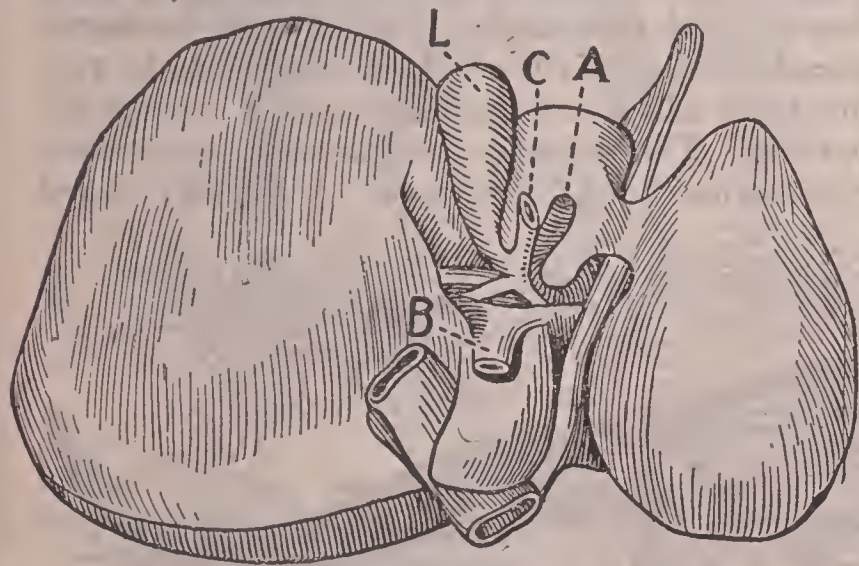
**LITTLE TURTLE**, a Miami Indian chief, remarkable for his intellectual strength and skill in war. On Oct. 22, 1790, he commanded an Indian force that defeated General Harmar on the Miami and on Nov. 4, 1790, gained a victory over General Saint Clair at Saint Mary's. He concluded peace with the whites in 1795 by signing the Treaty of Greenville, by which large tracts of land in Ohio were opened for settlement. In 1797 he met President Washington and several other high officials at Philadelphia. His death occurred July 14, 1812, at Fort Wayne, Ind.

**LITURGY** (līt'ūr-jÿ), the name of a form of Christian worship, applied especially to the celebration of the Lord's Supper. The Protestant churches in general use a form known as the vernacular liturgy, which has been in use in nearly its present form since the Reformation. The English Book of Common Prayer contains the form of communion service used in the Anglican churches, and the Protestant Episcopal church in America has substantially the same form, which was adopted by a gen-



eral convention held in 1789. It contains a number of changes from the liturgy of the English church, but the form of service is substantially the same. It provides for Scripture reading, a sermon, and a prayer, and these are followed by prayers and the administering of the consecrated bread and wine. The liturgies in general use may be divided into five groups, of which three are of Eastern origin and use, one Eastern in origin but Western in use, and one Western both in origin and use. They are known either by the names of the apostles with whom they are connected, or by the names of the countries in which they are believed to have been in use from an early date. The *Syrian rite* is in use in the Maronite Church of Mount Lebanon. The other Eastern rites are known as the *Persian* and the *Egyptian*, the former being in use by the Nestorians and the latter by the Copts. The Greek and Russian churches use the *Byzantine rite*, and the Roman Catholic church uses the the *Latin liturgy*.

**LIVER**, a large glandular organ situated in the upper abdominal cavity of vertebrates, whose function is to secrete bile, elaborate and



HUMAN LIVER.

store up glycogen, and otherwise change the blood that passes through it. The liver is the largest organ in the human body. It is situated on the right side, below the diaphragm, and weighs about four pounds. Its general form is broad, flat, thin at the left side, and thick toward the right. It has an arched upper surface, but the lower surface is irregular, divided into five lobes, and its tubes contain nearly one-fourth of the blood of the body. Arterial blood is brought to the liver by the hepatic artery A, directly from the aorta, while the portal vein B conveys to it venous blood from the stomach, intestines, pancreas, and spleen. The bile, a substance necessary to life in the digestion of food, is a dark golden colored liquid of bitter taste, and when not needed

for digestion is stored in the gall cyst L, with which the bile duct C communicates. About three pounds of bile are secreted per day.

The diseases of the liver include *hepatitis*, *jaundice*, *cirrhosis*, *acute yellow*, *atrophy*, and *fatty degeneration*. Diseases of the liver are accompanied by a yellowish complexion of the skin, owing to imperfect or inadequate bile secretion. The lower animals apparently have no liver, but rudiments of a similar organ appear in forms quite low in the scale of life. All vertebrates, except the lancelet, have a well-defined liver. This organ is found in many of the invertebrate animals. As we ascend the scale of animal life the liver assumes perfect form with much rapidity, and in the higher vertebrates it is very similar to the liver of man. See **Bile; Digestion**.

**LIVERPOOL** (lĭv'ēr-pōōl), the most important seaport of Great Britain, in Lancashire, England, on the Mersey River, three miles from the Irish Sea. Next to London, it is the largest and wealthiest city of the British Isles. It has extensive railroad connections, uniting it with all the trade emporiums of England and Scotland. The city is supplied with modern municipal facilities, including telephones, gas and electric lights, sewerage, pavements, public parks, and electric street railways. The wharves and docks are commodious and extensive, and are crowded with vessels that communicate with all parts of the world. Many of the thoroughfares extend from the margin of the river to the higher land some distance inland, where the general elevation is about 250 feet. They are mostly platted at right angles and kept remarkably clean in the better residential quarters. In several parts of the city are elevated railways.

Liverpool is generally well built. The noteworthy buildings include Saint George's Hall, the free public library, the Walker Art Gallery, the townhall, the Picton Lecture Hall, and the union railway station. It is the seat of the Liverpool College, Queen's College, Liverpool Institute, and University College; the last named has sixty professors and 750 students. It has many business colleges and schools of law, art, medicine, engineering, and charitable and benevolent societies. The places of worship are very numerous, a total of about 400 buildings, and represent all of the leading Christian denominations. It has many fine monuments, statues, boulevards, and public parks. Among the manufactures are cotton and woollen goods, spirituous liquors, cordage, ironware, sugar, clothing, chemicals, steamships, tobacco, and machinery. It is noted as the principal port for the departure of emigrants from Great Brit-



ain. The export and import trade is very extensive, and embraces all classes of products produced and consumed in the United Kingdom.

Liverpool was founded in 1190. At the middle of the 14th century it had a population of 840, but in 1561 it had declined to only 690. In 1647 it was made a free port, from which time its prosperity dates, being stimulated especially by its large trade in cotton. Docks were not built until 1700. Since then the dockage capacity has been enlarged until at present these improvements include a large area of water surface. The more recent improvements of value in promoting growth include the construction of a railway tunnel, in 1885, under the Mersey, by which connection is formed with Berkenshire; the opening of a ship canal to Manchester, in 1894; and the construction of an overhead railway in the same year. Politically Liverpool is strongly Conservative and sends nine members to Parliament. Population, 1907, 746,144.

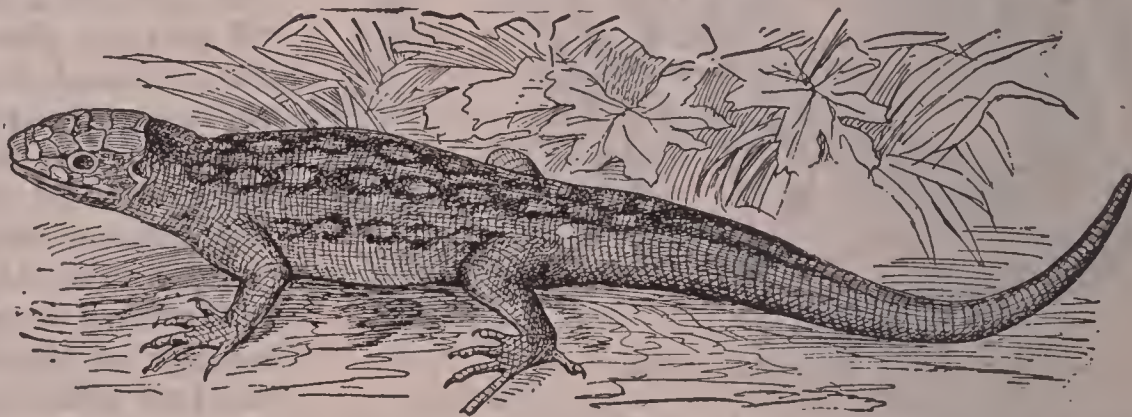
**LIVERWORT** (lĭv'ēr-wŭrt), the name of any plant belonging to certain cellular cryptogams, comprising one of the two suborders of the *bryophytes*, the other suborder being the *mosses*. The liverworts rank next to the lichens, and in a higher development of their several organs are closely related to the true mosses. They grow in damp places, either on the ground or on trees and decaying wood. The tissue is closely cellular. They have an axis or stem which sends out roots from its under side, which is furnished with distinct leaves, or with leaves so intimately united to each other as to assume the form of a frond. The reproductive organs, differently situated in different species, are of two kinds, known as the *sexual* and *asexual*. The liverworts are native to all climates where there is sufficient shade and moisture. They are of very little known utility from an economic point of view.

**LIVINGSTON** (lĭv'ĭng-stŭn), a city of Montana, county seat of Park County, 122 miles southeast of Helena. It is finely located on the Yellowstone River and the Northern Pacific Railway, and a branch line extends to Yellowstone National Park, the entrance to which is about thirty miles south of Livingston. Electric lighting, waterworks, and several fine school buildings are among the public improvements. The surrounding country has large interests in farming and mining, hence it is the center of considerable trade in live stock, merchandise,

coal, and lumber. It has a fine railway depot and extensive roundhouses and machine shops. Population, 1900, 2,778; in 1910, 5,359.

**LIVRE** (lĭv'ēr), the name of a coin formerly used in France, but superseded in 1895 by the franc. It had a value of 81 as compared to the value of 80 francs. The same name was applied to a weight in France, which had a value of 17.267 oz. avoirdupois, but which was superseded by the kilogram.

**LIZARD** (lĭz'ērd), the popular name of an order of reptiles which have four well-developed limbs, each terminated by five toes of unequal length, and an elongated body. Many species are included in the order, the entire list embracing about 1,500. Fifteen genera have been described. They frequent regions from the Equator to high latitudes in the Temperate zones. In the tropical regions they are the most numerous and attain the largest size. The length of the body varies from a few inches to three or four feet. Some species are carnivorous in habit and feed on insects, small quadrupeds, and birds, but others live wholly by feeding on plants. The tail is long and powerful in most lizards, and this organ, like the legs, is reproduced in case it is lost. They propagate by laying eggs, which are hatched without care of the parents. The color is very various, most species having bright markings. A kind of lizard



LIZARD.

native to Mexico and Arizona is poisonous, the poison being connected with a grooved tooth, but all others are devoid of poison glands. The different families of the order embrace the iguanas, chameleons, skinks, and geckoes. In the winter time and during cold weather they are in a torpid state, but manifest much activity during the season of warmth.

**LLAMA** (lä'má), a ruminating quadruped closely allied to the camel, native to the southern parts of Peru and other sections of South America. Writers usually classify the llama, alpaca, vicuna, and guanaco as allied species, the former two being domesticated in large numbers and the latter living mostly in a wild state.



The llama is noted for its faithfulness in carrying commodities on its back and because of its ability to forage for its support, on account of which it is utilized in Peru and Chile as a beast of burden. The height is about three feet at the shoulder, and the color diversified, but usually is whitish or blackish. It has ability to travel about fourteen miles a day with a hundredweight across mountain districts. The hair



LLAMA.

is used in the manufacture of coarse material, and the flesh of young animals is valued for table use. Herds of llamas still frequent the plains of Patagonia and various places in the Andes Mountains, where they are hunted.

**LLANOS** (lă'nôz), the name applied by the Spanish to the level plains in the northern part of South America. They are situated principally in the basin of the Orinoco and in Colombia. In many places they are quite barren, but in some localities are good pasture and timbered areas. Similar plains are known as *pampas* in the southern part of that continent and as *savannas* in North America.

**LLOYD'S**, a vast corporation of London, having offices in the London Royal Exchange, so named because the early members met in a coffeehouse conducted in the 17th century by Edward Lloyd. The business of the corporation is to write insurance, collect and publish information in relation to commerce, and furnish a library, restaurant, and suitable quarters for

ship auctions. Membership is solicited with the understanding that those joining give security to discharge liabilities, and the general affairs are under the direction of a committee. The marine and general insurance carried by the company amounts to an average to about \$2,250,000,000. Among the publications are the daily *Lloyd's List*, the annual *Lloyd's Register of Foreign Shipping*, and several other periodicals.

**LOADSTONE** (lôd'stôn), or **Magnetic Iron Ore**, a mineral remarkable for its high magnetic quality. It consists of protoxide of iron mixed with peroxide of iron. It is found in primitive rocks, but sometimes in grains. The highly magnetic property caused the ancients to believe that it possesses a magical or divine effect, until the phenomena of magnetism became better understood. See **Magnet**.

**LOAM**, a mixture of various earths, but consisting principally of sand and clay, the latter predominating. With loam formations occur deposits of decayed animal and vegetable matter. Upon the proportion of the latter depends in a large measure the fertility of the soil.

**LOANDA** (lô-ăn'dà), **Saint Paul de**, a town of Angolia, a Portuguese possession of Western Africa, noted as a trading center. The noteworthy buildings include those of the government, a number of churches, a governor's residence, and a bishop's palace. The harbor is shallow, making it impossible for the larger vessels to reach nearer than one and a half miles from shore. It has several improved streets, modern municipal facilities, and railroad connections with interior points. Coffee, hides, ivory, palm oil, and grain are exported. About one-third of the inhabitants are Europeans. Population, 1907, 22,208.

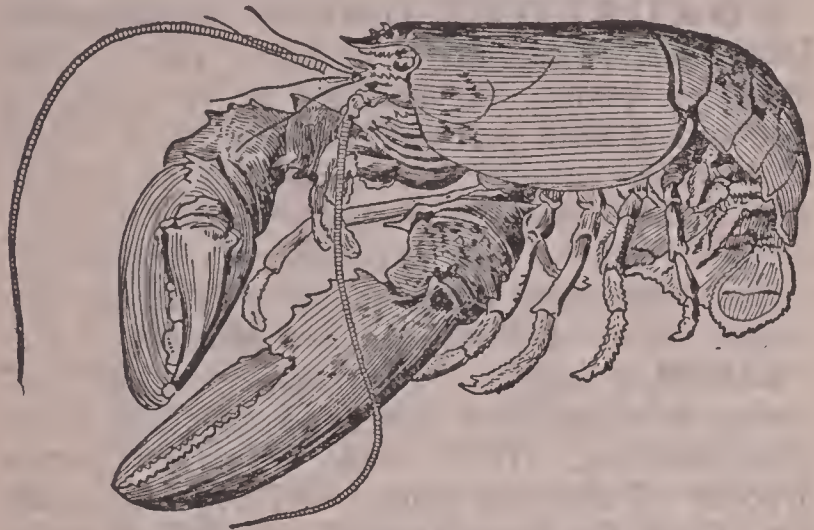
**LOBELIA** (lô-bē'lî-à), a genus of herbs of the natural order *Lobeliaceae*. It includes many species that are widely distributed in various parts of the earth, but especially abundant in the tropical regions of America. They contain a milky juice, have alternate leaves, and produce many-seeded pods. The flowers and foliage are very beautiful. Several species possess medicinal properties useful for an expectorant and cathartic. The drugs obtained from these plants are prescribed in various doses for spasmodic asthma and as diuretics. When handled in a dry state, the herb irritates the throat and nostrils like tobacco. The medicinal preparations are known as the *tincture* and the *etheral tincture* of lobelia.

**LOBLOLLY PINE** (lôb'lôl-lÿ). See **Pine**.

**LOBSTER** (lôb'stêr), a marine crustacean which resembles a crawfish, but is much larger.



The common lobster of America is a typical species. It is ten-footed, has a long tail, is stalk-eyed, and often attains a weight of ten pounds. It is widely distributed in America, occurring in large numbers off the New England and New York coasts, but also in other waters of America and elsewhere. The front legs, which occur in pairs, are much enlarged and form the claws. Lobsters mostly frequent rocky coasts, feed on other animals, and have a bluish



LOBSTER.

or greenish colored shell, which becomes red by boiling. The tail spreads like a fan, is constituted of a number of flat plates, and serves in propelling the animal through the water. The young are able to swim with much rapidity, but the adults walk or crawl, and the molting occurs annually in adults. They are caught in baited traps for the market and are considered excellent food, the principal edible parts being the tail and claws. The season for catching is from the early part of October until May.

**LOBWORM**, or **Lugworm**, the name of a worm found in Europe and North America, used extensively for bait in fishing. It has a round head without eyes or jaws, and in size resembles the earthworm. It is found chiefly along the seashore, where it burrows in the sand, and its presence may be ascertained by noticing small coils of sand left while burrowing.

**LOCAL OPTION**, a term used in civics to express the right of determining certain measures of government by popular vote in each locality of a state or province, such as a county, township, or city. The term has come into extensive use in relation to the liquor traffic, and is applied to the system whereby each community may decide by vote whether or not the traffic may be licensed and maintained. In some states the local option is by petition, but it is exercised more commonly by an election.

**LOCH LEVEN** (lök lē'ven), a lake in the southeastern part of Scotland, 23 miles north-

west of Edinburgh. It has an area of 3,410 acres, is surrounded by prominent elevations, and drains to the Firth of Forth by the Leven. The lake has fine trout fisheries and several islands, the most important of the latter being Castle Island and Saint Serf's Inch. Mary, Queen of Scots, was imprisoned for ten months on one of these islands in 1567-68, and on July 4, 1567, signed her abdication.

**LOCH LOMOND** (lō'münd), the largest lake of Scotland, in the counties of Dumbarton and Stirling. It is surrounded by beautiful hills, has a number of wooded islands, and is noted for its excellent scenery. The length is about 22 miles and the breadth is from one to five miles. In its vicinity are several noted caves. Fifteen miles southeast of Loch Lomond is the city of Glasgow:

**LOCK**, an inclosure in a canal where boats are raised and lowered for the purpose of passing them from one level to another. It consists of a basin between the levels, having a pair of gates at each end communicating with the respective levels. In descending from a higher to a lower level the water is allowed to flood the lock until it reaches a common level with the water in which the vessel is located and, after the vessel enters, the lower gate is opened, whereby the vessel is lowered to a level corresponding to the surface of the next lower lock, and again moves forward. This operation is continued until the vessel is brought to the common level of the canal. When the boat is to attain a higher elevation, a process directly opposite is pursued. It would be quite impossible to build canals in many regions if it were not that a system of locks could be utilized.

**LOCK**, a fastening which has a bolt that is moved by a key, used to secure a door, lid, or other object against intrusion. Many different classes of locks are in use, depending upon the size and the character of the inclosure which is to be protected, and some of them date from the time of the Egyptians and Babylonians. For many years it was a matter of deep study to find how to construct a lock that no one could open unless he had a proper key. The first lock of this character was known as a combination lock and could be opened only by the proper key, after turning a knob on the outside for the purpose of placing the interior bolt in such a position that the key could be made to turn effectually. In 1820 an American inventor, Linus B. Yale, patented a lock that is combined with a clock mechanism, and by means of it the combination locks are so constructed that they can be opened only at a specified time.



The time locks and Yale locks with special keys are the ones used most extensively where large treasures and valuables are stored.

**LOCK HAVEN**, a city in Pennsylvania, county seat of Clinton County, on the Susquehanna River, 28 miles above Williamsport. It is on the Pennsylvania and the New York Central railroads and is surrounded by a rich farming and coal-mining country. The chief buildings include the county courthouse, the public library, the city hall, and the State Central Normal School. Among the manufactures are machinery, cigars, paper, leather, and earthenware. Pavements, electric lights, rapid transit, and waterworks are among the improvements. It was settled in 1769 and incorporated in 1833. Population, 1900, 7,210; in 1910, 7,772.

**LOCKPORT**, a city of New York, county seat of Niagara County, twenty miles east of Niagara Falls. It is on the Erie Canal and on the Erie and the New York Central railroads. The manufactures include woolen goods, paper, ironware, flour, machinery, engines, furniture, brooms, and carriages. Among the noteworthy buildings are the county courthouse, the high school, the Federal building, the Saint Joseph's Academy, and many churches. In its vicinity are productive limestone and sandstone quarries. Lockport was settled in 1825 and incorporated as a village in 1829, but was chartered as a city in 1865. Population, 1910, 17,970.

**LOCOFOCO** (lō-kō-fō'kō), the name of a radical faction in the Democratic party of New York, but later extended to an element in that party throughout the nation. It originated from a faction that opposed the rechartering of state and private banks by special legislation and advocated the rechartering of the United States bank. In 1835 there was formed in New York the Equal Rights party and a meeting of its representatives was held in Tammany Hall, of which the regular Tammany Democrats tried to gain control. When the latter found themselves outnumbered, they turned out the lights and retired, but the meeting was continued by the use of candles and locofoco matches. The Democratic newspapers began to call the faction Locofocos, and the name was later given to the whole Democratic party by the Whigs. This party was beaten at the election and through the efforts of President Van Buren became absorbed by the regular organization.

**LOCOMOTIVE** (lō'kō-mō-tiv). See **Steam Engine**.

**LOCUST** (lō'küst), the name of several species of trees of the order *Leguminosae*. They have a rough bark, pinnate leaves, and fragrant white flowers, and grow to a height of eighty

feet. The wood is pierced extensively by borers, but, when the bark is taken off and it is dried, it is serviceable in fencing, for furniture, machinery, railway sleepers, and in the construction of houses. The honey locust has pink flowers, which have a fine fragrance and grow in clusters. Several trees are closely allied, such as the *carob tree* and the *thorn acacia*, but they differ in minor points. The common honey locust is planted largely as an ornamental tree and for hedges, being suitable to bear trimming and dwarfing.

**LOCUST**, the name of several species of insects allied to grasshoppers and crickets. The term is applied conjointly by some writers with the name grasshopper to destructive and migratory species of insects common to many portions of the continents. However, the true locust is a distinct kind of orthopterous insect. Two particularly destructive species of these insects are found in America, one in the northeastern part of the United States and Canada, which is more properly the locust, and the other in the regions west of the Mississippi. Those common to the latter region have been especially destructive in parts of Texas, Colorado, Kansas, Nebraska, and Oklahoma at different times, but in recent years they have been less abundant. Species very similar have been known to swarm in vast numbers in various countries of Asia and Africa, darkening the sunlight in their flight. They devour all forms of vegetation. When most abundant in the Mississippi valley, they settled down in some regions in such large swarms that they destroyed all vegetable growth. In some places they accumulated so thickly upon the railways that it interfered with traffic.

The common locust has great leaping power because of its powerful hind legs, which are stronger than those of grasshoppers. They fly with a loud whizzing sound. The eggs are deposited in the earth by the females in the fall of the year and, when warmth returns the following spring, the young are hatched. The *Carolina locust* is pale yellowish-brown, has black wings, and is about one and a half inches long, the extended wings measuring three inches. It flies a considerable distance when it is disturbed by a traveler. The greatest danger to crops is while these insects are in an immature state, for soon after they take to wing and distribute in swarms. They sometimes effect much damage and cause disastrous famines in the regions where they settle.

The Arabs and some other nations use the locusts as an article of food. They are prepared for the table by pounding them into small particles and baking them as bread or frying them



as a delicacy in oil. In the island of Cyprus, India, China, and some of the American states preventive measures have been adopted by pulling large tanks of diluted kerosene across the ground. This serves to kill them by the thousands. Another method is to dig pits, lining them with zinc, and after the locusts fall in they are destroyed by fire or in some other way.

**LODI** (lō'dī), a city of Italy, in the province of Milan, on the Adda River, nineteen miles southeast of Milan. It is on several railways; has a Gothic cathedral erected in the 12th century, and contains important manufactures of silk and woolen goods, chemicals, and machinery. The old city of Lodi, situated about five miles west, is noted as the place where Napoleon forced the bridge on May 16, 1796, in spite of vigorous firing by the Austrian army. Population, 1906, 27,845.

**LODZ** (lōdz), a city of Russia, in the Polish government of Piotrków, on the Łódka River, 78 miles southwest of Warsaw. It is noted as a railroad and educational center, has electric lights and street railways, substantial pavements, public libraries, and a number of parks. The manufactures include cotton and woolen goods, machinery, earthenware, utensils, and vehicles. Large quantities of cereals and fruits are produced in the vicinity. The population is principally German. The city has had an extraordinary growth the past decade and has a large trade in merchandise. Population, 1906, 385,406.

**LOESS** (lēs), the name first applied to certain loose deposits along the Rhine, in Germany, and later extended to like formations in other countries. It has reference to a loamy or sandy deposit of the Pleistocene age. Loess is usually of a light yellow color and exceedingly fine, and somewhat resembles loose deposits of clay. It is thought that the loess deposits were formed at a time when the streams were broader and more sluggish than at present, and in some instances they are likely due to the action of glacial lakes. In the arid region of North America, extending southward from Alberta and Saskatchewan, these deposits are found in the valleys many hundreds of feet in depth. Along the Mississippi and Missouri rivers, especially in Iowa, are large bluffs of loess, such as are seen in the vicinity of Council Bluffs and Sioux City. Similar formations are more or less widely distributed in all the continents. As they contain the remains of considerable silt, many of these deposits are quite fertile, but they require more rainfall than loam, owing to their sandy character.

**LOFODEN** (lō-fō'den), or **Lofoten**, a chain

of islands situated northwest of Norway, stretching along the shore a distance of 175 miles. The area is 2,250 square miles. Much of the surface is mountainous, the highest elevation being about 3,500 feet. Among the larger islands are Hindö, Andö, Langö, Vest Vaagö, and Oest-Vaagö. The inhabitants engage largely in fishing and the cultivation of potatoes, oats, and barley. They rear cattle, horses, and poultry. The fisheries yield considerable quantities of cod, herring, lobsters, and oysters. A large trade is maintained in stockfish and cod-liver oil, but most of the fish are sold fresh. The celebrated Maelstrom off Norway is situated in their vicinity, being produced by the Great West Fiord flowing between the islands and the west coast of Norway. The Gulf Stream modifies the climate perceptibly, especially during the summer, and renders it favorable to sheep culture. Most of the inhabitants are Lapps and Scandinavians. Population, 1906, 42,972.

**LOG**, an apparatus for ascertaining the rate of a ship's speed in the sea. It is usually in the form of a triangular piece of wood, called the *log-chip*, curved at the bottom, and loaded so it may float upright in the water. A strong line is attached to the log-chip, being wound around a reel, the axis of which projects, allowing it to turn freely when held in the hollow of the thumb and fingers. The log-chip is placed in the water and remains at rest, while the ship moves continuously on, and the speed is measured by the rapidity with which the log line unwinds from the reel. The line is divided into sections and the rate at which the vessel sails is determined by the number of sections that pass from the reel in a given time, the time being measured by an hourglass, and the tests cover from twenty to thirty seconds of time. A *log book* is kept on the vessel, which contains a journal of the progress made from day to day, together with events occurring on board, the state of weather, the number and class of vessels sighted, and many other circumstances of interest in the tour. Most ships carry an official log book in which to keep an account of sickness, offenses committed, disobedience of officers, and all general matters pertaining to the crew and passengers.

**LOGAN** (lō'gan), a city in Utah, county seat of Cache County, on the Logan River, seventy miles north of Salt Lake City. It is on the Oregon Short Line Railroad and is surrounded by a rich farming and stock-raising country. An abundance of water power for manufacturing is obtained from the river. Among the noteworthy buildings are the State Agricultural College, the New Jersey Academy, the Brigham



Young College, the county courthouse, the high school, and a number of churches. It has manufactures of brick, beet sugar, clothing, hosiery, and machinery. The place was settled in 1859 and incorporated in 1866. Population, 1900, 5,451; in 1910, 7,522.

**LOGAN, Mount**, one of the highest mountains in North America, in the Dominion of Canada, near the Alaskan boundary, 26 miles northeast of Mount Saint Elias. In 1892 J. H. Turner, United States surveyor, placed its height at 19,514 feet, which is considerably higher than Mount Saint Elias, previously thought to be the most elevated peak in North America. It is exceeded in height by Mount McKinley.

**LOGANSPORT**, a city in Indiana, county seat of Cass County, at the confluence of the Eel and Wabash rivers, seventy miles north of Indianapolis. It is on the Wabash, the Vandalia, the Pittsburg, Cincinnati, Chicago and Saint Louis, and other railroads. Among the chief buildings are the county courthouse, the public library, the high school, the Holy Angels' Academy, and the Northern Indiana Hospital for the Insane. The municipal facilities include electric street railways, waterworks, sewerage, and several parks. It has manufactures of flour, ironware, machinery, woolen goods, clothing, cigars, and farming implements. The surrounding country is a fertile farming and dairying district. It contains natural gas and coal deposits. It was settled in the early part of the 19th century and was incorporated in 1838. Population, 1910, 19,050.

**LOGARITHM** (lög'ä-rith'm), one of a class of auxiliary numbers which are so related to the natural numbers that the multiplication and division of the latter may be performed by addition and subtraction. They facilitate the raising of numbers to powers and the extraction of roots by very simple multiplication and division. The logarithm of a number may be defined as the exponent of the power to which it is necessary to raise a fixed number, called the *base*, to produce the given number. The labor of performing these operations by the ordinary processes of arithmetic, when the numbers are composed of many figures, is very complicated. By the use of logarithms, for the invention of which we are indebted to John Napier (1550-1617), of Scotland, this labor is greatly diminished. However, several mathematicians have since prepared extensive tables so it is not difficult to perform these operations. In most tables the logarithms are calculated to base 10, but in the system of Napier the base is 2.718281828... The logarithm of 100 is 2, be-

cause 10 raised to the second power equals 100. Similarly, the logarithm of 1000 equals 3, of 10,000 equals 4, and so on. When the logarithms form series in an arithmetical progression, the corresponding natural numbers form a series in geometrical progression, thus:

Logarithms.....	0	1	2	3	4	5
Natural numbers.....	10	100	1000	10000	100000	

Between the numbers 1 and 10 the logarithms consist of decimals; between 10 and 100, of the integer 1 and a decimal; between 100 and 1000, of the integer 2 and a decimal, and so on. The integral part of a logarithm is called the *index* and is always less by one than the number of integer places in the corresponding natural number, hence the index of the logarithm of 3 is 0, of 30 is 1, of 300 is 2, etc. The decimal part of a logarithm is called the *mantissa*. The logarithms of decimals have negative indices and the number of units in the index is always greater by 1 than the number of ciphers immediately following the decimal point, hence the index of the logarithm of .3 is -1, of .03 is -2, of .003 is -3, etc. Karl Friedrich Gauss (1777-1855), the German mathematician, invented a system of logarithms which is of great value in astronomical computations.

**LOG BOOK**, a book kept on board a ship at sea, in which is entered the daily progress of the vessel, with notes on the weather and incidents of the voyage. The velocity of such a vessel is measured by a log, an apparatus constructed of a wooden float, weighted on one side to make it float upright, and the measurements are taken on a line, which is unwound from a light running reel, while the log remains stationary in the water as the ship moves forward. The results of these measurements are recorded in the log book together with other matters of interest, and usually the record is transcribed at noon. A log book is kept on all the vessels of the navy and the record is verified and signed each day. This record, when completed, is properly marked and filed for future reference in the Navy Department.

**LOGIC** (løj'ik), the science which treats of the formal laws of human thought. It deals with all the forms of thought, including conception, judgment, reasoning, and construction, and bases its principles on the logical axioms. As understood at present, it is a development and modification of the art of reasoning molded into consistent shape by Aristotle in his treatise entitled the "Organon of Aristotle." This work is based partly on the writings of Socrates, who treated the art in a general way, and notably on the treatises of Zeno of Elea. The Scholastics were the first to develop the logic of



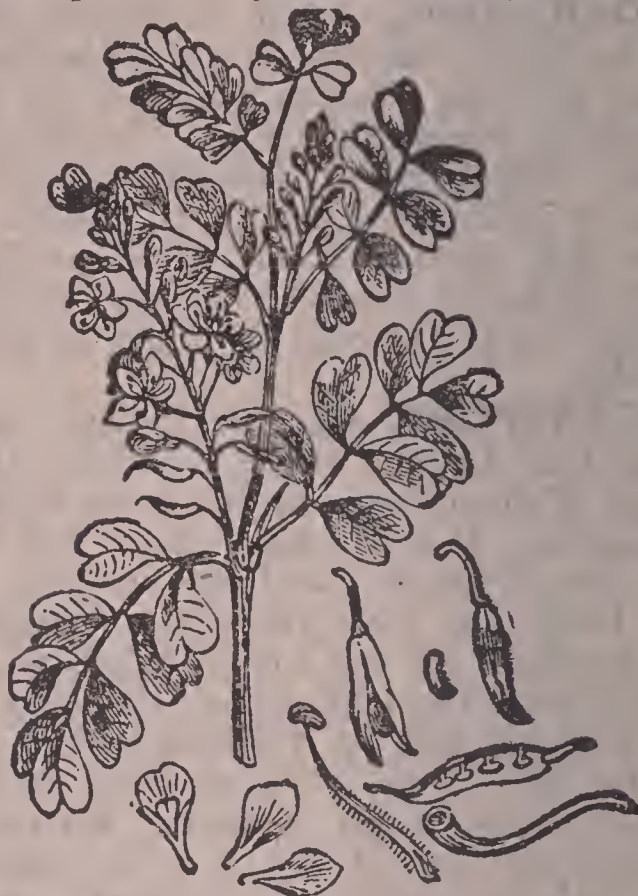
Aristotle. They made the art an independent power in great theological debates. At the time of the Reformation, particularly in continental Europe, Scholasticism was depreciated, and down to the first half of the 19th century there was little dispute as to how logic should be defined, but since then have originated many different definitions.

According to Whately and Sir W. Hamilton, logic is limited in its application to the form of thought, and has nothing to do with the matter; that is, it deals with the form common to all reasonings, judgments, and concepts, but is not concerned about the content or subject of either. If this view is held, logic is only *deductive*, but John Stuart Mill founded the system of *inductive logic*, according to which the evidence, methods, and principles involved in scientific research must be regarded the principal subjects of interest in the art. Both the inductive and deductive systems are reviewed by the German philosopher Kant, who recognizes thought as the essential factor of cognition, thus holding the matter and not the form as the paramount element of importance in logic.

The system of Kant is now accepted as a standard, since it holds that thought or intelligence is realized through the system of forms used in logic, thus making thought instead of mere form the basic element in logical procedure. In method of procedure it is either inductive or deductive, the two methods being the reverse of each other. The former proceeds from particulars to the general, the latter from the general to particulars. One is a process of analysis, the other a process of synthesis. Logic is divided according to the forms of thought and expression into logic of concepts, treating of the term; logic of judgment, treating of the proposition; logic of reasoning, treating of the syllogism; and logic of construction, treating of the system.

**LOGWOOD** (lög'wōd), a tree which was originally found in Central America, but naturalized in and exported from Jamaica and other West Indian islands. It grows most vigorously in moist and swampy regions, has pinnate leaves and small yellowish flowers, and attains a height of from thirty to fifty feet. The wood is dense and solid, particularly the heartwood, which is so heavy that it sinks in water. This heartwood has a red color and is useful in the manufacture of dyestuff to produce dark red colors. To obtain the dyestuff the wood is ground into small pieces, after which the coloring matter is extracted, and, by applying alkalis, a purple color is secured, while acids give a paler tint to the red. The colors are not

permanent, but are made so by a mordant. When iron is used for mordanting the fabric, the color produced is black, but with chromium a green or black is secured, and with alumina a lilac and violet are obtained. Logwood dyes depend upon the crystalline principle known as



LOGWOOD, FLOWER AND SEEDS.

*haematoxylin*. They are used largely in giving a black or brown color to calico, in making ink, and for producing colors useful in painting. An astringent medicine is also extracted from logwood.

**LOIRE** (lwär), the most important river of France. Its source is in the Cevennes Mountains, from which it has a northwesterly course to Orleans, and thence flows nearly west into the Bay of Biscay. Canals connect it with the Seine, the Saone, and the harbor of Brest. Its basin, which includes about one-fourth of France, is noted for fertility of soil and much wealth. The entire length is 625 miles, of which about 500 miles are navigable. On its banks are the cities of Nantes, Mayenne, Vienne, and Allier.

**LOLLARDS**, the name of adherents to a semi-monastic society of the Netherlands. This organization was formed in Antwerp and Brabant about 1300. The chief object was to care for the sick and look after the burial of the dead. The name Lollards was applied to the followers of Wycliffe in England near the end of the 14th century. Oxford was long a central point of influence, whence the Lollards went to the smaller villages to preach a simple gospel. Later they developed certain economic theories



of a socialistic nature and were persecuted by the authorities, especially in the time of James IV. of Scotland and Henry V. of England.

**LOMBARDS** (löm'bērdz), a people distinguished for great valor in the early history of Europe, so named from the long spears they carried, or from their long beards. They were a branch of the Germans, occupied originally the regions of the Lower Elbe, and in the 4th century began to resist the Roman invasions. In the early part of the 6th century they came in contact with the Eastern Roman Empire by pressing southeast into the valley of the Danube. Later, in 568, their king Alboin invaded Italy, where they operated in conjunction with the Saxons and occupied the northern section, which has since been known as Lombardy. They did not only establish themselves firmly, but built churches and monasteries of much beauty, founded cities, and gradually became assimilated by the Italians. The Lombards possessed powerful kings in Autharis, Rotharis, and Luitprand, the last named securing temporary dominion over all of Italy. In 774 the last king of Lombardy, Desiderius, was overthrown at Pavia by Charlemagne, who became King of the Lombards and Franks. They embraced Christianity in the early part of the 7th century, made extensive internal improvements, and carried on a large foreign trade, Lombard street in London deriving its name from their business relations.

The *Lombard Architecture* is an outgrowth of the Lombards and the Gothic invaders of northern Italy. It dates properly from the early part of the 9th century to the 13th century, and was derived from the more inferior Roman style. Many buildings of this style of architecture still remain. Examples of it occur in Italy and in the continent as far north as the Baltic in Germany, the connection between the two countries coming about during the existence of the former German Empire, or Holy Roman Empire, which included Italy. The most important of those remaining are in Italy. They embrace churches and other buildings, notably in Verona, Pavia, and Milan, the Saint Michael Church at Pavia being the most prominent representative. The architecture differs from the classic largely in that it has a preponderance of vertical lines instead of horizontal, and in that it utilizes the dome extensively. Both the grouping of piers and the arrangement of the transepts and choir are highly artistic.

**LOMBARDY** (löm'bār-dī), a region of northern Italy, extending originally from the Alps to the Po River, so named from the Lombards. The region belonged to the Romans

prior to the Lombard invasion. In 774 it fell to Charlemagne, then passed consecutively to Germany and Spain, and in 1815 became a part of Austria, but since 1859 it has belonged to Italy. A department of Italy is now known as Lombardy, but it does not include all of the region formerly known by that name. It includes the seven provinces of Brescia, Como, Bergamo, Pavia, Milan, Cremona, and Sondrio. The area is 9,085 square miles. Formerly the province of Mantua was included also, but it is now a part of Venetia.

**LOMBOK** (löm-bök'), an island in the Indian archipelago, belonging to the Netherlands. The area is 2,108 square miles. It is situated a short distance east of Java, between the islands of Bali and Sumbawa. The island is of volcanic origin and has several mountain ranges, but is well watered and fertile. Among the products are cereals, fruits, live stock, tobacco, and coffee. Most of the inhabitants are Mohammedans. Mataram is the capital. Population, 1906, 644,208.

**LONDON** (lün'dūn), the capital of the British Empire, in the southeastern part of England, on the Thames River, about sixty miles from the sea. It is the most populous city in the world. It is located on both sides of the Thames River, which is spanned by many fine bridges. The river at this place is from 600 to 900 feet wide and flows slowly, and vast improvements by deepening and canalizing have tended to make it the center of an extensive system of navigation. Numerous railways extend from it to all parts of the United Kingdom, and it has additional transportation facilities by a vast network of electric railway lines.

**DESCRIPTION.** London is built on a low and level tract of land, hence there is no point of vantage from which the whole city may be viewed even on the clearest day. The Fire Monument, situated near the center of the city, affords the best view, but it is not sufficiently elevated to permit seeing beyond the outskirts of the closely constructed buildings. Many of the streets are narrow and crooked, hence pure air and sunshine are wanting in many of the more densely populated districts. Fog and mist characterize the atmosphere, due to the close proximity to the sea, and the bright sky of Paris and Berlin is wanting. This circumstance, taken in connection with the exclusive use of bituminous coal for domestic and manufacturing purposes, causes the aspect to be dark and gloomy the greater part of the day. London has a mean annual temperature of 50°, ranging from 40° in the winter to 62° in the summer, and the annual rainfall is about 25 inches.



The Thames River passes from east to west through the city. South of it are the counties of Kent and Surrey, which contain the portion that is of lesser importance. The county of Middlesex is north of the river. All of the larger commercial institutions are in the East End, which contains the customhouse, the docks, the general post office, the Bank of England, the Saint Paul's Cathedral, and other noted structures. However, the East End also contains the poorest quarters, in which myriads live in want and disease. Here and in some of the narrow streets in the Lambeth and Bermondsey districts, south of the Thames, are the abodes of many of the poorer classes. The West End contains the homes of many wealthy and fashionable people, especially in the neighborhood of Hyde Park and Kensington Gardens. In this section are many fine residences of the aristocracy, located a short distance from the government offices, the British Museum, the royal palaces, and the houses of Parliament. Formerly the palaces of the nobility were located within an area of 673 acres, but they were driven farther west through the extension of trade, and the limits of London proper embrace chiefly warehouses, banks, and office buildings. During the night it is almost deserted, while in daytime more than a million persons work within the confines of what is generally known as the Old City.

**STREETS AND PARKS.** The streets in the business districts are inadequate, since they are congested by the heavy traffic during the day. Many of the thoroughfares have been widened, but no general system of improvement in this line has been carried out. Along the Thames extends the Victoria Embankment, which is one of the most noted thoroughfares of the city. It affords communication along the north shore of the river eastward from the houses of Parliament, and is adorned by many fine statues and shrubbery. The most fashionable shops are on Regent Street, and numerous substantial structures of comparatively recent date have been erected on Oxford Street and its continuations. Fleet Street is devoted largely to the newspaper trade, Paternoster Row is headquarters for the book business, and the Haymarket has many fine hotels and theaters. Club life is well represented on Pall Mall, the jewelry trade is centered on Bond Street, and the police court is on Bow Street. Piccadilly has many fine shops and clubhouses. The Strand, Cheapside, and Holborn are other noted business streets, and they are particularly noted for being uncomfortably crowded during the day.

The parks and squares of London, though

very numerous, are inadequate to the requirement of so large a population. Trafalgar Square, one of the finest in the city, is surrounded by many fine buildings, including art galleries, hotels, and churches. Lincoln's Inn Fields, surrounded by offices of the law fraternity, is the largest open ground in the city. Hyde Park, containing 400 acres, is located between Mayfair and Kensington Gardens, and is surrounded by a noted carriage drive. Green Park and Saint James's Park, near Trafalgar Square, are among the royal parks that have been opened to the public. Greenwich Observatory, in the southern part of the city, is surrounded by the beautiful Greenwich Park. Black Heath and Hampstead Heath are among the many heaths, or commons, preserved for the use of the people in their natural condition. Many of the public places are adorned by monuments. These include Cleopatra's Needle, on the Thames embankment; the Nelson Column, in Trafalgar Square; the monument to commemorate the great fire of London, on Fish Street Hill; the national memorial to Victoria, in front of Buckingham Palace; the colossal statue of Achilles, at Hyde Park; and the Albert memorial, at Kensington Gardens.

**BUILDINGS.** London has many magnificent buildings, the most important of which include those erected by the government. The houses of Parliament, located on the banks of the Thames, are among the largest Gothic structures in the world. They cover eight acres, have a river front of 940 feet, and were erected at a cost of about \$15,000,000. Saint Paul's Cathedral, whose dome may be seen from most parts of the city, is a fine monumental structure. The Tower, formerly the scene of crimes and suffering, but now an arsenal and armory, is situated near the banks of the Thames. The Lord Mayor of London has his official residence in the Mansion House in the Poultry, a structure in the Corinthian style. Buckingham Palace, Saint James's, and Marlborough House are buildings of much historical interest. The British Museum contains a valuable national collection, which embraces specimens that represent all the arts and sciences and cover all the centuries included in the history of man.

Facing Piccadilly is the Royal Academy of Art, noted for its annual exhibition of sculptures and paintings. A great variety of art products are located in the Victoria and Albert Museum. The churches include White Field's Chapel, Saint Paul's Cathedral, Westminster Abbey, Saint George's Church, Saint Giles's, Saint Bartholomew the Great, and Saint Mary le Bone. Besides the fine system of public



schools, London has many noted institutions of higher learning. These embrace the University of London, Westminster School, Charter House School, Saint Paul's College, College of Physicians, and The Inns of Court. The more prominent theaters include the Covent Garden Theater, the Haymarket, the Drury Lane Theater, the Adelphi, the Strand, the Criterion, and Daly's Theater.

**INDUSTRIES.** London has a large domestic and foreign commerce. It is connected by steamship lines with Bremen, Hamburg, Antwerp, and other cities of Europe and the continents of both hemispheres. Being the largest consumer of food supplies in the world, it has a small export trade compared with the imports. Much of the foreign trade is with the East and West Indies and the colonies of Great Britain. The chief imports include tea, coffee, rice, sugar, tobacco, raw cotton, spices, petroleum, and fruits. London is the leading manufacturing city of Great Britain and the products make up an almost endless list. Though manufacturing enterprises are located in different parts of the city, they are more largely represented in a section extending in a semi-circle to the south and east. Among the principal products are clothing, furniture, machinery, glass, pottery, jewelry, clocks and watches, chemicals, saddlery, musical and surgical instruments, and spirituous liquors.

**COMMUNICATION.** London has one of the most efficient underground railways in the world, furnishing connections between the different parts of the city and the great railway terminal stations. About a million persons enter the city every morning, hence the enterprise of furnishing communication is very important. The London Bridge, which furnishes the chief communication over the Thames, is crossed by about 350,000 persons every day. Many stations of the underground railways are located within the city, such as Victoria, Waterloo, and London Bridge, and at many underground points are numerous shops. Four tunnels pass under the Thames, hence communication is continuous

between the north and south sides of the river, which is also crossed by many bridges and lines of ferries. Extensive tramways and electric street railways are in operation, but considerable communication is still furnished by horse cars. Carriages, cabs, and omnibuses supply a larger per cent, of the communication than is the case in American cities. It is customary in London to summon a cab by blowing a whistle at the doorstep.

**GOVERNMENT.** The government of London has been evolved from an experience extending over a long period of time, but the form now in force dates from 1900, when the administration was greatly simplified by consolidating various districts. At present the British government exercises the central control, and the du-



PARLIAMENT BUILDING AT LONDON.

ties and powers of the local authorities are defined and limited by acts of Parliament. Control is exercised over various local authorities by certain departments of the general government, similar in at least some respects to the influence of the national government of the United States over various regulations in the District of Columbia. For instance, the public utilities, such as electric lighting, are under the supervision of the Board of Trade. The board of control has certain jurisdiction over the parks and commons, while the board of education may withhold the government grant from a district where the school system is not maintained with a certain degree of proficiency. A special act of Parliament is required before local bodies can negotiate a municipal loan. From this it will be seen that the city must be



understood from various standpoints in order to appreciate the effort put forth by so vast a number of people to live together in the metropolis of the British Empire.

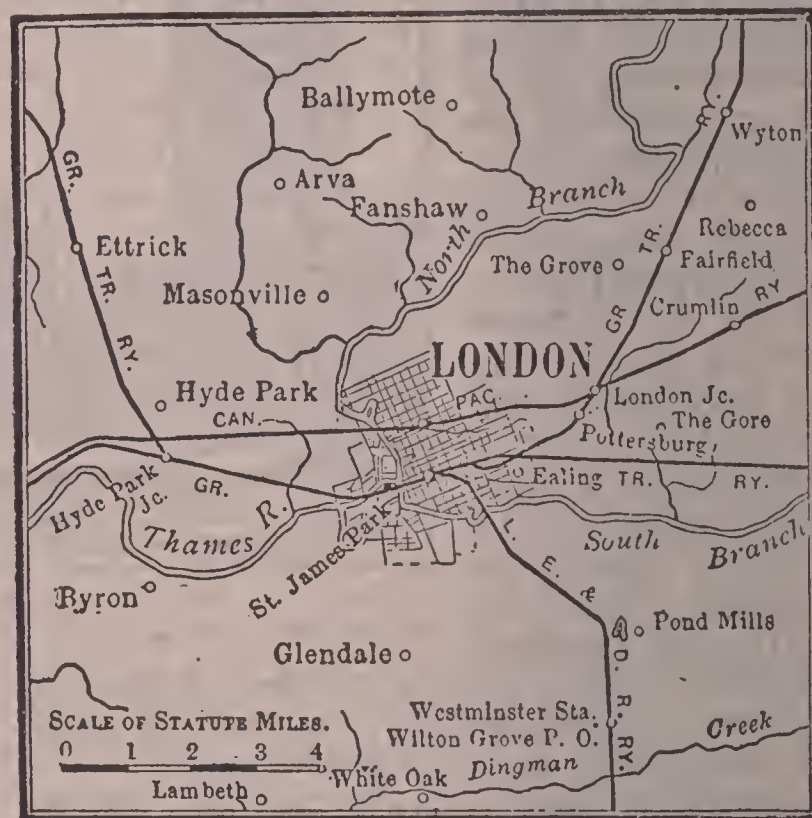
At least four Londons may be enumerated: One known as the ancient city of London, another under the county council, a third including boroughs for parliamentary representation, and a fourth embracing a number of suburbs. The first mentioned has come down from the Middle Ages, and has its own police regulations, a common council, and the chief executive, who is known as the Lord Mayor. All the affairs of the ancient city are controlled by the city government, except the main drainage system. The London under the county council is outside of the ancient city, but it does not include the urban district which has been annexed to form Greater London. The city is divided into thirty parliamentary boroughs, from which 58 members are returned to Parliament. A mayor, aldermen, and a common council comprise the chief officials of each administrative district, and these are responsible only to the central government, except that some minor matters are directed by the common council of London. The police force of the entire city is under the government of Great Britain, consisting of about 16,500 men, and the central offices are at New Scotland Yard, located near Westminster Bridge. For postal purposes Greater London is divided into a number of districts, and the delivery of mail is free.

**INHABITANTS.** The city contains a large mixture of different races of people. More than half of the inhabitants were born in London. The most numerous of those not English are included in the following: Irish, 300,000; Scotch, 185,000; Germans, 165,000; French, 60,000; and Jews, 50,000. In 1907 the county and city of London had a population of 4,758,218. In the same year Greater London had a population of 7,217,941.

**HISTORY.** The history of London begins about the year 43 A. D., when the Romans were in possession of the southern part of Britain and founded a military station on the present site of London. An insurrection of the British led by Boadicea caused it to be burned in 61 A. D. It was the center of various disturbances until about 306, when Constantine constructed walls and fortifications, and thereby established stability and laid a firm basis for commercial prosperity. From 369 until 412 it was the capital of Britain, when it was known as Augusta. Subsequently it became the chief seat of the Saxons. King Alfred expelled the Danes and fortified the city. It became famous as a com-

mercial center at the beginning of the reign of Edward III. In 1664-66 the plague raged, when about 69,000 persons succumbed to the dreaded disease, and in the latter year a destructive fire spread over 340 acres, burning about 15,000 houses. From these calamities the city recovered with marked rapidity. The Bank of England was established in 1694, Sir Hans Sloane founded the British Museum in 1759, the old walls were torn down in 1760, and about that time the streets were improved by pavements, lighting, and efficient sanitary regulations. In 1840 the present parliamentary buildings were commenced, and in rapid succession followed the construction of great aqueducts, parks, street railway lines, and many other modern municipal improvements.

**LONDON**, a city of Ontario, county seat of Middlesex County, on the Thames River, 121 miles southwest of Toronto. It is on the Canadian Pacific, the Erie and Detroit, and the Grand Trunk railways. The chief buildings include the county courthouse, the public library,



the Western University, Hellmuth's Ladies' College, and Huron College. It has gas and electric lighting, systems of sewerage and waterworks, and electric street railways. The manufactures include boots and shoes, leather, flour, ironware, chemicals, machinery, cigars, woolen goods, suspenders, and utensils. The surrounding country is agricultural and stock producing. London was platted as a town in 1826. Population, 1901, 37,981.

**LONDON, University of**, an institution of higher learning at London, England, founded in 1827. It was originally known as University



College, but in 1836 two charters were granted, one establishing University College and the other London University, the latter having power to grant degrees, but the former serving as a preparatory institution for the university proper. In 1878 these institutions were made coeducational. Admission may be secured at the age of sixteen years. Extensive courses are maintained. In connection with the institution is a fine library. In 1908 it had an attendance of 998 students, besides many evening students.

**LONDONDERRY** (lŭn'dŭn-dĕr-rĭ), or **Derry**, a city and seaport of Ireland, capital of a county of the same name, on the Foyle, three miles from Lough Foyle. It is connected with Waterside, an extensive suburb across the Foyle, by an iron and steel bridge. The chief buildings include the county courthouse, the Anglican and Catholic cathedrals, the public library, the Gwyn's School, and Magee College. It has railway communication, modern municipal facilities, and manufactures of spirituous liquors, shirts, ironware, lumber products, and ships. It is the residence of a bishop. The monastery of Saint Columba was founded on its site in 546, around which the city developed. In the early period of the Reformation in Britain it became a stronghold of Protestantism and in 1689 was besieged by James II. Population, 1906, 41,082.

**LONG BRANCH**, a town of Monmouth County, New Jersey, at the mouth of the South Shrewsbury River, 28 miles south of New York City. It is on the Central of New Jersey, the New Jersey Southern, and the Pennsylvania railroads. Electric street and interurban railways connect it with the beach and with other localities. It is noted as a fashionable summer resort, having many commodious hotels, fine residences, and a life-saving station. The town stretches about five miles along the beach. It has manufactures of shirts, flour, lumber products, asphalt, and machinery. Long Branch was settled in 1670 and has been popular as a summer resort since 1790. The summer population often exceeds 30,000, but the permanent population, according to the census of 1910, is 13,298.

**LONGEVITY** (lŏn-jĕv'ĭ-tĭ), the term employed to designate the duration of life of a people or an individual. Careful investigation has proved that women have an average duration of life somewhat longer than that of men, while a people combining intellect with virtue possesses the greatest longevity. In studying the tendency to live long three elements are taken into account: longevity, fecundity, and vigor. Human life does not generally reach seventy years, while ninety is very rare, but

there are instances in which persons of regular habits and extraordinary physical strength endured more than one hundred years. The elephant and the whale live to exceed a hundred years. Some writers assert that the swan, goose, and heron sometimes exceed a hundred years, but the instances are rare, and some fish are said to live 150 years.

The greatest duration of human life mentioned in writings coming to us from ancient times is that spoken of in the Bible, especially in the time before the deluge. Methuselah's age was 969 years, being the greatest on record, but some have subjected the accuracy of the record to adverse criticism. It is recorded that Abraham was 175; Isaac, 180; Jacob, 147; and Joseph, 110 years at the time of death. The average age of man was reported at 35.2 years by the census of the United States in 1900.

**LONG ISLAND**, an island of the United States, situated between Long Island Sound and the Atlantic Ocean, forming a part of the State of New York. The length from east to west is 117 miles, the width is from ten to 24 miles, and the area is 1,682 square miles. It is separated from New York City by the East River. Near it are several small islands. It has an undulating surface and contains a number of small lakes. Formerly the island was covered by a heavy growth of timber and still has small tracts of primitive forest, consisting largely of oak, chestnut, hickory, and pine. Much of the soil is productive, especially in the northern part, but in the southern portion are a number of sandy plains and a series of lagoons. The fisheries yield oysters and many species of fish. The coast has several large bays, supplying many convenient harbors, and railroad lines traverse its entire length. Coney Island is noted as a summer resort and Brooklyn is the principal city, but it was annexed to Greater New York in 1898. Long Island is subdivided into the four counties of Kings, Queens, Suffolk, and Nassau, Kings being entirely and Queens being partly in New York City. The Dutch founded the first settlement at the western end of the island in 1622. It was in the hands of the British during the greater part of the Revolution.

**LONG ISLAND, Battle of**, an engagement of the American Revolution, fought at Brooklyn Heights on Aug. 27, 1776. Washington occupied a strong position on Brooklyn Heights with 8,500 men and was attacked by 15,000 British under General Howe. The American outposts were commanded by Generals Sterling and Sullivan, who were routed and captured, the British losing 400 and the Americans about 1,400 in



killed and captured. During the night Washington conveyed his army over to New York, thus saving it from being captured.

**LONG ISLAND SOUND**, an extension of the Atlantic Ocean between Connecticut and Long Island. Its width is from three to twenty miles. The greatest depth is about 200 feet and it is navigable for the largest vessels. Several lighthouses are on or near its shore. The strait called East River connects it with New York Bay. It receives the water flowing from the Connecticut, Housatonic, Thames, and other rivers. The sound has valuable fisheries and is important as a sailing route to and from New York City.

**LONGITUDE** (lŏn'jĭ-tūd), the distance measured in degrees on the earth's surface due east and west from a given meridian. Latitude and longitude enable us to locate the exact position of a place upon a globe or map. Longitude is measured along the Equator or a parallel of latitude, and is generally reckoned from the meridians of Washington, Greenwich, Berlin, or Paris, the larger number of school texts used in America giving longitude east or west of Washington or of both Washington and Greenwich. It is expressed in degrees, minutes, and seconds, or in time, 15° being equal to one hour. At the conventional point the longitude is 0°, and degrees of longitude are reckoned east and west from it to 180°, or to twelve hours in time. The reason that degrees, minutes, and seconds of longitude are reduced to equivalent denominations of time by dividing by fifteen is that the earth turns through 360° of longitude from west to east in 24 hours, or 15° in one hour. At the Equator degrees of longitude are longest, being generally stated at 69½ statute miles, but more properly at 69.16 miles, while at the poles they are designated 0°. The cause of degrees of longitude being shorter as we approach the poles is due to the fact that the earth is a sphere. See **Latitude**.

**LONG PARLIAMENT**, a term used to designate the fifth Parliament summoned by Charles I. of England. It met Nov. 3, 1640, was twice expelled and twice restored, and dissolved of its own accord March 16, 1660. The name *Rump Parliament* is given to the members who remained, about sixty, after the others had been expelled by the army after the treaty of Newport was concluded, in 1648. It was the Rump Parliament that executed Charles I.

**LOO-CHOO**, Liu Kiu, or Riu Kiu, a chain of islands in the Pacific Ocean, between Formosa and Japan. The chain includes 55 islands and islets, 36 being inhabited, and the area is

934 square miles. It is of volcanic origin, but has a fertile soil and is populated principally with descendants of the Japanese. However, the prevailing customs are mainly of Chinese origin. Among the products are minerals, wheat, rice, sugar cane, maize, sago, sweet potatoes, tobacco, indigo, fish, domestic animals, and many varieties of fruits. Great Loo-Choo and Oshima are the two largest of the group, the former having an area of 500 and the latter of 290 square miles. The islands have belonged to Japan since 1774. They contain several market towns, among them Napa and Shuri, the latter being the capital. Population, 1908, 458,628.

**LOOM**, a machine in which yarn or thread is woven into fabric by the intercrossing of threads called *warp*, or *chain*, running lengthwise, with others called *woof*, *weft*, or *filling*. Looms were used for weaving fabrics by peoples in remote antiquity, Pliny attributing the invention of cotton weaving to Semiramis. The looms of Babylon maintained their celebrity long after the fall of the Assyrian Empire. The first machine-power loom was invented by Cartwright of England in 1787, since which time many valuable improvements have been made, but hand looms are still used for some purposes and in countries where manufacturing has not been modernized.

The principal parts of a loom are its frame, in which the row of yarn that forms the warp is held, and the harness or leshes, which govern the interlacing of the threads to form a shed for the woof. In 1876 an important improvement was made in the manufacture of looms by the Hunt Loom and Fabric Company of San Francisco. This consists of an attachment by which the loom becomes self-feeding and overcomes the waste of weft. In this machine there is no intermission in the operation of weaving, except to make repairs, and, if a break of the warp thread occurs, the loom is stopped automatically and a signal bell rings. This invention has made it possible for a large number of looms to be operated by a single attendant. Looms of different construction are used in the manufacture of all classes of fabrics, such as silk, woolen, cotton, and linen goods. They are employed in the manufacture of different classes of cloths, matting, and carpeting.

**LOPE DE VEGA**. See **Vega**.

**LOQUAT** (lŏ'kwät), a shrub native to China and Japan, but cultivated for its fruit in the warmer parts of the temperate regions. It grows to a height of about twenty feet, but yields the best returns when it is trimmed so as not to exceed twelve feet in height. The leaves are wrinkled and oblong, and the fruit is pear-



shaped and about an inch in diameter. Several species are grown in the United States, chiefly in Florida and California, and the seeds are used as a flavoring to tarts.

**LORAIN** (lō-rān'), a city of Ohio, in Lorain County, on Lake Erie, 24 miles west of Cleveland. It is on the New York, Chicago and Saint Louis, the Baltimore and Ohio, and other railroads, and has communication by steamboats and electric railways. Coal and natural gas are obtained in the vicinity. It has a public library, the Saint Joseph's Hospital, a fine high school, and many churches. The manufactures include iron and brass wares, clothing, earthenware, and machinery. It is the seat of the Johnson Steel Works, at which about 2,000 persons are employed. The place was first settled in 1822, became a town in 1875, and was chartered as a city in 1895. Population, 1910, 28,883.

**LORCA** (lōr'kā), a city of southern Spain, in the province of Murcia, 42 miles southwest of the city of Murcia. The surrounding country is fertile and contains lead mines. Lorca consists of two portions, the old and the new towns, the former dating from the time of the Moors. Among the chief buildings are the cathedral, the public library, the castle, and several schools and convents. The manufactures include linen and woolen goods, soap, leather, machinery, and earthenware. Lorca has modern facilities, such as electric lighting and street railways. Population, 1906, 71,147.

**LORELEI** (lō'rā-lī), a precipitous elevation on the Rhine River, half a mile above Saint Goar, Germany. It has a height of 427 feet, is now penetrated by a railway tunnel, and was made famous by Heine's celebrated "Volkslied." This exquisite poem represents a siren seated upon the Lorelei, by whose charms and beautiful song boatmen were attracted to a whirlpool at the base of the rock and there met destruction. The scenery at the cliff is the most beautiful on the Rhine, and near it is a basin noted for its productive trout fishery.

**LORETO** (lō-rā'tō), or **Loretto**, a small town of Italy, situated on a railway line, about fifteen miles south of Ancona and three miles west of the Adriatic. It is noted as the seat of the Holy House, which, according to tradition, was occupied as a dwelling by the Virgin Mary at Nazareth and, in 1295, removed to Loreto. The building was originally of simple construction, but it has been finely improved by sculptures in marble. The town is visited by many tourists annually, who go there to view the structure and witness an image of the Virgin, which is reputed to be a carving by Saint Luke. Population, 1906, 7,948.

**LORETO, Sisters of**, an order of Roman Catholic nuns, so named from the town of Loreto, Italy. It was founded by Charles Nerinck in 1812 and the first community was established in Kentucky, since which time it has spread rapidly, devoting its efforts to the care and education of poor orphans. The principal academy of the order is situated at Florissant, Mo. In 1908 it had 602 sisters and 65 academies and parochial schools.

**LORIS** (lō'rīs), the name of two species of lemurs native to Asia. They differ from the true lemurs in having a round head, large eyes, and no tail. They spend the larger part of the day by sleeping in the branches of trees, but come out at night in search of food, which consists of insects, small birds, and fruits. These animals are small, about as large as the domestic cat.

**LORRAINE** (lō-rān'), called *Lothringen* in German, a region of Europe, so named because it formed a possession of King Lothaire II. Originally it included Friesland, Alsace, and the regions lying between the Meuse, Rhine, and Scheldt, and in 954 became divided into Upper and Lower Lorraine. The latter now forms a portion of the kingdoms of Belgium and Holland, being known in Belgium as Brabant and as Brabant and Guelderland in Holland. France secured Upper Lorraine in 1766, but at the close of the war between Germany and France, in 1870-71, a large portion of it was ceded to Germany. The German portion includes the two fortified cities of Metz and Thionville and embraces part of Alsace-Lorraine (q. v.).

**LOS ANGELES** (lōs ān'gĕl-ēs), a city of California, county seat of Los Angeles County, 475 miles southeast of San Francisco. It is finely located on the Los Angeles River, about 20 miles from its entrance into the Pacific, and is on the Southern Pacific, the San Pedro, Los Angeles and Salt Lake, and the Atchison, Topeka and Santa Fé railroads. San Pedro, its seaport, is 25 miles distant, but the Pacific Ocean is only fifteen miles west, and north of it are ranges of the Sierra Madre. It is noted for its healthful climate and beautiful location.

The streets are broad and regularly platted and many of them are substantially paved with asphalt, stone, and brick. Fine gardens, vineyards, and orange groves surround the city. It is beautified with fine shrubs, flowers, and avenues of eucalyptus, palmetto palms, and other trees. Near the city are a number of celebrated health and seaside resorts, hence it is visited by many tourists at practically all times of the year. An extensive system of street



railways provide urban, suburban, and interurban communication. Griffith Park, located in the foothills near the city, is a beautiful public place. Elysian Park contains the famous Fremont's Gate, erected in honor of General Frémont, and is celebrated for its great variety of flowers and shrubs. The parks as a whole contain about 3,850 acres and without a doubt are equal to the finest public grounds in the United States.

The architecture is modern and substantial. The public buildings include the county courthouse, the city hall, and the Federal building. Among the notable structures erected through private enterprises are the opera house, the Huntington building, and a number of fine hotels, including the Angelus and the Lankershim. It is the seat of a State normal school, the University of Southern California, the Saint Vincent's College, and the Occidental College. Among the notable churches are the Roman Catholic Cathedral, the First Congregational, the Saint Paul's Cathedral (Episcopal), the First Methodist Episcopal, and the Old Plaza Church, once the headquarters of General Frémont. The public library has about 100,000 volumes. The city has several hospitals, a number of fine public schools, and beautiful cemeteries.

Los Angeles is surrounded by a fruit-growing country and is in the center of a region that contains valuable deposits of lead, gold, silver, coal, and petroleum. Among the manufactures are flour, canned fruit, fertilizers, confectionery, earthenware, and machinery. It has extensive interests in the refining of petroleum. Large quantities of fruit, wine, and merchandise are shipped and it has a growing jobbing trade with the cities of southern California and Arizona. The public utilities include waterworks, gas and electric lighting, sewerage, and telephone service.

The Spaniards first visited the region in 1769. In 1781 the place was settled and named *Puebla de Nuestra Senora La Reina de Los Angeles*, meaning "City of Our Lady, the Queen of the Angels." The Mexicans made it the capital of the Province of California, though the seat of government was alternately at this place and at Monterey. Commodore Stockton with a force of the United States navy captured it in 1846 and it was chartered as a city in 1851. Its prosperity began with the completion of railway lines to various points on the Pacific coast, and its growth was stimulated through the discovery of petroleum and the development of gardens and orchards in its vicinity. Population, 1900, 102,479; in 1910, 319,198.

**LOTTERY** (lŏ'tēr-y), an institution for the

distribution of prizes by lot or chance. The general plan is to prepare a number of tickets, which are sold at a specified price, the larger majority of which are blank, thus making the income much larger than the amount expended. Lotteries were of common occurrence among the Romans. They are now sanctioned for the support of charities and religion, but as a general institution are prohibited in most nations. The lotteries of many European countries took on the worst form of gambling and dishonesty in the middle of the 16th century, on account of which prohibitive measures were adopted and the institutions were suppressed. In America the first lottery was sanctioned by the Virginia Company in 1612, and in 1776 the American Congress passed an act legalizing lotteries for schools, roads, and other public improvements. Subsequently many frauds were perpetrated, which finally induced many legislative bodies to enact limiting and prohibitive legislation. The most extensive lottery ever maintained in America was the Louisiana State Lottery at New Orleans, which was finally suppressed by the State constitution in 1895, and an act of Congress prohibited the use of the mails in the management of its business. It is singular that there is a tendency in man which prompts individuals to invest their hard-earned money in lottery tickets, thereby taking chances along with others in winning prizes, knowing such an institution is absolutely certain to take more from the investors than is returned.

**LOTUS** (lŏ'tūs), a name derived from the *lotus* of Greek legend and applied to a large number of widely different plants. It is now used to designate several species of the water-lily family, particularly the so-called *sacred lily* that grows in the valley of the Nile. The same and allied species are found in other parts of Northern Africa and in the countries of Europe and Asia which border on the Mediterranean. The roots are eaten by people who reside in the vicinity of Lake Menzaleh. The name is applied in America to a water lily, commonly called *chinquapin*, and in Arabia to several species of thorny shrubs that grow in the desert. The lotus of Egyptian mythology is, perhaps, the same class of fruit referred to by Homer in the account where companions of Ulysses were persuaded to eat the lotus with the design that the participants would, as a result, desire to remain forever in the country where the lotus thrives, but the exact kind of fruit implied by the term is not known. The so-called *common lotus* is a favorite flowering plant grown extensively in gardens and houses. It has white flowers and large leaves. Lotus



plants of the clover family are called bird's-foot trefoil. They are creeping vines with perennial roots.

**LOUISBURG** (lōō'is-bûrg), a fortress built by the French on the southeastern coast of Cape Breton Island, in Nova Scotia, after the Peace of Utrecht in 1713. In the war between France and England, beginning in 1744, the fort was taken by New Englanders, but the Peace of Aix-la-Chapelle restored it to France in 1748. General Wolfe besieged Louisburg in 1758 and compelled the French garrison to surrender,

in 1781. In the same year, in the same manner, in their expedition they are attached to British New Guinea. These islands were discovered in 1606 and have belonged to Great Britain since 1888.

**LOUISIANA** (lōō-ē-zē-ā'nā), a southern state of the United States, popularly called the *Creole State*. It is bounded on the north by Arkansas, east by Mississippi and the Gulf of Mexico, south by the Gulf of Mexico, and west by Texas. The northern part is separated from Mississippi by the Mississippi River and the southern part by the Pearl River, and about two-thirds of the western border is formed by the Sabine River. From north to south the State has a length of 280 miles and its greatest breadth is 290 miles. The area is 48,720 square miles, which includes a water surface of 3,300 square miles.

**DESCRIPTION.** The surface has a general elevation of 75 feet above sea level, its highest altitude being not more than 500 feet. The highest point of land is in the northern part, in Claiborne and Union counties. Large areas of the surface are made up of alluvial deposits, which include many coast swamps and a considerable number of inland lakes formed through the deposit of silt by the Mississippi. Vast levees extend along both sides of the Mississippi in various sections to prevent the overflow of these alluvial lands during high water. The portion of the State lying south of a line drawn east and west a short distance south of Lake Pontchartrain is within the al-



COMMON LOTUS OF EGYPT.

after which the town was destroyed entirely and has since remained in a ruined condition. The fortress cost France \$5,000,000 and was regarded the strongest in America. The town situated on its site is made up largely of fishermen. It has a lighthouse, a good harbor, and a considerable trade in fish and produce.

**LOUISIADE** (lōō-ē-zē-ād'), a group of islands located near the southeastern coast of British New Guinea. The three largest islands are Rossel, Southeast Island, and Saint Aignan, with a total area of about 650 square miles. The surface is mountainous in the larger islands, while the smaller islets are level and of coral formation. The inhabitants consist chiefly of savage Papuans. For the purpose of admin-

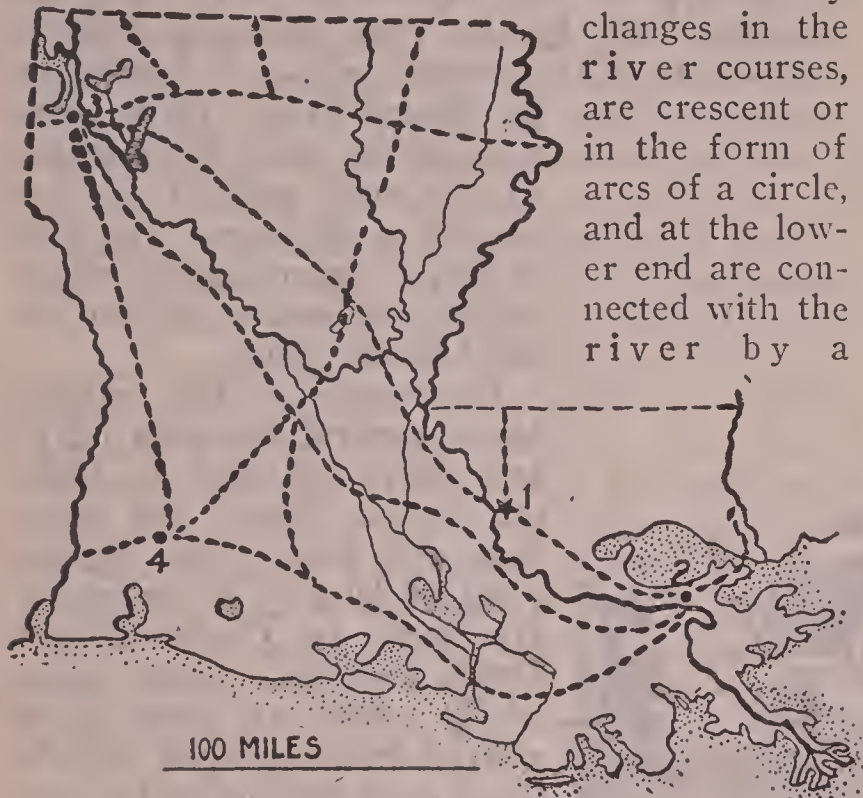
istration they are attached to British New Guinea. The region lying toward the north is gently undulated.

The general slope is toward the south, which is the direction of its water courses. The Mississippi, which forms a part of the eastern border and flows diagonally through the southern part, furnishes navigation for 600 miles. Its largest tributary within the State, the Red River, flows toward the southeast through the north central part. The Ouachita, Washita, Atchafalaya, Pearl, and Sabine are important for their navigation facilities. Many of the tributaries of the Mississippi are locally called *bayous*, many of which are navigable, and as a whole they are important in taking off the excess water during floods. Some of the streams,



like the Red and the Ouachita, have a width of from four to twenty miles at various points. The State has a large number of lakes, some of which are inland, but many of them form inlets from the Gulf of Mexico or from the larger rivers. Lakes Sabine, Grand, and Pontchartrain are connected with the coastal waters and are more or less brackish. Another class of lakes, those formed in channels which have been

cut off by changes in the river courses, are crescent or in the form of arcs of a circle, and at the lower end are connected with the river by a



LOUISIANA.

1, Baton Rouge; 2, New Orleans; 3, Shreveport; 4, Lake Charles. Principal railroads shown by dotted lines.

bayou. Many of these lakes have brackish water and the level rises and falls with the tide. All of the great delta of the Mississippi is within the State.

The soil and climate of Louisiana are alike favorable to the growth of luxuriant vegetation. Being located near the gulf, the State has an equable climate. At New Orleans the mean annual temperature is about 68°, while the general temperature ranges from 45° to 96°. However, it frequently attains to 100° in the summer season, but the freezing point is rarely reached in any section of the State. All parts of the State have an abundance of rainfall, which averages 50 inches in the northern part and 60 in the delta region. Clouds and mists obstruct the sunshine about half of the time in the winter and fully 40 per cent. of the time during the summer season.

**MINING.** The mineral resources are not extensive, but the production of petroleum is of growing importance. In the vicinity of Lake Charles, in the southwestern part, are large oil fields, which extend into the State from Texas. The salt deposits are next in importance, oc-

curing in solid beds of salt rock from 40 to 80 feet deep, found chiefly in a region stretching from the Parish of Plaquemines to Abbeville and in the parishes of Iberia, Vermilion, and Saint Mary. A good quality of lignite and bituminous coal is obtained in the southwestern part, the field extending into the State from Texas. Lead and sulphur deposits occur in different sections, and gypsum and limestone are worked extensively.

**FORESTS AND FISHERIES.** Louisiana is rich in timber and has more or less extensive forest areas in all parts of the State, especially in the northern section and along the Red River. Valuable cypress trees abound in the swamps and many species of oak, including the live oak, occur in large areas. Other trees that are well represented embrace the magnolia, pine, poplar, beach, cottonwood, cedar, and black walnut. Many varieties of fruits are cultivated, such as the fig, lemon, peach, plum, olive, banana, and pomegranate. The jasmine, oleander, and roses are well represented.

In the value of fisheries Louisiana holds second rank among the states bordering on the Gulf of Mexico. Along the southern shore are extensive oyster fisheries. The catfish and shrimp are caught more extensively than in any other State. Alligators, though formerly very abundant, are not found to any great extent at present, but the hide has increased greatly in value.

**AGRICULTURE.** A large per cent. of the surface is utilized for agriculture and the only uncultivated land is in the coast marshes and forests, but these furnish good pasturage. The soil is inexhaustible in fertility and all of the State has a favorable temperature and sufficient rainfall. Much of the farming is done by the plantation system of cultivation, hence many of the farms are large and are worked by tillers who reside on small divisions of the large estates. A majority of the tenants are Negroes, but the ownership of the land is vested very largely in white proprietors. Corn and cotton are the two leading crops, and the area cultivated in either exceeds largely that utilized in all other crops. Though the area devoted to the cultivation of cotton is about the same as that utilized in growing corn, the value of the cotton crop is about double that of corn, hence is the staple product. Sugar cane takes third rank in the area, but the value of the product rivals that of cotton. Rice is grown in the delta parishes and the prairie coast region toward the west, and in this product the State takes very high rank. Oats, hay, peas, fruits, and vegetables are other important products. Much attention is given to



the cultivation of strawberries and a large part of the yield is shipped to the northern markets early in the season.

Stock raising is of small importance as compared to the interests in the northern states. Horses and mules are reared for domestic use, especially for driving and tilling purposes. Considerable interests are vested in cattle raising, especially for the production of milk and butter. Swine are grown profitably and the young are able to thrive in the fields and forests almost without feeding. Poultry is grown extensively and some interest is taken in the raising of sheep.

**MANUFACTURING.** Rapid development has been made the last two decades in the output of manufactures. Cotton, rice, and sugar cane are important in the manufacturing enterprises of the State, and the refining of sugar has been growing in importance. In the value of the output sugar and molasses take first rank, but these are followed closely by lumber products and cottonseed and oil. Other manufactures include rice products, machinery, bags, railway cars, tobacco products, and canned fruit and oysters.

**COMMERCE AND TRANSPORTATION.** The port of New Orleans ranks third in the value of foreign trade, being exceeded only by Boston and New York. Among the chief exports are cotton, flour, sugar, lumber, rice, and cereals. The imports include machinery, coffee, and clothing. It has larger transportation facilities by water than any state in the Union, owing to its location on the Gulf of Mexico and many navigable streams, the latter affording transportation for a distance of 3,750 miles. At present 3,450 miles of railways and numerous electric lines are in operation. Though transportation facilities are afforded by railways in all parts of the State, the majority of lines run through it from north to south. New Orleans and Shreveport are the principal railway and manufacturing centers.

**GOVERNMENT.** The State is governed under a constitution adopted in 1898, by which the chief executive authority is vested in a governor, lieutenant governor, treasurer, auditor, and secretary of State, each elected for terms of four years. The Legislature consists of two branches, the senate and house of representatives, and members in each branch are elected for four years. The constitution provides that the number of senators cannot exceed 41 and the number of representatives cannot be more than 116 members. A chief and four associate justices constitute the supreme court, and these officials are appointed by the Governor and the senate for terms of twelve years. Subordinate to this

court are the court of appeals, the district courts, and the municipal and justice courts. The State is divided into parishes, which correspond to the counties in other states, and local government is administered according to the civil law introduced by the French.

**EDUCATION.** Public schools are maintained under a State board of education, consisting of the governor, superintendent of education, attorney-general, and one member from each congressional district. This board appoints the school directors for each school parish, these officials serving for terms of four years. Parish superintendents are elected by the school directors, who fix the salaries within certain limits. The general system provides for elementary and higher education, with separate schools for the white and colored children. Higher education culminates in the Louisiana State University and Agriculture and Mechanical College, at Baton Rouge, which is supported in part by the State and by the Federal governments. All residents of the State are admitted free of tuition into this institution. Teachers are encouraged to extend their academic courses by permitting graduates from the university and the State normal school to teach without passing an examination. Natchitoches is the seat of the State normal school. Although the per cent. of illiteracy is higher than the average for the Union, there has been a constant improvement. Among the native white population the illiteracy is 17.3 per cent. and among the Negro inhabitants of ten years and over it is 61.1 per cent.

Louisiana has a large number of excellent institutions of higher learning, including Tulane University, at New Orleans, which ranks as one of the leading educational centers in the South. Other noted institutions include the Methodist Episcopal University, New Orleans; the Thatcher Institute, Shreveport; the Baptist Leland University for Negroes, New Orleans; the Southern University for Negroes, New Orleans; the Saint Charles College, Grand Coteau; the Southwestern Industrial Institute, Lafayette; the College of the Immaculate Conception, New Orleans; and the Centenary College, Jackson. Baton Rouge has schools for the blind and deaf, Jackson has an asylum for the insane, and charitable hospitals are maintained at Shreveport and New Orleans. Formerly the convicts were leased, but they are now put to work upon farms or in industries owned and controlled by the State.

**INHABITANTS.** A large element in the present population is of French descent, due to the fact that Louisiana was settled in its early his-



tory by immigrants from France. The largest immigration from other states and foreign countries came in after the Civil War, though the foreign born population is not large. Baton Rouge, on the Mississippi, is the capital. The chief cities include New Orleans, Shreveport, Lafayette, New Iberia, Crowley, Carrollton, Alexandria, Plaquemine, Lake Charles, Donaldsonville, and Monroe. In 1900 the State had a population of 1,381,625. This included a colored population of 652,013, or 47.2 per cent. The colored inhabitants included 650,804 Negroes. Population, 1910, 1,656,388.

**HISTORY.** The history of Louisiana dates from 1541, when it was discovered by De Soto. La Salle took possession of it in 1642 for France, naming it after Louis XIV. Iberville ascended the Mississippi for 200 miles in 1699, but returned to the present site of Biloxi and established a fort and the first permanent settlement. Soon after Bienville, the governor of the colony, made a settlement at New Orleans, and John Law secured control of the colony in his Mississippi scheme about 1717. France ceded the territory to Spain in 1762, but again received title to it in 1800. It was Napoleon's ambition to found a New France in America, but in 1803 he was induced to sell it to the United States. The Territory of Orleans was formed in 1804, and in 1812 it was admitted into the Union as the State of Louisiana. The final battle of the War of 1812 was fought at New Orleans on Jan. 8, 1815, after peace had been made at Ghent, but before the news had reached America. From that time the development of the State made rapid strides, expanding agriculture and manufacture, New Orleans becoming the most important cotton market and port of the South.

On Jan. 26, 1861, the State seceded from the Union and cast its fortunes with the Confederacy. In the spring, on April 25, 1862, New Orleans was captured by the United States forces. During the war it was an important point because of the many engagements which occurred on the Mississippi River. After the war a carpet-bag element harassed the State during the reconstruction period. The Fourteenth amendment to the Federal Constitution was ratified in 1877 and the construction of levees and river jetties began about the same time. The Louisiana State Lottery was abolished in 1891. In the past quarter of a century the State developed rapidly in every material line, building railroads, canals, cities, and educational institutions.

**LOUISIANA**, a city of Pike County, Missouri, on the Mississippi River, 85 miles northwest of Saint Louis. It is on the Chicago and

Alton and the Chicago, Burlington and Quincy railroads and has a good landing for steamboats. Among the chief buildings are the public library, the high school, and a number of churches. The manufactures embrace flour, tobacco, building stone, lumber, and earthenware. The surrounding country is fruit growing and lumber producing. It has a large trade in grain and live stock. Population, 1900, 5,131; in 1910, 4,454.

**LOUISIANA PURCHASE**, the most important annexation made to the territory of the original thirteen states of the American Union. The purchase included a vast region extending from the Gulf of Mexico to the British possessions, west of the Mississippi River. Within its confines is included all the portion of the United States which is situated west of the Mississippi River, except Texas, California, a portion of Oregon, the Gadsden purchase from Mexico, the Mexican cession, and Alaska. It is now subdivided into thirteen states and embraces a population of nearly 20,000,000 people. The enterprise of coming into possession of this vast region was consummated by Thomas Jefferson, who appointed James Monroe as a minister to act with Robert R. Livingston at the French court. The treaty was signed April 30, 1803, and the stipulated price was \$15,000,000, of which the sum of \$3,750,000 represented claims of American citizens against France, which the United States agreed to assume. Livingston said regarding this purchase, "We have lived long, but this is the noblest work of our whole lives;" while Napoleon is quoted as saying, "I have just given to England a maritime rival that will, sooner or later, humble her pride." •

**LOUISIANA PURCHASE EXPOSITION**, an international exhibition of the United States, at Saint Louis, Mo., in 1904. It was held to celebrate the one hundredth anniversary of the purchase of Louisiana from France, which was consummated in 1803. The site included a tract of about 1,000 acres in the west part of the city, made up chiefly of Forest Park and the campus of Washington University. Forty-two states and many foreign nations were represented by buildings and exhibits of their arts and industries. The architecture of the buildings and the landscape gardening were exquisite in taste and effect, and both the grounds as a whole and the exhibits were never surpassed in any of the great international exhibitions. Fifteen large exhibition buildings were erected by the management, including the beautiful structure known as the Cascades, and in addition there were the large building designed by the United States government and numerous



structures erected by the several states and foreign nations. The sunken gardens, the floral clock, the network of lakes, the exhibit of Philippine life and products, the display of wireless telegraphy, the Ferris wheel, and the extensive display of electric machinery were among the notable features. The Pike was the popular amusement feature, similar to the Midway of the Columbian Exposition at Chicago.

To promote the exposition and insure its success, a fund of \$15,000,000 was pledged. This included a donation of \$5,000,000 by the citizens of Saint Louis and equal amounts by the city of Saint Louis and by the United States government. An expenditure of \$1,500,000 was made by Congress for the government exhibit and \$1,000,000 for the Philippine exhibit. The buildings erected by the several states cost about \$7,000,000, and a like sum was expended in the construction of buildings by foreign nations. The receipts from all sources were reported at \$10,162,380 and the attendance was 18,741,073.

**LOUISIANA STATE UNIVERSITY AND AGRICULTURAL AND MECHANICAL COLLEGE**, an institution of higher learning maintained by the State of Louisiana, at Baton Rouge. It was founded in 1855 as a State seminary and opened at Alexandria, La., in 1860 under the superintendency of William T. Sherman, who later became prominent as a Union general in the Civil War. The United States government granted the buildings and grounds at Baton Rouge, to which place it was removed in 1886. The courses include commerce, literature, classics, general science, agriculture, and mechanical and civil engineering. Associated with it are three experiment stations, located at Baton Rouge, Calhoun, and New Orleans. It has a library of 25,000 volumes and is attended by 450 students. The endowment is \$350,000, but a large part of the income is derived from the State and the Federal governments.

**LOUISVILLE** (lōō'is-vīl), a commercial and railway city of Kentucky, county seat of Jefferson County, on the Ohio River, about 400 miles above its mouth and 130 miles southwest of Cincinnati, Ohio. It is on the Baltimore and Ohio Southwestern, the Louisville and Nashville, the Pennsylvania, the Illinois Central, the Southern, and the Chesapeake and Ohio railroads, connecting it with the principal commercial centers in the central part of the United States. A series of rapids characterize the Ohio at this place, hence a canal is maintained so steamboats may avoid the rapids at the time of low water. New Albany and Jeffersonville, both

in Indiana, are connected with the city by three bridges, one of which is a mile in length.

The city is located on a site fully 60 feet above high-water mark, hence is free from the danger of overflow. It extends along the river front a distance of about eight miles and includes an area of twenty square miles. The country in its vicinity is rich in coal, iron, timber, and agricultural resources. It has regularly platted streets, many of which are paved with brick, asphalt, and granite, and the avenues are shaded with beautiful trees. The principal business establishments are located at Jefferson, Main, Market, and Fourth streets, and on the intersecting streets from First to Sixteenth. Electric street railways furnish communication to all parts of the city, and the system is connected with lines penetrating long distances into the country.

The rise of Louisville as a commercial center is due to its railway and river transportation facilities, through which it has acquired a large jobbing and export trade. It has obtained vast benefits from its location in a region which is rich in mineral and agricultural resources. As a market for tobacco it takes rank as of first importance in North America. Having large slaughtering industries, it is a center of pork packing, much of the output being exported. It has large grain elevators and an extensive trade in produce. Whisky and other spirituous liquors are manufactured extensively. Other manufactures include flour, leather, soap, ironware, cement, boots and shoes, clothing, brass fittings, and machinery.

The architecture is modern and substantial, which is evidenced by such structures as the city hall, the county courthouse, the Masonic Temple, the customhouse, the commerce building, and the board of trade building. It has about 200 churches, representing all the leading denominations. They include the Episcopal Christ's Church cathedral, the Broadway Baptist, the Roman Catholic cathedral, the Second Presbyterian, the Warren Memorial, the Church of the Messiah, and the Temple Adas Israel. It is the seat of the Polytechnic Society of Kentucky, which has a library of 52,500 volumes, and in connection with it are a museum and an art gallery. The public schools are well organized and buildings ranging from the lower grades to the high school are maintained in the different parts of the city. Special instruction is promoted by a normal school, two schools of pharmacy, a dental school, two law colleges, three seminaries, and nine medical colleges. It is the seat of the State school for the blind, with which is connected the American Printing House for the Blind. The public grounds em-



brace about 1,200 acres, included principally in Cherokee, Iroquois, and Shantee parks. The city contains a monument to Confederate soldiers, the grave of Zachery Taylor, and statues of Thomas Jefferson and Henry Clay. Cave Hill Cemetery is one of the finest burial grounds.

The first settlement on the site of Louisville was made in 1778, when Col. George Rogers Clarke and a number of others located near the Ohio Falls. The town had a population of 60 in 1780, when it was incorporated and named Louisville in honor of Louis XVI. of France. At that time it was under the jurisdiction of Virginia. The Legislature of Kentucky granted it a charter as a city in 1824, since which time it has enjoyed a constant growth. A majority of the people sympathized with the Union during the Civil War. It was visited by a tornado in 1890, when property valued at \$3,000,000 was destroyed. Population, 1910, 223,928.

**LOUSE**, a parasitic bug of the suborder *Parasita*, which obtains food by sucking the blood of animals and the juices of plants. These insects are widely distributed and include many species. The common louse is the best known of the species that prey on man. It has a suctional mouth, simple eyes, little marks of difference between the abdomen and thorax, and three pairs of legs attached to the segments of the thorax. The female is oviparous, producing eggs properly called *nits*. In five or six days the young are hatched, and after eighteen days they are capable of reproduction. Properly there are three species of lice parasitic on man under certain circumstances: the *head*, or *common louse*; the *body*, or *clothes louse*; and the *pubis*, or *crab louse*. Many species of lice are parasitic on birds, bees, wasps, beetles, fishes, and plants.

**LOUVAIN** (lōō-vān'), a city of Belgium, in the province of Brabant, eighteen miles east of Brussels. It is on the Dyle River and has steamboat facilities through the Louvain Canal. Among the noteworthy buildings are the Church of Saint Joseph, the Church of Saint Gertrude, the Union railway station, the athenaeum, the post office, and a noted university, containing a library of 250,000 volumes. This institution formerly had an attendance of 6,000 students, but at present has less than 2,000. The manufactures include machinery, spirituous liquors, cotton and woolen goods, lace, leather, and musical instruments. Its numerous parks and gardens are decorated with fine sculptures. Some of the public buildings are among the finest in Europe. Louvain was the capital of Brabant in the 14th century, when it had a population of 200,000. Nearly half of the inhabitants died of

the plague in the 16th century. Population, 1906, 41,146.

**LOUVRE** (lōō'vr'), a celebrated palace in Paris, France, situated near the Seine River, near the central part of the city. The name properly is *The Palace of the Louvre*, which includes an extensive group of buildings. The older portion of it was a royal residence of King Dagobert in 628. Louis XIV. enlarged and beautified the building. Napoleon I. commenced the new Louvre, and Napoleon III. completed it in 1857. The palace has several wings and galleries, all of which are distinguished for their elegance and sumptuous architecture. The more ancient part is now used as a depository for rare specimens of paintings, sculptures, and antiquities from all countries and all ages. In connection with it is a large public library with the national archives attached. Napoleon's expedition to Egypt and the Italian campaign added many valuable treasures to the already extensive collections in the Louvre. The only works admitted to its galleries are productions of deceased artists. In 1871 the Communists committed serious injury to several portions of the palace, when about 90,000 volumes of the imperial library in the Richelieu pavilion were destroyed. Baron Rothschild, in 1873, presented to the museum many relics discovered in the ruins of a temple of Apollo at Miletus.

**LOW ARCHIPELAGO**, a group of coral islands in the Pacific Ocean, located east of the Society Islands. They are sometimes called the *Tuamotu Islands* and are divided into a number of groups. The area is about 360 square miles. Fruits, pearls, and copra are the chief products. The islands have been a possession of France since 1844. Fakarava, the capital and principal port, is located on an island of the same name. Population, 1908, 7,125.

**LOWELL** (lō'él), a city of Massachusetts, one of the county seats of Middlesex County, on the Merrimac River, 25 miles northwest of Boston. It is on the Boston and Maine, the New York, New Haven and Hartford, and a number of electric railways. The site is hilly and the river has a fall of 33 feet, thus affording splendid water power for manufacturing. About fourteen square miles are included in the area of the city. The noteworthy buildings include the post office, the city hall, the Church of Saint Anne, the Lowell Textile School, the Saint John's Hospital, the Theodore Edson Orphanage, the State Normal School, and the public library of 70,000 volumes. Other features include the Ladd-Whitney Monument, the Fort Hill Park, and Pawtucket Falls.



Lowell is important as a commercial and manufacturing center. It is one of the largest producers of cotton and woolen goods in the world. Other manufactures include leather, machinery, engines, hardware, patent medicine, carriages, paper, clothing, carpets, and utensils. It has an extensive trade in manufactures and merchandise. Lowell was founded in 1822 and was named from Frances C. Lowell (1775-1817), a noted merchant and manufacturer. It was incorporated as a town in 1826 and was chartered as a city in 1836. Population, 1910, 106,294.

**LOYALTY ISLANDS**, a group of islands in the South Pacific, situated sixty miles east of New Caledonia. The area is 1,050 square miles. They are of coral formation and have a level surface. Among the products are cotton, cereals, live stock, and tropical fruits. The most important islands of the group include Lifu, Uea, and Maré. These islands have belonged to France since 1864 and for the purpose of government are attached to New Caledonia. Population, 1906, 19,493.

**LUBECK** (lü'bĕk), a free city of Germany, on the Trave River, 38 miles northeast of Hamburg. The area included in the free territory is 115 square miles. It has extensive railroad facilities, well graded and paved streets, and systems of waterworks and electric street railways. Among the chief buildings are the Church of Saint Mary, the Church of Saint Catharine, the public library, the Union railway station, and the post office. It is the seat of many hospitals and contains the Rathhaus in which the deputies of the Hanseatic League held their meetings. The manufactures include cotton and woolen goods, ironware, spirituous liquors, clothing, textiles, cigars, ships, and engines. It has an extensive import and export trade, especially in fish, cereals, live stock, and merchandise. The Trave River has been deepened so as to permit the largest vessels to reach the city, though its harbor properly is at Travemünde, sixteen miles down the river. Fully 98 per cent. of the people are Protestants. The Saxons founded Lübeck in 1143, and, on account of important privileges granted by the German emperors, it rose rapidly to commercial importance, being for many years at the head of the Hanseatic League. Frederick II. made it an imperial free city as early as 1226. The French captured it in 1806 and annexed it in 1810, but in 1813 it recovered independence, and is now a constituent part of the German Empire. Population, 1905, 105,857.

**LUBLIN** (lyŏ'blyĕn), a city of Russian Poland, capital of the government of Lublin, sixty miles southeast of Warsaw, on the Bistrzyca

River. It has railroad facilities, good schools, and a large trade. The chief buildings include the Church of Saint Nicholas, the city hall, and several convents and monasteries. Among the manufactures are cotton and woolen goods, soap, machinery, and hardware. Many of the inhabitants are Jews. Population, 1906, 52,084.

**LUCCA** (lŏok'kà), a city of Italy, capital of a province of the same name, on a railway line, thirteen miles northeast of Pisa. In the surrounding country are fine farms and orchards, including plantations devoted to the culture of silk and olives. The manufactures include stucco, silk, musical instruments, and machinery. It has a large trade in silk goods, olive oil, fruits, and cereals. The city has several fine churches, among them the Cathedral of Saint Martin, begun in 1063, the Basilica San Ferdiano, and a number of fine educational institutions. The province of Lucca was made a principality by Napoleon, though it later passed to Spain, and in 1847 was ceded to Tuscany. Population, 1906, 76,109.

**LUCERNE** (lŭ'sĕrn), a deep-rooting perennial plant, cloverlike in appearance, cultivated extensively for fodder. It is native to the southern parts of Europe, but has been naturalized extensively in America and other grand divisions. The plant attains a height of from twelve to fourteen inches, growing quickly after being mown. It supplies forage early in the season, and is especially valuable in its ability to endure great droughts, causing it to be cultivated to a considerable extent in arid regions. See **Alfalfa**.

**LUCERNE** (lŏŏ-sĕrn'), a city of Switzerland, capital of the canton of Lucerne, at the northwestern extremity of Lake Lucerne, on the Reuss River. It has good railroad connections, modern municipal facilities, and a number of excellent buildings. The chief buildings include the public library, the gymnasium, and the church known as Hofkircke. Among the manufactures are cotton, woolen, linen, and silk fabrics, gloves, carriages, musical instruments, and machinery. As a gathering place of summer visitors and tourists it takes high rank, owing largely to its interesting scenery, including the Lucerne Lion, a figure of a lion hewn in 1821 from the solid rock after a model furnished by Thorwaldsen. The Glacier Garden, a fine public resort, contains interesting formations caused by the action of ice, and in the vicinity are many scenic views in connection with the lake region. Population, 1907, 34,480.

**LUCERNE, Lake of**, frequently called Lake of the Four Forest Cantons, a lake of Switzerland, surrounded by the cantons of Unterwalden, Schwyz, Lucerne, and Uri. It is 1,400



feet above sea level. The shores are rocky and precipitous, the general form is irregular, and the scenery, as well as its historical associations, have been celebrated for many centuries. The length of the lake is about 22 miles, the breadth is two miles, and the area is 44 square miles. Steamboats navigate it, making it important commercially. On its shore are many harbors and beautiful villas. Near it are several important cities. Many of the early historical associations are connected with the name of William Tell. Many thousands of tourists visit Lake of Lucerne during the summer.

**LUCIA** (lōō'shá), **Saint**, an island of the West Indies, belonging to Great Britain. The area is 233 square miles. It has much fertility and exports cocoa, sugar, rum, and tropical fruits. Castries is the capital and chief town. Population, 1906, 54,073.

**LUCIFER** (lū'sī-fēr), an ancient name of Venus, applied when it was the morning star, as distinguished from Hesperus, the name given to it when it was an evening luminary. Early commentators mistook the reference made in Isaiah xiv., 12, to the kings of Babylon and ascribed the appellation to Satan. Lucifer is the name applied in Milton's "Paradise Lost" to the archangel who fell from divine favor and lowered a part of the host of heaven to the infernal regions.

**LUCKNOW** (lūk'nou), a city of British India, capital of the province of Oudh, on the Gumti River, 42 miles northeast of Cawnpore. It is surpassed in population only by Calcutta, Madras, and Bombay. Steamboats are able to reach the city by the Gumti River at all seasons. It has extensive railroad facilities, connecting it with all parts of India, and is the seat of a vast trade in farm produce and merchandise. The older part of the city has low houses constructed of mud and straw roofs. In the newer portions are many fine streets and numerous religious, educational, and government buildings. It is improved by many modern municipal facilities, such as telephones, waterworks, sewerage, and electric street railways. The early history is unknown, since it was founded at a very early date, probably before any of the other great cities of India. In 1857 it was the center of activities during the Sepoy mutiny and its garrison was besieged by a large army of natives. In making the defense Sir Henry Wallace was slain, General Havelock died of dysentery, and permanent relief was not secured until in 1858, when Sir Colin Campbell entered the city with an English force and put an end to the mutiny. Population, 1906, 274,356.

**LUDINGTON** (lūd'ing-tūn), a city in Mich-

igan, county seat of Mason County, on Lake Michigan, where it is entered by the Père Marquette River. It is on the Père Marquette and other railroads and has direct communication by steamboats with the principal ports on the Great Lakes. The surrounding country is rich in the production of fruits, salt, and lumber. Among the noteworthy buildings are the county courthouse, the high school, the public library, and many churches. The manufactures include ironware, carriages, cigars, lumber products, furniture, and machinery. The city has modern facilities, including electric lights, waterworks, and sewerage. It was settled in 1851 and incorporated in 1874. Population, 1910, 9,132.

**LUDWIGSHAFEN** (lōōt'vīgs-hä-fen), a city of Germany, in the Rhine Palatinate, Bavaria. It is located on the Rhine, opposite Mannheim, with which it is connected by railway and electric lines. The harbor is extensive and well improved. It has manufactures of vinegar, flour, chemicals, fertilizers, and machinery. Formerly it was of little commercial importance, but the development of manufacturing enterprises has caused its rapid growth. It was founded by Louis I. of Bavaria in 1843, and was made a city in 1859. Population, 1905, 72,286.

**LUMBAGO** (lūm-bā'gō), the form of rheumatism that affects the muscles of the loins. It sometimes extends to the ligaments underneath the muscles, and often occasions sudden and severe pain to the person afflicted.

**LUMBER**, the name applied to split or sawed timber, such as boards, beams, joists, planks, lath, and shingles. Usually logs and telegraph poles are included in the term lumber, and places where these products are kept for sale are known as lumber yards. Canada and the United States are at present the leading lumber-producing countries. Other countries where timber and lumber products are obtained in large quantities include France, Germany, Russia, China, India, and the equatorial regions of Africa.

Lumber has been an export of Canada since an early date in its history. It is said that the first shipload of lumber was transported from Canada to Europe in 1667, and shipbuilding began on a small scale about that time at Quebec. Stringent regulations were issued for the preservation of timber in Canada, and a large area of the forests are included in the Canadian timber preserves. It is estimated that 800,000,000 acres of woodland are in existence in that country, but probably not more than half of this area may be considered forest land fit for timber production. The valuable forest lands are located in Quebec, Nova Scotia, New Bruns-



wick, Ontario, British Columbia, and in a belt extending across the north of the continent from Labrador to Alaska. The value of the annual output in Canada is placed at \$135,000,000.

Originally the United States had the largest and most valuable forest area of North America, and the value of the lumber produced at present is larger than that of any country in the world. Extensive forests extend through many of the states in the south, especially those bordering on the Mississippi. Another large forest area is located in the vicinity of the Great Lakes, in the states of Michigan, Wisconsin, and Minnesota, and productive lumber regions abound in Maine. Forests of more or less commercial value are found in all the highlands of the west, but those of largest size and greatest value are in Oregon, Washington, and the northern part of California. In the value of the output the lumber industry takes rank as the fourth enterprise in the United States. The annual production has a value of \$565,500,000. In recent years the tendency has been for lumber products to increase in value, owing to the supply becoming more limited, or the larger tracts of timber being purchased by large investors. There has been a constant increase in the importation of wood and its products from Canada, which average annually about \$25,500,000. See **Forest**.

**LUMPFISH**, or **Lumpsucker**, a fish found in the Atlantic Ocean, chiefly along the coast northward from New York in America and from France in Europe. It is so named from its awkward shape. The back is characterized by an elevated ridge, which is notched quite like the comb of a cock. Bony tubercles cover the body and the ventral fins are formed into a sucker, enabling it to cling firmly to any solid substance. The color becomes brilliant crimson at the spawning season, though usually it is of a dull lead color. The lumpfish deposits its eggs in an improvised nest and hovers near to protect them against enemies. It is caught for its flesh, though it is quite soft and oily and not highly esteemed.

**LUMP JAW**, or **Lumpy Jaw**, a dangerous disease of cattle, due to fungi found on grasses and some of the cereals. It usually makes its appearance on the lower jaw, which is affected more or less by swellings, though other parts of the body are sometimes the seat of the disease. A single fungus may penetrate the gums and cause the disease, which is attended by irritation, abnormal growths, and tumors or abscesses. Lancing or removing the tumors at an early stage and treating the seat of the disease with iodine and iodide of potash constitute the

usual remedies, but unless skillful treatment is applied the disease is usually fatal.

**LUNACY** (lū'nā-sŷ), a term applied to persons born sane, but who have from some cause fallen into temporary or permanent aberration of intellect. Lunatics possess a brain of so little circumference that they are never capable of exercising much reason. Lunacy is distinguished from idiocy in that the latter is a designation of persons born with unsoundness of mind. See **Insanity**.

**LUNAR THEORY**, the deduction of the moon's motion from the law of gravitation, manifested in the attraction of the sun and planets. None of the heavenly bodies, except the sun, disturbs the moon to a considerable extent in its orbit. However, they affect the earth in this respect, and so in an indirect way influence the moon.

**LUNDY'S LANE**, the seat of an important battle near Niagara Falls, in Canada, fought in the War of 1812. The British had been defeated at Chippewa and General Drummond was sent forward to meet the Americans under Gen. Jacob Brown, but the latter dispatched General Scott to menace the forts on the Niagara River. On July 24, 1814, General Scott came in contact with the British forces under General Riall on a hill near Lundy's Lane, and sent Major Jesup forward to make a flank movement at the British rear, while Scott engaged the enemy. Action continued from the middle of the afternoon until midnight, the British troops being repulsed early in the engagement, but the American generals, Scott and Brown, were wounded, when the command devolved upon General Ripley. The latter withdrew from the field, and it was again possessed by the British on the following day. The Americans lost 850 men, while the British loss was near 900.

**LUNGS**, the organs for aërial respiration, situated in the thorax, on each side of the heart. In man the lungs are conical, with the base resting on the diaphragm and the trachea extending above the collar bone. They consist of two lobes, separated by a deep fissure, the right being somewhat larger on account of having a third lobe of triangular shape above and also because the heart lies toward the left side. The lungs are composed of honeycomblike cells to which air passes by means of the bronchial tubes, these being formed by divisions of the trachea, and at the upper part of the trachea is the larynx. Within the lungs are ramifications of the pulmonary artery and veins, bronchial arteries and veins, lymphatics, and nerves, the whole being bound together by fibrous tissue. Each lung is enclosed in a serous



membrane, the pleura, which extends to its roots, and is then expanded on the chest wall. All mammals, reptiles, birds, and some amphibians possess lungs, while in the lowest and simplest forms of animal life there are no traces of respiratory organs, equivalent action taking place by cilia or by the general movement of the body. Most mollusks possess gills in the place of lungs. Fishes sustain life by gills, though many have an air bladder. Animals which approach the reptiles in form have a well-devel-

flammation, and consumption. See **Respiration**; **Circulation**.

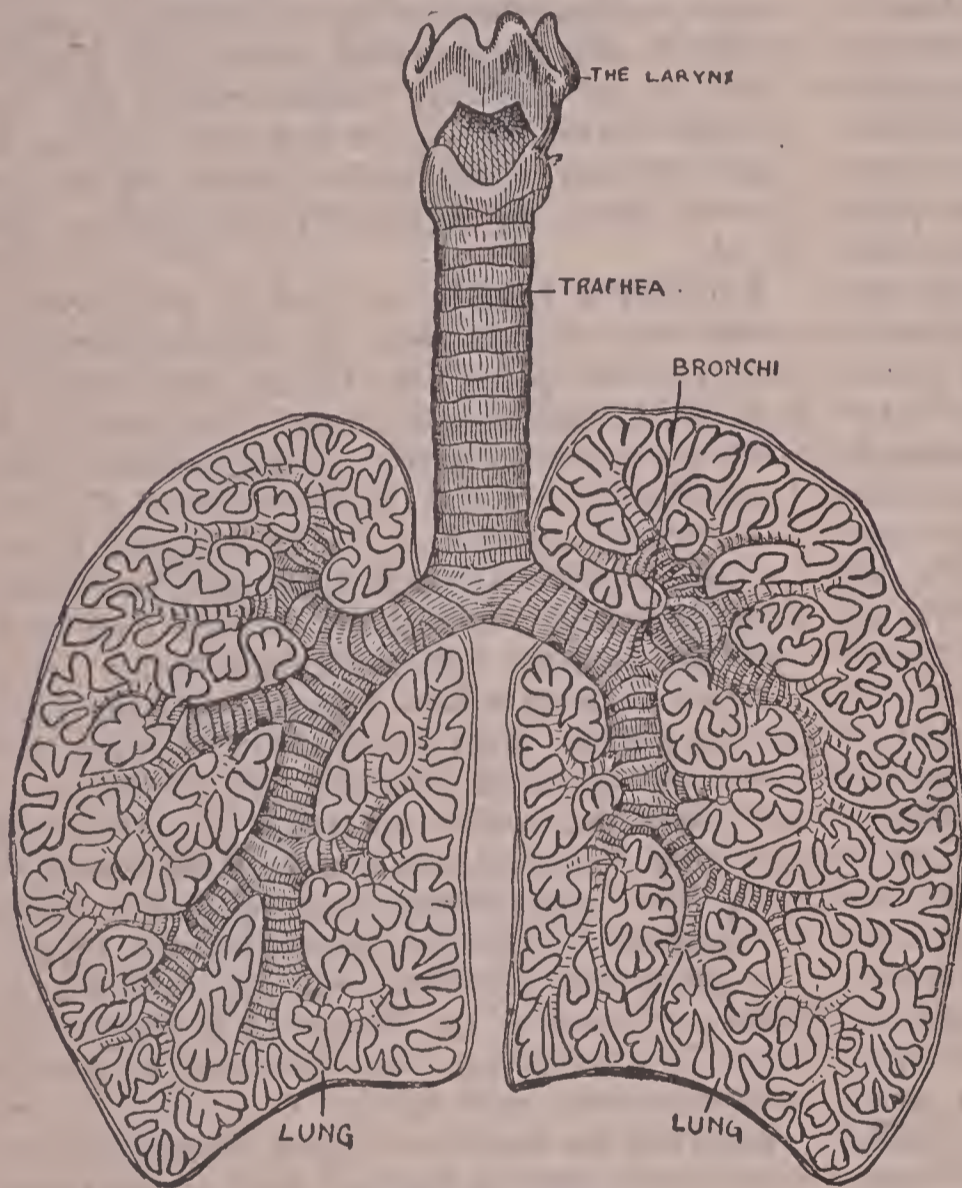
**LUNGWORT** (lŭng'wôrt), the name of a herb native to Europe and North America. It is cultivated for its tubular or trumpet-shaped flowers. The leaves are ovate and the flowers have a bright blue color. The name is likewise applied to a lichen of the Northern Hemisphere, which is used to some extent in treating diseases of the lungs.

**LUPERCALIA** (lŭ-pĕr-kā'li-à), a festival of ancient Rome, celebrated annually on Feb. 15 in honor of Lupercus, the god of fertility. It is related that the festival was celebrated at the Lupercal, a cave on the Palatine Hill, and that sacrifices of the first fruits of the last harvest were offered. Later the sacrifices consisted of goats, and two youths, known as the *Luperci*, clothed in goat skins, ran through the streets, striking those they met with thongs made of the skins of the slaughtered animals. These ceremonies were supposed to induce fertility.

**LURAY** (lŭ-rā'), a town and the county seat of Page County, Virginia, in a fertile valley of the South Fork of the Shenandoah, 77 miles west of Washington. It has woolen factories, mills, a tannery, an academy, and two seminaries. Near it is the celebrated Luray Cave, remarkable for its peculiar stalactites, many of which are fifty feet long. Hundreds of lakes are in the cave, varying in size from a few to fifty feet in diameter, and from six to fifteen feet in depth. The exact size of the cave is not known, but there are various chambers of large size and irregular outline, many of them having a height of 260 feet. It has a temperature of about 54° Fahr. The air is pure and por-

tions are lighted by electricity, thus forming a favorite attraction for thousands of visitors annually. The population of Luray, in 1900, was 1,146.

**LUTE**, a stringed musical instrument which somewhat resembles a guitar. Formerly it was popular throughout Europe. It was introduced into Western Europe by the Arabians, who used it in the performance of solos and duets and for accompaniments. Its antiquity is attested by representations on Egyptian tombs and sculpture. Originally the lute had five or six pairs of strings, each pair tuned in unison or octave, but later the strings were increased to 24 in order to accommodate the lute to the chromatic scale.



HUMAN LUNGS.

oped sac, in many of which it takes on a double form analogous to the double lung.

The important function of the lungs is to bring the blood in contact with the air for the purpose of purifying it. In this process the air gives up its oxygen to the blood in the delicate cells in the lungs, and in turn receives water and carbonic acid gas that have become foul with waste matter, accumulated by the blood in circulating through the body. The air exhaled carries off these impurities, while the purified blood bounds through the system and carries the inspiring oxygen to the different organs. Several acute and chronic diseases affect the lungs, among them pneumonia, a form of in-



The music is produced by striking the strings with the fingers of the right hand and stopping them on the frets with those of the left.

**LUTHERANS** (lū'thēr-anz), a body of Christians that adopted the principles of Martin Luther, and who constitute numerically the largest Protestant organization in the world. The two principal branches are designated as Evangelical and Reformed, the former holding closely to the teachings of Luther, while the latter constitutes a branch separated from the main body under Calvin. The largest number of adherents to Lutheran tenets are in Germany, Sweden, the United States, Holland, Switzerland, Austria, Norway, Denmark, and Russia, but there are branch organizations in all parts of the civilized world. The first Lutheran immigrants to America came from Holland and settled at New Amsterdam in 1624. Large numbers came from Sweden in 1637, from Germany in 1680, and Switzerland in 1734. In 1908 there were 265 ministers and 42,548 communicants of the Lutheran Church in Canada. In the same year the denomination had 8,348 churches and 2,450,380 communicants in the United States, while all of the Lutheran population, including several allied branches, was 6,842,590. They maintain 120 institutions of higher learning, support extensive missionary operations, and are grouped in sixteen independent synods. Among the important societies are the Luther League, Women's Societies, Walther League, and Christian Endeavor Associations. The chief Lutheran institutions in America are in Saint Louis, Mo., Fort Wayne, Ind., Springfield, Ill., Saint Paul, Minn., Milwaukee, Wis., and Neperan, N. Y.

**LÜTZEN** (lüt'sen), a town of Germany, in Prussian Saxony, celebrated because of two historic battles fought within its proximity. The first was between the Swedes under Gustavus Adolphus and the imperialists under Wallenstein in 1632, in which the former were victorious. The other occurred between the allied German and Russian forces against Napoleon on May 2, 1813, in which the victory was claimed on both sides. In this battle the French lost 12,000 men and the allies lost 10,000.

**LUXEMBOURG** (lüks-än-bōōr'), the name of a celebrated palace in the southern part of Paris, in the Rue de Vaugirard. It was built for Maria de' Medici in the early part of the 17th century and was designed to resemble her former home in Florence, the Pitti Palace. Subsequently it was greatly changed and enlarged, was destroyed by fire in 1859, and later was rebuilt. In 1879 it was made the meeting place of the Senate of France, though formerly it con-

tained a famous picture gallery. The latter was removed to a neighboring building. It includes 24 scenes in the life of Maria de' Medici painted by Rubens. The collection is known as the Musee du Luxembourg and is considered the most important accumulation of sculptures and paintings in the world. The walls of Luxembourg Palace are beautified by fine ceiling decorations. The gardens of the Luxembourg, noted as the most beautiful in France, comprise a large public park.

**LUXEMBURG** (lüks'ēm-bûrg), a grand duchy of Europe, surrounded by Germany, France, and Belgium. It was under the sovereignty of King William III. of Prussia until his death in 1888, when it passed to Adolph, Duke of Nassau. The area is 998 square miles. Luxemburg is the capital, a city of 31,225 inhabitants. The soil is fertile and well adapted to agriculture. Most of the drainage is by a number of streams into the Moselle. The government is constitutional, the duke being assisted by a chamber of deputies of 45 members, who are chosen by direct vote. For commercial purposes it is united with the German *Zollverein*. The language is German and the religion is largely Catholic. Population, 1908, 241,453.

**LUZÓN** (lōō-zōn'), the largest and most northerly island of the Philippines. The area, including several dependent islands, is 44,235 square miles. It has a fertile soil, vast forests of valuable timber, and a number of mountain ranges. Mount Mayón, the highest peak, has an altitude of 7,566 feet. The general contour is very irregular, especially in the southern part, which has many important bays and excellent harbors. Among the principal lakes are Laguna Bay and Laguna de Taal, both in the southern part of the island. The chief streams are the Pampanga, Agno, Abra, Cagayan, and Pasig rivers. It has extensive productions of manila hemp, rice, sugar, tobacco, ginger, coffee, pepper, and many varieties of fruits. The domestic animals include cattle, horses, buffalo, sheep, and swine. Several railway lines are operated, connecting Manila, the capital, with interior and coast points. In 1903 the population, including several adjacent islands, was 3,798,507. See **Philippines**.

**LYCEUM** (lī-sē'üm), the principal gymnasium of Athens, dedicated to Apollo Lyceus, whence its name. It was situated in the eastern part of the city and was surrounded with lofty plane trees. Aristotle and his disciples taught in the Lyceum, who, from their habit of walking while delivering their lectures, were called *Peripatetics*. In modern times the name lyceum came to be applied to schools for young men



and to organizations which maintain popular or technical lecture courses.

**LYCIA** (lĭsh'ĭ-à), an ancient country of Asia Minor, located south of Phrygia and west of Pamphylia. The region was colonized at an early period by the Greeks, who long maintained the independence of their territory. They formed a league of cities, including Patara, Xanthus, Myra, and Olympus. In the 6th century B. C. the Lycians were conquered by Persia and subsequently passed under the dominion of Macedonia. Later the country belonged to Egypt, Syria, Rome, and Turkey, and throughout the early history of Christianity it had no importance.

**LYDDITE** (lĭd'it), a modern high explosive, so named from its manufacture at Lydd, Wales, where the first experiments were made with it. The first use of lyddite in warfare was by the British in the war with the Boers in 1899-1901. Its method of manufacture has been kept a secret, but it is thought to consist of picric acid brought to a dense form by fusion and poured into shells in a liquid state. Though formerly restricted in use to five-inch howitzer guns, it is now employed in the larger fort and naval ordnance. When fired, the picric acid causes a dense fume of yellowish-green gas, and it is somewhat objectionable on account of requiring a primer.

**LYDIA** (lĭd'ĭ-à), an ancient country of Asia Minor, surrounded by Phrygia, Mysia, Ionia, and Caria, originally inhabited by a people called Maeonians. About 720 B. C. the Lydians occupied the country and developed a large interior commerce. Their greatest prosperity was reached in the period included between the years 716 B. C. and 546 B. C., but their king, Croesus, was conquered in the latter year by Cyrus of Persia. It is claimed that the Lydians were the inventors of musical instruments, of the art of coining money, and of wool dyeing, and that they discovered the art of working in ore. Sardis was the capital and after the Persian invasion became the seat of government of the western part of the empire, remaining such until its conquest by the Athenians.

**LYMPH** (lĭmf), a colorless fluid found in the lymphatic vessels. It is nearly transparent, has a saltish taste, and may be said to be blood with a somewhat different kind of corpuscles. See **Lymphatic System**.

**LYMPHATIC SYSTEM** (lĭm-făt'ĭk), the system in animals that absorbs lymph from the various organs and tissues, and conveys it by the lymphatic vessels toward the heart. It includes the lymphatic vessels, the glands, and the lacteals. The *lymphatic vessels* are delicate tubes of nearly uniform size, have a knotty ap-

pearance, and occur in every texture and organ of the body. The *lymphatic glands* vary in size from a hemp seed to an almond, are round and oval in form, and are made up of adenoid tissue. They occur in the course of the lymphatic vessels and the lacteals, and may be noticed particularly near the large blood vessels, in the armpits, and in the neck. The lymph is a clear, colorless, alkaline fluid, consisting of a plasma resembling that of the blood and of corpuscles like the white blood corpuscles, but the coloring matter of the blood is wanting. After being absorbed from the different tissues and organs, it is conducted to the general blood current. The lymphatics of the right thorax, the right arm, and the right side and neck convey their contents to the right lymphatic duct, and those of the rest of the body into the thoracic duct.

The *lacteals* serve to absorb chyle from the small intestines, which is elaborated in the lymphatic glands, and afterward carried to the thoracic duct. The important function of the system is to retain and elaborate portions of the waste matter of the body and render them suitable for further use. They likewise absorb the poison of disease and produce the phenomena of absorption of the skin. After an excess of matter is deposited to fill up a breach in the body, as in an open wound, it is removed to other parts of the body by the lymphatics. Hibernating animals are supported during the winter by the fat which the absorbents carry into the circulation from the extra supply accumulated during the summer. In sickness a man unconsciously consumes his own flesh through the activity of the lymphatics.

**LYNCHBURG** (lĭnch'bûrg), a city of Virginia, in Campbell County, on the James River, 123 miles west of Richmond. It is on the Southern, the Norfolk and Western, and the Chesapeake and Ohio railroads, and is surrounded by a fertile farming country. Among the noteworthy buildings are the public library, the high school, the Miller Female Orphan Asylum, and the Randolph Macon Women's College. It has manufactures of furniture, tobacco, ironware, flour, lumber products, machinery, cotton goods, and utensils. Extensive stone quarries and iron and coal mines are worked in the vicinity. It has systems of pavements, waterworks, sewerage, and electric street railways. An abundance of water power for manufacturing is obtained from the river. It was settled in 1786 and incorporated in 1823. Population, 1900, 18,891; in 1910, 29,494.

**LYNCH LAW**, the summary infliction of punishment by an informal and self-appointed body of men, who act as an extemporized court. It is used to designate such punishment either



with no trial at all or after trial by a court of law. The term is thought to have originated from James Lynch, mayor of Galway, Ireland, who sentenced his son to death for murder about 1526, and to prevent a rescue by a band of men executed him by his own hands without due process of law. The term became of common application in the United States from a Virginia planter named Charles Lynch, who acted with a number of associates to punish summarily Tories and British sympathizers. Lynch-law executions in the United States are about twice as numerous as legal ones.

**LYNN** (lĭn), a city of Massachusetts, in Essex County, on Massachusetts Bay, ten miles northeast of Boston. It is on the Boston and Maine and the Boston, Revere Beach and Lynn railroads. The harbor is comparatively shallow, but it has a shore line of three miles. The chief buildings include the public library, the city hall, the Lynn Home for Aged Women, the Lynn Hospital, and many schools and churches. Forest Park, Lynn Beach, and a soldiers' monument are other features. Lynn is noted particularly for the extensive output of boots and shoes. Other manufactures include electrical apparatus, clothing, machinery, agricultural implements, ironware, and fabrics. The city has all modern municipal facilities, including an extensive electric street railway system, waterworks, sewerage, and stone and macadam pavements. It was first settled in 1629, when it was known as Saugus, and the present name was adopted in 1637. Population, 1905, 77,025; in 1910, 89,336.

**LYNX** (lĭnks), a mammal of the cat family. It is characterized by ears that are tufted at the tips, a short tail, long fur, and comparatively long limbs. The name is given to several species of animals, most of which are larger than the true cats. They are light brown in color, with spots of black, and are fierce and savage in preying upon poultry, sheep, and other quadrupeds. In the common lynx the body is nearly three feet long and about twenty inches high at the shoulders, and the weight is from sixteen to twenty pounds. The eyes are brilliant and the sight is keen, enabling them to lurk about safely at night. Lynxes are found in America, Europe, and in other grand divisions. Several species are utilized in hunting, for which purpose they are domesticated.

**LYONS** (lĕ-ôn'), the third largest city of France, on the confluence of the Saône and Rhone Rivers, in the department of the Rhone, 240 miles southeast of Paris. The rivers divide the city into three parts, which are connected by many stone and steel bridges. It is noted as a railroad center, has a good river port, and is the center of a large commerce. The municipal

facilities are modern, including electric street railways, several parks, city waterworks, and a fine public library of 125,000 volumes. It is strongly fortified. A system of canals connects it with various trade centers. The manufactures consist chiefly of cotton, woolen, and silk goods, drugs, hats, jewelry, lace, machinery, earthenware, furniture, tobacco, and spirituous liquors.

Lyons is generally well built and has broad and well-paved streets. Electric street railways furnish intercommunication. The noteworthy buildings include the Cathedral of Saint Jean, the Hôtel-de-Ville, the Church of Notre Dame, the Palais des Arts, the Grand Théâtre, the Church of Saint Martin, the Gothic Church of



LYNX.

Saint Nizier, and the Palais de Justice. The University of Lyons, with an attendance of 2,650, ranks next to that of Paris. Lyons was founded in the year 43 B. C. by the Romans. It became the capital of a Roman province about the beginning of the Christian era, and in the Revolution of 1789 was enthusiastic in the common cause, but suffered greatly during the conflict. It is noted as one of the fashionable centers of France. Population, 1906, 472,114.

**LYONS** (lĕ-ôn'), Gulf of, a bay on the southeastern coast of France. It receives the water from the Herault, Rhone, and Aude rivers. On its shore are many ports, including those of Marseilles, Toulon, and Cette. It is the seat of an active commerce. Gales are not uncommon and, owing to their fury, it is said to have been named from the lion.

**LYRE** (lĭr), a stringed instrument of the harp class. It has been used from remote time. The invention of the lyre is ascribed to the Grecian Hermes, who is spoken of by Homer in that regard, and he is credited with giving it to Apollo, who was the first to play upon it with method as an accompaniment to poetry. The lyre was used by the early Assyrians, Baby-



Ionians, Egyptians, and Semites. At first this instrument had three strings, but the number was increased to seven, later to eleven, and finally to sixteen. This became necessary as the number of sounds cannot be greater than the number of strings. In playing the performer uses a lyre stick of polished wood or ivory, though some operate solely with the finger. The instrument has two hornlike pieces, with a crossbar at the upper ends, from which the strings are stretched to the lower parts. As a means of increasing the sound, the principal portions of the lyre are hollow. In modern times the lyre has gone largely out of use, but is still employed by pastoral people of Europe, Asia, and Africa. Lyric poetry was so named from the lyre, since it is the instrument used early as an accompaniment to that class of poetry.

**LYRE BIRD**, a genus of birds common to Australia and New South Wales. The body is not as large as that of a pheasant. It has a



LYRE BIRD.

brownish-black color above and is grayish-brown below. The male is remarkable for having sixteen tail feathers arranged in a lyre-shaped form, whence the name. Lyre birds are shy and solitary, running rapidly at the approach of danger, and are the largest of all song birds. They are noted for their peculiar ability to imitate the sounds of animals and the voices of other songsters. They are fast decreasing in

number and their acclimation in countries foreign to their nativity thus far has failed. The eggs are two in number. Lyre birds feed on worms, beetles, and bugs, for which they scratch in the ground. Only three species are included in the genus, of which the *common lyre bird* and the *rasorial lyre bird* are the best known.

**LYRIC POETRY** (lī'rik), a term which was originally applied to poems intended to be sung to the accompaniment of the lyre or harp, but now used to designate that form of poetry whose object is to give expression of thought as influenced by emotion. Among the various forms of lyric poetry are the sonnet and elegy, now not set to music, and the song, hymn, ode, and psalm, which imply a musical setting. Lyric is distinguished from epic poetry in that action is essential to the latter.

Lyric poetry may be said to have originated before the time of Christ. It inspired the Greeks and Spartans to march to battle, engaged the ingenuity of Horace and Ovid, and was an element of inspiration to the shepherds of the Middle Ages. The patriotic songs and love poems of Walther von der Vogelweide gave way in Germany to the purely lyric poems of the 14th century. Among the famous English lyrics are Shelley's "Clouds," Milton's "L'Allegro," Tennyson's "Tears, Idle Tears," and Burns's "Highland Mary." Holmes's "Chambered Nautilus" and Longfellow's "Hymn to the Night" are among the American lyric poems. Below is the beautiful lyric poem "Break, Break, Break" of Tennyson:

Break, break, break  
On thy cold gray stones, O Sea!  
And I would that my tongue could utter  
The thoughts that arise in me.

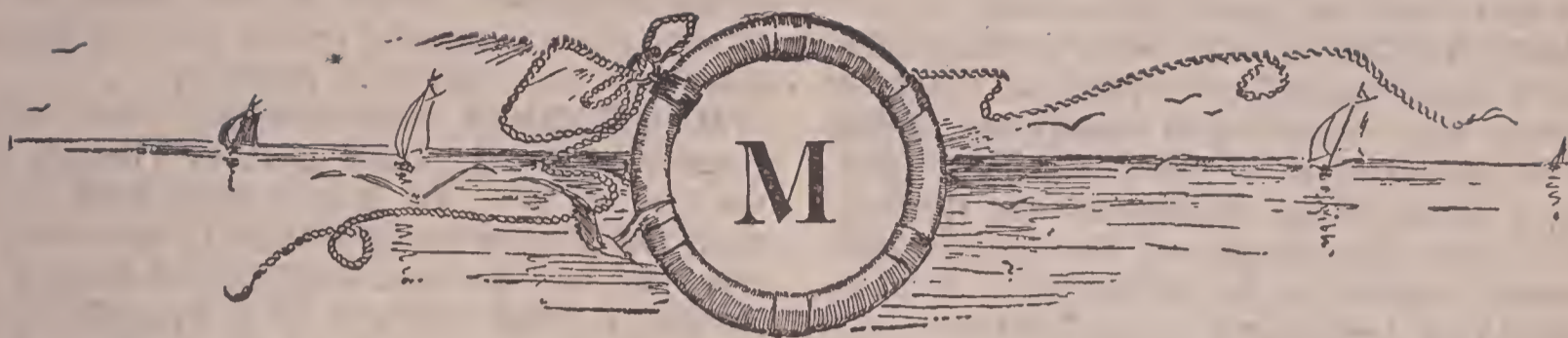
O well for the fisherman's boy,  
That he shouts with his sister at play!  
O well for the sailor-lad,  
That he sings in his boat on the bay!

And the stately ships go on  
To their haven under the hill;  
But O for the touch of a vanished hand  
And the sound of a voice that is still!

Break, break, break  
At the foot of thy crags, O Sea!  
But the tender grace of a day that is dead  
Will never come back to me.

**LYSIMACHIA** (lī-sī-māk'ī-à), a genus of plants of the primrose family. The species are widely distributed, but only a limited number are native to North America. The *moneywort*, which is cultivated in gardens, is a trailing vine with roundish leaves and bright yellow flowers. It is well fitted for covering rocks, and is used extensively as a plant for hanging baskets. Several species are known as the *loosestrifes*, which have large showy flowers and are cultivated as border plants in gardens.





## M

**M**, the tenth consonant and thirteenth letter of the English alphabet. In form it came from the Phoenician through the Greek and Latin with but little change. It has a labial and nasal articulation and is classed among the liquids. In the English it has but one sound, as in much, man, and time, but in some languages it indicates that the vowel before it is to be pronounced with nasal resonance. In the Roman notation M denotes 1,000, and when written with a dash over it ( $\overline{M}$ ), 1,000,000.

**MAB**, a mythical personage who was made queen of the fairies by Shelley in his "Queen Mab." She is likewise mentioned by other poets, including Ben Jonson and Shakespeare. In Shakespeare's "Romeo and Juliet" the mischievous ways of Queen Mab are described, but, according to that writer, the office of Mab properly belongs to Titania, the wife of Oberon Titania.

**McALL MISSION**, a Protestant mission instituted in France by Robert Whitaker McAll (1821-1893) in 1871, which is the largest of its kind in that country. The founder of this movement was born in Macclesfield, England, Dec. 17, 1821; died May 11, 1893. He was aided in the enterprise by his wife, the two visiting the laboring classes, establishing stations, and distributing literature. The workers engaged are largely French, but there are many persons of other nationalities connected with it. About \$50,000 is contributed annually by the people of the United States to this enterprise.

**MACAO** ( $m\grave{a}-k\grave{a}'\ddot{o}$ ), a seaport city of China, near the mouth of the Canton River, forty miles west of Hongkong. It is inhabited chiefly by Portuguese. The site is partly on an irregular tableland and partly on a small peninsula. A number of forts are located near its harbor, and a lighthouse 330 feet high is within the walls of one of the forts. The chief buildings include

## MACAW

a cathedral, several hospitals, and a number of schools and charitable institutions. It has a large trade in tea and rice, but its commercial importance has been lessened by the rapid growth of Hongkong. The Portuguese made the first settlement at Macao in 1577, but it remained Chinese territory until 1887, when it was made a Portuguese colony by treaty. A number of modern improvements, such as electric lighting and tramways, are maintained. Population, 1908, 78,650.

**MACARONI** ( $m\grave{a}k-\grave{a}-r\ddot{o}'n\ddot{i}$ ), an article of food composed of the dough of fine wheat flour, usually made into tubes one-eighth of an inch in diameter and about eighteen inches long. The smaller sticks, although made of the same material, are known as *spaghetti* or *vermicelli*. It is prepared most extensively in Italy and France, but the manufactures of Canada and the United States are steadily growing in importance. Machinery is used in the American manufactures for the purpose of kneading the dough and also for pressing it into sticks. Macaroni is sold in the market packed in boxes. It is a wholesome food and is used principally in the preparation of broth, soup, and pudding.

**MACASSAR** ( $m\grave{a}-k\grave{a}s's\grave{a}r$ ), a strait of the Pacific, extending a distance of 375 miles between Borneo and Celebes, and connecting the Java Sea with the Celebes Sea. It is about fifty miles wide at the northeastern point, and, as it extends toward the southwest, it widens to a breadth of from 100 to 140 miles.

**MACAW** ( $m\grave{a}-k\grave{a}'$ ), a genus of birds found in tropical South America, remarkable for their size and the beauty of their plumage. They range as far north as Mexico. The macaws belong to the parrot tribe. They may be taught to articulate a few words, but have a harsh and disagreeable cry. The species are designated as



red and blue macaw, blue and yellow macaw, and gray-green macaw. The red and blue macaw attains a length of forty inches, the tail measuring about twenty inches. These birds have two broods of young in the year.

**MACCABEES** (mäk'ká-bēz), in Jewish history, a name applied to a patriotic family of Hebrews who resisted with remarkable patriotism the persecutions of Antiochus IV., Epiphanes, a Syrian king. Mattathias was the original of the Maccabees, and the term became commonly applied to his descendants. It is recounted that Antiochus was expelled from Egypt by the Romans, after which he made a vigorous attempt to put down the Jewish worship. He endeavored to induce the aged Mattathias, priest of Modin, to adopt the Greek gods and the Grecian mode of offering sacrifices. The messenger sent by the king with bribes was slain by Mattathias, and, aided by his five sons, he destroyed the Grecian idols and escaped with their possessions to the mountains. From their mountain resort they went forth periodically to restore the faith in Jehovah, but Mattathias died in 166 B. C. In the following year his son Judas gathered a number of patriots and reconquered Jerusalem, purified the temple, and instituted the Feast of Dedication, a memorial held annually in succeeding years. A Maccabean dynasty ruled over Jerusalem about a century, the last scion of the house being Hyrcanus, whom Herod the Great, slaughterer of the infants of Bethlehem, put to death, though he was the high priest and a man of great piety.

**MACCABEES, Knights of the**, a fraternal association founded in 1883, now represented by a large number of subordinate tents and hives. The total membership of the order is 375,575. It is incorporated under the laws of the State of Michigan with headquarters at Port Huron. Benefits are paid in cases of accident, sickness, and death. The Ladies of the Maccabees is an affiliated order of the society.

**MACCLESFIELD** (mäk'k'lz-fēld), a town of England, in Cheshire, fifteen miles southeast of Manchester. It is on the Bollin River and several railways and has manufactures of machinery, earthenware, and cotton and silk textiles. The markets, gas works, cemetery, public baths, and electric railways are owned by the municipality. It has an infirmary, a townhall, and several schools and churches. Coal, stone, and slate are obtained in the vicinity. Population, 1907, 36,354.

**MACE**, an aromatic spice made from the dried membranous covering of the seed of the nutmeg. The portion used for its manufacture is the aril or inner covering, which is fleshy and

has a crimson hue when fresh. The flavor of mace resembles that of nutmeg. It is produced chiefly in the Spice Islands, and is used principally for making pickles and in cooking. Mace is also the name of a staff of office, usually borne by officials or displayed on the table of legislative bodies as a symbol of authority.

**MACEDONIA** (mä-s-ē-dō'nī-ä), an ancient country of Europe, lying north of Thessaly and the Aegean Sea. Its history dates back to the year 700 B. C., when Perdiccas I., according to tradition, was the first king, but all history regarding it prior to 490 B. C. is wrapped in obscurity. In the latter year it was invaded by the Persians, who compelled the Macedonian king, Alexander I., to join Xerxes in an expedition to Egypt. In the year 359 B. C. Philip II. subdued all opposition and established himself on the throne of Macedonia. His reign was successful and prosperous, and his son, Alexander the Great, strengthened the army, encouraged internal improvements, and made himself undisputed sovereign over large parts of Europe, Asia, and Africa. Among the flourishing cities of Macedonia in the time of Alexander the Great were Pella, Thessalonica, Pydna, Potidaea (Cassandria), Phillipi, and Olynthus. At his death Macedonia lost many of its possessions under a division of the empire into four kingdoms. Soon after Greece was separated from it, and the battle of Pydna in 168 B. C. made it a province of Rome. The region is now inhabited by Wallachians, Greeks, Albanians, and Turks, and forms part of the Turkish possessions in Europe. The inhabitants of this part of Turkey, which corresponds nearly to the vilayet of Saloniki, have been subjected to many atrocities by the Turks. An acute stage was reached in 1903, when Austria-Hungary and Russia interceded for the Christian inhabitants of that region.

**MACEIÓ** (mä-sä-yō'), or **Maçayó**, a seaport city of Brazil, capital of the state of Alagoas, 130 miles southwest of Pernambuco. It is pleasantly located on the Atlantic coast and has connection with interior points by several railways. The manufactures include cigars, cotton goods, and machinery. It has extensive shipyards and a large trade in corn, cotton, hides, and fruits. Population, 1908, 34,286.

**MCGILL UNIVERSITY**, an institution of higher learning at Montreal, Quebec. It is so called from its founder, James McGill, who, two years before his death, bequeathed his property of Burnside, then valued at £20,000, together with a sum of £10,000 in money, to found a college in a Provincial University, the erection of which had already been provided for by the generosity of the British government. This property



was, on his death, conveyed to the Royal Institution for the Advancement of Learning, a body which, in 1802, had been incorporated by the Legislature for the establishment of free schools and the advancement of learning in the Province of Quebec.

Owing to persistent opposition by a section of the people to any system of governmental education and to the refusal of the Legislature to make the grants of land and money which had been promised, the proposed establishment of the Provincial University by the government was abandoned. Thereupon, the Royal Institution took action on its own account and in 1821 obtained a royal charter. On account of protracted litigation, however, they were unable to obtain possession of the estate until 1829, when the work of teaching began with two faculties, those of arts and medicine. In 1852 a number of prominent citizens of Montreal became interested in the institution and a new charter was secured. At that time there were only three faculties, those of arts, medicine, and law, with sixteen professors and four assistants. Shortly after the William Molson Hall, erected by the generous donor whose name it bears, was provided to serve as a library and convocation hall. Subsequently other buildings were erected, including the new quarters for the faculty of medicine, but this structure was partly destroyed by fire in 1907, after which a magnificent new and wholly up-to-date building was erected. The course of medicine now extends over five sessions of about eight months each.

The faculty of applied science dates back to 1857, when a chair of civil engineering was established in the faculty of arts. However, the faculty cannot be said to have had an organic existence until 1893, when a separate building was provided for the work in applied science. This building, provided through the generosity of Sir William Macdonald, was destroyed by fire in 1907, but it has since been rebuilt on a larger scale. The equipment of this building is exceedingly valuable, comprising all the latest inventions and the newest machinery, especially in connection with the departments of mechanical, electrical, and civil engineering. Other noteworthy structures include the physics building, the chemistry building, the museum, the library, the McGill Union, the Strathcona Hall, the Royal Victoria College, and the Macdonald College. The last mentioned institution is on a tract of 560 acres, at Saint Anne de Bellevue, about 20 miles from Montreal. This property contains a total of seven buildings and all have been constructed and equipped in the most up-to-date fashion. No expense has been spared in

this respect by the founder, Sir. William Macdonald, who has endowed it with over \$2,000,000.

McGill University owes its foundation and its existence to private generosity. The greatest of its benefactors, as already indicated, is Sir William Macdonald, who has, in one way or another, donated to the university nearly \$5,000,000. Other generous contributors include Lord Strathcona, Peter Redpath, J. H. R. Molson, William Molson, and Thomas Workman. Apart from Macdonald College, the total endowments amount to \$4,500,000 and the value of the property, leaving Macdonald College out of account, is over \$2,500,000. The number of students in attendance is about 1,500 and there are in the several faculties 65 professors, 25 assistant professors, and 130 lecturers, tutors, and demonstrators. At present there are 112,000 volumes on the library shelves, but there is a working capacity for at least double that number. McGill University may be said to have had but two principals, Sir William Dawson and Dr. William Peterson. The former retired in 1893 and the latter was appointed in 1895.

**MACHINE GUN**, a designation commonly applied to any ordnance that may be loaded and fired in rapid succession by mechanical appliances and combinations. The first ordnance of this character was used in the Franco-German War of 1870-71, but soon after the celebrated Gatling gun was invented and manufactured in the United States. Among the different classes of machine guns utilized in warfare are the Gatling, Hotchkiss, Nordenfeldt, Gardner, and Maxim. These guns are capable of discharging from 200 to 350 rounds in half a minute with ease and accuracy. They differ more or less in size and efficiency, but may be grouped in two classes. The two classes include those in which the recoils of the barrel, or force of the powder gases, act to operate the gun, and those in which the gun is operated by some exterior force, as by the hand.

**McKEESPORT** (mă-kēz'pōrt), a city of Allegheny County, Pennsylvania, on the Monongahela River, twelve miles southeast of Pittsburg. It is on the Pennsylvania, the Baltimore and Ohio, and the Pittsburg and Lake Erie railroads. The chief buildings include the Carnegie Library, the high school, the Douglass Industrial College, the McKeesport Hospital, the Y. M. C. A. building, and many schools and churches. It has manufactures of ironware, electrical supplies, tin plate, machinery, engines, glass, lumber products, spirituous liquors, and tobacco. The surrounding country is fertile and contains large deposits of limestone and coal. It has a large commercial and jobbing trade, of which



a considerable portion is carried by river navigation. The city has extensive municipal facilities, including street railways, pavements, electric lights, and waterworks. McKeesport was settled in 1795 and incorporated in 1842. Population, 1900, 34,227; in 1910, 42,694.

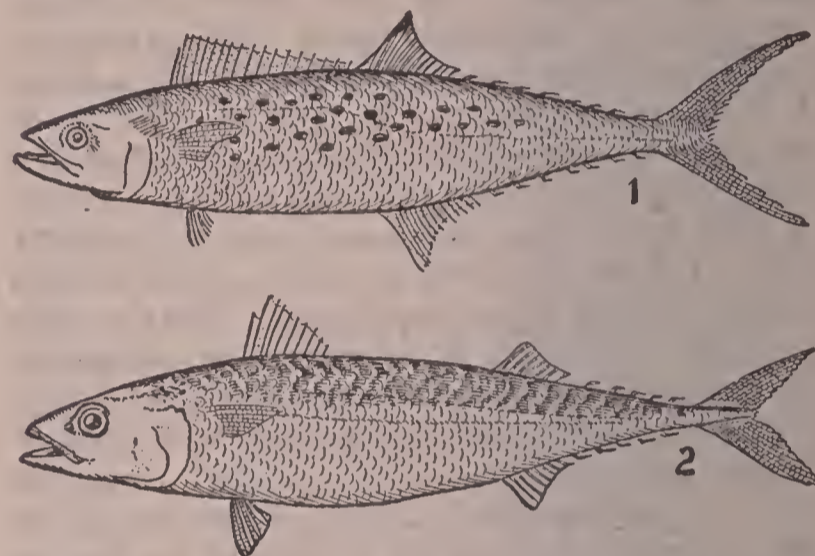
**McKEES ROCKS**, a borough of Pennsylvania, in Allegheny County, on the Ohio River, a short distance northwest of Pittsburg. It is on the Pittsburg and Lake Erie and the Pittsburg, Chartiers and Youghiogeny railroads, and is noted for the manufacture of flour, glass, machinery, and steel and iron products. Electric lighting, waterworks, and electric railways are among the public utilities. The first settlement was made in 1830 by John McKee, and it was incorporated as a borough in 1892. The prosperity of McKees Rocks is due chiefly to extensive manufacturing enterprises. Population, 1900, 6,352; in 1910, 14,702.

**MACKENZIE** (mä-kěn'zī), a river of British America. It rises as the Athabasca River in the Rocky Mountains, thence flows a distance of about 600 miles, entering Lake Athabasca, thence has a course of 240 miles as the Slave River to Great Slave Lake, and thence takes on the name of Mackenzie River, flowing northwest for a distance of 1,050 miles into the Arctic Ocean. The entire course is over 2,000 miles and the basin drained equals 575,000 square miles. It was named from Alexander Mackenzie (1755-1820), who discovered and first navigated it in 1789.

**MACKENZIE**, a district of Canada, which occupies the greater part of the Mackenzie River valley and the north central part of the Dominion. It is bounded on the north by the Arctic Ocean and Franklin, east by Keewatin, south by Keewatin, Saskatchewan, Alberta, and British Columbia, and west by Yukon. It embraces an area of about 500,000 square miles. The eastern part is drained chiefly by the Phelon River into Hudson Bay, and the central and western parts by the Mackenzie into the Arctic Ocean. Nearly the entire region slopes toward the north and the surface is generally low. Numerous swamps and lakes abound, including Great Bear, Aylmer, Mackay, and Great Slave lakes. The valleys of the Coppermine, Great Fish, and Mackenzie rivers have extensive forests of pine, birch, spruce, tamarack, and aspen poplar. The minerals include salt and coal, both of which are found in the region of Great Slave Lake. Lumbering and furring are the chief industries, but agriculture is not practicable, except in a comparatively small region, owing to the short summers and long and severe winters. The settlements are confined

mainly to the valley of the Mackenzie. Since the region is sparsely settled, organized civil administration is impracticable, and the government is exercised largely through the north-west mounted police. Population, 1906, 5,950.

**MACKEREL** (mäk'ēr-əl), an excellent food fish, widely distributed, particularly abundant in the North Atlantic. It attains a length of from twelve to eighteen inches, weighing about two pounds. The color is steel blue with blackish markings above and silvery beneath. Usually these fish are caught in drift nets which reach about twenty feet below the surface. The mackerel move in schools, are carnivorous, feeding chiefly on the fry of other fish, and are caught



1, SPANISH MACKEREL.  
2, COMMON MACKEREL.

mostly when coming toward the shore for the purpose of spawning. The most extensive fisheries in America are off the coast of New England, where the *common mackerel* is very abundant. A species known as the *Spanish mackerel* is found in the Mediterranean, where it is caught in large numbers.

**MACKINAC** (mäk'ī-nä), or **Mackinaw**, a strait that connects lakes Michigan and Huron. The island of Mackinac is located in the strait, about three miles east of Saint Ignace, county seat of Mackinac County, Michigan, and is about two miles in width and three in length. The city of Mackinac is situated on the island. It has a good harbor and is noted as a favorite summer resort. Formerly a military post known as Fort Mackinac was maintained on an eminence 300 feet above the city of Mackinac, which was captured by Pontiac in 1669 and taken by the British in 1812. Mackinac remained a village until 1900, when it was chartered as a city. Population, 1904, 736.

**McKINLEY** (mä-kīn'li), **Mount**, an elevated peak in the south central part of Alaska, 150 miles north of Cook Inlet. The summit is



covered with snow perpetually and around the slopes are numerous glaciers. It is elevated 20,464 feet above the sea, hence is the highest peak of North America.

**MACOMB** (mă-kōm'), a city and the county seat of McDonough County, Illinois, 185 miles southwest of Chicago, on the Chicago, Burlington and Quincy Railroad. It is surrounded by a fertile farming country. Among the principal buildings are the county courthouse, the public library, and the Western Illinois State Normal School. It has manufactures of tile, earthenware, and machinery. Large deposits of fire clay are found in the vicinity. It was settled about 1840 and incorporated in 1857. Population, 1900, 5,375; in 1910, 5,774.

**MACON** (mā'kūn), a city of Georgia, county seat of Bibb County, on the Ocmulgee River, 98 miles southeast of Atlanta. It is on the Southern, the Central of Georgia, the Macon and Birmingham, and other railroads. The chief buildings include the county courthouse, the public library, the Mercer University, the Wesleyan Female College, the Saint Stanislaus College, the State Academy for the Blind, and the Federal building. Among the manufactures are cotton and woolen goods, clothing, lumber products, machinery, brass and iron wares, spirituous liquors, and utensils. The municipal facilities include pavements, electric lights, street railways, and waterworks. It has a large trade in cotton, produce, and general merchandise. Macon was settled in 1822 and incorporated in 1823. Population, 1900, 23,272; in 1910, 40,665.

**MACON**, a city of Missouri, county seat of Macon County, 70 miles southwest of Quincy, Ill., on the Wabash and the Chicago, Burlington and Quincy railroads. The surrounding country is a fertile section and has deposits of bituminous coal. Among the noteworthy buildings are the county courthouse, the high school, the county insane asylum, and a number of churches. It has manufactures of flour, brick, cigars, ironware, and machinery. The city has public waterworks and a sanitary sewer system. Population, 1900, 4,068.

**MADAGASCAR** (măd-ă-gās'kār), an island in the Indian Ocean, off the southeastern coast of Africa, separated from that continent by the Mozambique Channel. It ranks as one of the largest islands in the world. The length from northeast to southwest is 975 miles, the breadth at the widest point is 356 miles, and the area is 228,500 square miles. Much of the surface is elevated, the average height above sea level being about 3,500 feet, and the highest mountain ranges approximating 9,000 feet. The coast regions contain a number of large fertile tracts

and few large indentations, but have a number of good harbors. Among the principal rivers are the Mangoka and the Mangoro and the largest inlet is Antongil Bay. The highlands have a temperate climate, with an average of 72°, but some of the coast regions are hot. Excessive rains and extensive marshes render large areas unfavorable to European colonization. The wild animals consist chiefly of lemurs, crocodiles, lizards, chameleons, snakes, and many birds of fine song and plumage.

The productions of Madagascar are various, including principally farm produce, minerals, and fish. Among the products of the farms and gardens are manioc, cacao, sugar cane, rice, coffee, gum copal, vanilla, and many kinds of tropical fruits. Other products include India rubber, lumber, cattle, hides, silk, and sweet potatoes. The forests are abundant and yield many valuable woods, including numerous species of palms, and occur most extensively in a circle around the entire island and some distance from the coast. Among the minerals are iron, copper, lignite, galena, gold, graphite, sulphur, and various building stone. The chief manufactures include jewelry, carpets, silk goods, cloth, straw work, and lumber products. Roads and wheeled vehicles are being introduced rapidly. A line of railway has been constructed some distance from Antananarivo. At present the total lines of steam railroads aggregate 312 miles. A cable connects the island with Mozambique. Commercial relations are sustained with France, the United States, Germany, England, and other European countries. The principal imports are cotton and woolen goods, ironware, spirituous liquors, tinware, and tobacco.

The natives speak a Malayan language and belong to the Malayo-Polynesian class of people. They include a number of tribes, of which the Hovas are the most powerful, and the several classes are graded differently in civilization and religion. Mission, agricultural, public and normal schools are maintained by the government. Most of the architecture is of frame timber and bamboo, though rapid progress is being made in manual arts, especially in carpentry, weaving, and iron work. The religion is fetichism. Infanticide and polygamy are still practiced to some extent, but superstition is fast giving way to the influence exerted by Christian teachers and missionaries. About 50,000 natives are Roman Catholics and 475,000 are Protestants.

France has laid claim to Madagascar since 1642, but little was done until recent years to establish the claim and develop the natural resources. The earliest information of this island was published by Marco Polo in the 13th cen-



ture and the Portuguese cruised off its coast in 1506, publishing an account of it in which the name Saint Lorenzo was applied to the island. Radama I. was recognized as the reigning sovereign of the Hova tribe in 1810. He encouraged missionary work and authorized a translation of the Bible into the Malagasy language. At his death, in 1828, his queen, Ranavalona, became ruling sovereign. She resisted the extension of French influence and refused the Christians free access and communication. Her son, Radama II., succeeded to the throne in 1861. He not only admitted missionaries, but encouraged improvements and emancipated the slaves. His liberality caused much dissatisfaction among the natives and was the occasion of his assassination by a native in 1863, when Queen Ranavalona II. ascended the throne. Soon after a war broke out against France, but it terminated in the French being recognized as the rulers of the island and the establishment of a governor general at Diego-Suarez. The queen was formally deposed in 1897 and exiled to Algeria. Antananarivo is the capital. Other trade centers include Mojanga, Tamatave, Antombaka, and Fort Dauphin. Population, 1906, 2,651,762.

**MADDER** (măd'dēr), a family of plants, represented by about 4,500 species in the trop-

black. Many of the species yield coloring matter and products useful in medicine. The *common madder* of Europe is grown in many parts of the world for its roots, which yield a red dye, including a shade known as *turkey red*. Several species in South America belong to the trees that yield Peruvian bark, from which quinine is extracted. The coffee tree, though native to Abyssinia, is grown extensively in tropical countries. A small tree of Brazil belonging to this family yields the emetic drug *ipecacuanha*. The species common to the United States include the *bluets*, *bedstraw* and *buttonbush*. Though alizarin was formerly obtained chiefly from madder, this coloring matter is now produced artificially from anthracene. It produces the colors known as Turkish-reds.

**MADEIRA** (mă-dē'rà), a large river of South America, the most important tributary of the Amazon. It is formed at the boundary line between Bolivia and Brazil by the confluence of the Guaporé and Mamoré rivers, and after a course of 935 miles joins the Amazon about 98 miles below Manaus. It has a basin of nearly 500,000 square miles, and its total length to the source of the Mamoré is 2,210 miles. At a distance of 715 miles above its mouth are noted falls, the Falls of São Antonio, and above that navigation is impossible, the series of cataracts extending about 225 miles. The Madeira valley and the valleys of its tributaries are exceedingly fertile. They contain vast forests and the most productive rubber regions in the world. The country is being rapidly developed under governmental encouragement. A railroad has been projected around the rapids.

**MADEIRA**, a group of islands situated about 350 miles northwest of Africa, nearly due west of Morocco. The largest island, Madeira, is named after the group. It has a length of 35 miles, a breadth of from nine to fifteen miles, and an area of 300 square miles. The area of the entire group is 315 square miles. The surface is diversified by mountain ranges, the culminating peak of which has a height of 6,010 feet. Many small islands are situated adjacent to Madeira, the most important of which are Porto Santo and Deserta Grande. The productions are principally live stock, cereals, wine, sugar, and tropical fruits. It is noted for the excellence and abundance of its vines, which bear successively for many years. The island group belongs to Portugal, and has been in possession of the Portuguese since 1431, when it was colonized by them. It has some remains of Roman occupation, including ruins of several fortifications. The inhabitants consist principally of Negroes, Portuguese, and



MADDER.

ical and warmer temperate regions of both hemispheres. They include many herbs, shrubs, and trees, most of which are tropical. The leaves are opposite or whorled, the flowers are greenish-yellow, and the fruit is dark brown or



Moors. Funchal is the commercial center and capital. Population, 1906, 152,847.

**MADISON** (măd'ĩ-sŭn), a city of Indiana, county seat of Jefferson County, on the Ohio River, fifty miles northeast of Louisville, Ky. It is on the Pittsburg, Cincinnati, Chicago and Saint Louis Railroad and has regular steamboat communication. The surrounding country is agricultural and dairying. Among the manufactures are furniture, cotton and woolen goods, engines, steamboats, boilers, and machinery. It has a public library, the Saint Gabriel's Academy, and many fine schools and churches. Waterworks, sewerage, pavements, and electric street railways are among the improvements. It is the seat of a large trade in merchandise. Madison was incorporated in 1824. Population, 1900, 7,835; in 1910, 6,934.

**MADISON**, the capital of Wisconsin, county seat of Dane County, 83 miles west of Milwaukee, on the Illinois Central, the Chicago and Northwestern, and the Chicago, Milwaukee and Saint Paul railroads. It has a beautiful situation between lakes Menona and Mendota, which have been improved by parks and hotels and form a popular summer resort. It is improved by an electric street railway system, public lighting, pavements, waterworks, and sanitary sewerage. Among the principal buildings are the State capitol, the United States post office, the soldiers' orphans' home, the State lunatic asylum, the Carnegie public library, the public high school, and the University of Wisconsin. The State capitol is a fine structure, erected at a cost of about \$5,000,000, and near it is the library and museum building of the Wisconsin Historical Society. This association has a reference library of 250,000 volumes. Other learned societies include the Wisconsin Academy of Sciences, Arts, and Letters and the Wisconsin Geological and Natural History Survey. Madison is noted for its large Chautauqua assembly meetings.

Madison is important as an industrial and wholesaling center. The chief manufactures include flour, machinery, ironware, furniture, wagons and carriages, boots and shoes, books and stationary, and electrical appliances. It was selected as the site of the State capital in 1836, when Wisconsin was organized as a Territory. Two years later it was named after President Madison, since which time it has been the seat of government and was incorporated in 1856. Population, 1905, 24,301; in 1910, 25,531.

**MADONNA** (mă-dŏn'nà), the Italian equivalent for madam, but now applied specially to the Virgin Mary, and in the latter sense used as the English term Our Lady. In 431 the Council

of Ephesus declared that the Virgin Mary is the Mother of God, and since that time the title has come to be the name of a great number of pictures in which the Virgin forms the sole or prominent object. These include principally Raphael's "Madonna di Ansidai," Leonardo da Vinci's "Madonna of the Rocks," Raphael's "Sistine Madonna," Holbein's "Madonna of Burgomaster Meyer," Rubens' "Madonna of the Innocents," Perugino's "Enthroned Madonna and Child," Angelo's "Madonna of Burges," Lochner's "Virgin in the Arbor of Roses," Raphael's "Madonna of the Canopy," Correggio's "Madonna with Saint Francis," Jan van Eyck's "Lucca Madonna," and Murillo's "Madonna."

**MADRAS** (mă-drăs'), a seaport city of India, capital of the presidency of Madras, on the Coromandel Coast of the Bay of Bengal. Madras, the presidency, has an area of 141,726 square miles and a population of 39,826,450. The city has extensive canal and railway connections, is the center of a vast interior and foreign trade, and contains a well-equipped garrison. Its harbor is not naturally commodious, but has been improved materially by piers, and a splendid lighthouse towers to a height of 125 feet and may be seen a distance of fifteen miles. The manufactures are numerous, but they did not become particularly noteworthy until within comparatively recent times. They consist chiefly of clothing, machinery, earthenware, soap, flour, and canned fish. The principal buildings include the government house, the Scotch Church of Saint Andrew, the Saint George's Cathedral, the Madras Polytechnic Institution, and a large number of Hindu and Mohammedan temples. The English founded Madras in 1639, after obtaining a grant of land from a native prince. It has been affected materially by hurricanes that sweep from the sea over the lower parts of the site during the monsoon period, from May to October. The population consists mostly of Hindus, and about 50,000 Mohammedans and 4,250 Europeans. Brahmanism is the religion of a majority of the people. Population, 1906, 522,972.

**MADRID** (mă-dríd'), the capital of Spain, in the province of Madrid, on the Manzanares River, a tributary of the Tagus. It has a fine site on a plateau 2,450 feet above sea level, in the geographical center of Spain. The city is connected with the chief cities of Spain and Portugal by railroads and has important commercial and manufacturing enterprises. The extremes in temperature make it quite unhealthy, the rate of mortality being exceedingly large. It has important public institutions, among them



many excellent churches, hospitals, libraries, royal academies, public schools, and a splendid university. The royal palace is built of granite. It is a fine structure in the form of a square, 470 feet on each side and 100 feet in height. Its armory is counted among the finest in Europe. The municipal facilities are modern, including stone and asphalt pavements, public lighting and waterworks, and a street railway system. Philip V. founded the national library, which at present contains 600,000 volumes. The university has extended courses of study and an attendance of 6,100 students. The bullfights held annually at the Plaza de Toros, which has a seating capacity for 13,000 spectators, attract vast audiences, spectators coming from many countries of Southern Europe. Other places of amusement and interest are its public parks, promenades, and several museums, including the Royal Museum of Painting and Sculpture.

Madrid was a small fortified town in the 10th century, when it was known as Majoritum. Alfonso VI. captured it from the Moors in 1083. It was made the permanent capital of Spain in 1561, after which it was greatly improved by grading and the construction of government buildings. In 1808 it was the center of the rebellion against the French under Murat. Population, 1906, 542,385.

**MADURA** (mä-dōō'rà), a city of India, capital of a district in the province of Madras, 275 miles southwest of Madras. The streets are regularly platted and improved with substantial paving. It has several large market places and a large trade. Among the chief buildings are many Hindu temples, the government houses, and a palace built by Tirumulla Nayak. A number of Christian missions and two colleges are located here. The manufactures include cigars, cotton and woolen goods, clothing, and machinery. It has electric railways, waterworks, and railway transportation facilities. Population, 1906, 108,206.

**MADURA**, an island in the East Indies, separated from the northeastern coast of Java by a narrow strait. The area is 1,700 square miles. Much of the surface is mountainous and the soil is not very fertile. Salt, petroleum, cattle, maize, tobacco, and fruits are the chief products. It is a possession of the Netherlands and is governed with a number of other islands, the entire territory having an area of 2,060 square miles. Pamekasan is the seat of government. Population, 1906, 1,638,204.

**MAELSTROM** (mäl'strüm), or **Malström**, a celebrated whirlpool near Moskenäs, one of the Lofoten Islands, off the northwestern coast of Norway. Many legends have been published

of large vessels being sunk in the deep, but most of them are fabulous. It is dangerous in winter, when it rages so furiously that its roaring sound is heard many miles. This is also the case when a strong wind blows from the northwest. At those times it is capable of engulfing small vessels which approach it, but ordinarily it can be traversed without danger. The Maelstrom is due to the currents of the Great West Fiord.

**MAESTRICH** (mä's'trikt), or **Maastricht**, a city of Holland, capital of the province of Limburg, on the Maas River, eighteen miles northwest of Aix-la-Chapelle, Germany. It is connected by important railroads, giving it commercial advantages, and was once a fortress of great strength, but has been reduced to a garrison. It has a fine statue of Charlemagne. A fine stone bridge crosses the river and connects the city with Wijk. The manufactures, educational institutions, and jobbing trade are important. It has pavements, public parks, and electric street railways. The Spaniards captured it in 1579. Population, 1906, 36,474.

**MAFEKING** (mä-fâ-kīng'), a town of South Africa, in the Bechuanaland Protectorate, near the border of the Transvaal Colony, 95 miles northeast of Vryburg. It has railroad facilities and a growing trade in produce and merchandise. The place became noted in 1899, during the Anglo-Boer War, when Colonel Baden-Powell was besieged here by a force of Boers under General Cronje. The Boers had planned to capture the British force at this place, but Colonel Mahon came to the relief with a British column.

**MAFIA** (mä'fê-à), a secret society of Sicily, whose aim is to substitute its own authority for that of the law. It exercises a powerful influence in the social and political affairs in the island and the southern part of Italy, and branches have been founded by Italian immigrants in New York, New Orleans, and other cities of the United States. Among the objects are to control elections, obtain employment for the members, and protect those belonging to the society against the officers of the law. In 1890 the branch society in New Orleans became involved in considerable trouble, since it was thought to be the cause of the death of the chief of police. Eleven of the members were put in jail, but they were taken out and murdered by a mob. This involved the United States in diplomatic complications with the government of Italy, but the matter was settled by a payment of indemnity by the United States to the relatives of the victims.

**MAGDALENA** (mäg-dà-lâ'nà), a river of



South America, rises in the southern part of Colombia. It flows nearly north and discharges into the Caribbean Sea by a delta below Barranquilla. The Cauca is its principal tributary, which rises about ten miles from the source of the Magdalena and joins it near 9° north latitude. Other streams flowing into it include the Bogotá and Sogamoso rivers. The Magdalena has a length of 975 miles and is navigable to Honda, 450 miles from its mouth. Above that point is a series of rapids. However, they have been paralleled by a line of railway, by which connection is afforded with the navigation in the upper course. The delta of the Magdalena includes 3,000 square miles.

**MAGDALEN ISLANDS** (măg'dă-lĕn), a group of islands in Canada, located near the center of the Gulf of Saint Lawrence, belonging to Quebec. They are about fifty miles northwest of Cape Breton Island. The surface is made up largely of rocky cliffs, but they contain considerable land suitable for agriculture. The inhabitants engage chiefly in the herring, cod, and seal fisheries. In winter the sea freezes to the extent that communication with the outer world is shut off for four months, except by telegraph. Population, 1906, 5,120.

**MAGDEBURG** (măg'dĕ-böörg), a city of Germany, capital of Prussian Saxony, noted as a strong fortress. It is located on the Elbe River, 75 miles southwest of Berlin, with which it is connected by railways. The river navigation and canal improvements, together with its numerous railroads, make Magdeburg an important jobbing center. It has many educational institutions, including a fine public school system, two normal schools, two gymnasia, institutions for the dumb, blind, and deaf, and several industrial training schools. The Cathedral of Saints Maurice and Catharine, founded in 1208, is one of the most noted ecclesiastical buildings in Europe. It contains the graves of many noted sovereigns, among them Emperor Otho, the founder of the city. Other noteworthy buildings include the Church of Our Lady, the Church of Saint Paul, the public library, the city hall and courthouse, the commercial exchange, and the public museum. It has manufactures of gloves, leather, vinegar, cotton and woolen goods, silk fabrics, ribbons, machinery, pottery, and musical instruments. Wallenstein laid siege to Magdeburg for seven months in the Thirty Years' War, but in 1631 it was captured by Tilly, who not only sacked it, but caused the death of 30,000 of its people. In 1808 it became a part of France, but was returned to Prussia in 1814 by the Treaty of Paris. Most of the inhabitants are Protestants. Population, 1905, 240,633.

**MAGELLAN, Strait of**, the channel which separates the island of Tierra del Fuego from the continent of South America. It is from two to seventy miles wide and about 350 miles long, and forms a connection between the waters of the South Pacific and the South Atlantic. Its navigation is endangered by numerous islands. The name was applied in honor of Ferdinand Magellan, who discovered it and sailed through it in 1520. On its shores are thousands of aquatic birds, including ducks, geese, gulls, penguins, cormorants, and oyster catchers.

**MAGENTA** (mă-jĕn'tă), a town of Italy, in the province of Milan, on a railway line about seventeen miles west of Milan. It is noted as the scene of a celebrated battle on June 4, 1859, between the Austrians and French. The latter were commanded by Marshal MacMahon, who defeated the Austrians under command of Count Gynlai. It is estimated that the French lost 5,000 men and the Austrians about 10,000. MacMahon was soon after created Duke of Magenta.

**MAGGIORE** (măd-jō'ră), a lake on the boundary between Switzerland and Italy, but situated mostly in the latter country. It has a length of forty miles. The average breadth is about four miles and the greatest depth is nearly 1,500 feet. It is thought that its origin is from volcanic action. Fine vineyards and fertile fields surround the lake, but adjacent to its northwestern coast are mountains of solid granite. In its vicinity are several prosperous towns, including Magadino and Lacarno, in Switzerland, and Cannobio, Luino, Bavino, and Palanza, in Italy.

**MAGI** (mă'jī), a name first mentioned by the prophet Jeremiah, in connection with an officer of Nebuchadnezzar, and afterward applied by Herodotus to one of the six Median tribes. Subsequently the Magi became an hereditary priestly caste of the Medes and Persians, who were regarded the servants of God and the preservers and propagators of sacred rites and traditions. This priestly caste had much influence in the affairs of individuals and of the state, and, besides conducting religious worship, had charge of the educating of princes and nobles. In the time of Zoroaster the Magi were reformed and disciplined, but later they declined in influence until they developed into magicians and fortune tellers. The name magi is given to the three wise men who came from the East to worship the infant Jesus.

**MAGIC**, the alleged art of exercising supernatural powers by calling into activity the spirits of departed beings, or employing enchantment, sorcery, and witchcraft. Superstition and belief



in magical arts date from remote history, and, after passing through the various centuries, it is still adhered to among the unlearned Gypsies and other classes, who reap a rich harvest by acting upon the credulity of superstitious people. *Natural magic* is the name applied to the art of utilizing natural causes to produce effects apparently supernatural.

**MAGIC LANTERN**, or **Stereopticon**, an instrument invented by a German Jesuit, Athanasius Kircher, in 1645. It consists of a case or box in which the scattered rays of some powerful light are confined and made to pass through a tube. A concave reflector put opposite the tube, back of the lamp, aids in condensing the light and directing it through the tube, in which powerful lenses are arranged to condense the diverging rays upon paintings on glass, which slide in a sort of stage, and another object glass throws the image of the highly illuminated object upon a white wall or screen, the focus being adjusted by sliding this lens nearer to or farther from the object. The best effects are secured in a room which is highly darkened, but the size and beauty of the pictures cast upon the screen depend upon the distance of the object from the lenses, the position and character of the lenses, and the power of the light. A brilliant picture twenty feet in diameter may be secured from a slide three inches in diameter under a powerful light. To appear erect upon the screen, the picture slides must be inserted into the tube in an inverted position. Recently vast improvements have been made in the magic lantern by discarding the oil lamp and substituting for it oxy-hydrogen and electric lights. A very beautiful effect is secured by what is known as *dissolving views*. It involves having two reflectors so placed that the images of two pictures are thrown at the same time on the screen, causing one to fade or melt into the other. See **Kinetscope**.

**MAGNA CHARTA** (mäg'nä kär'tä), or **Great Charter**, an important document in British history, forming a part of the Constitution of Great Britain, and regarded as a basic guarantee of liberty. It was extorted by the people of England from King John at Runnymede, June 15, 1215. This document was brought about by the tyranny and oppression practiced by the Norman kings under the feudal system, on account of which the barons rose up with the hearty support of the people in their demand for reformatory measures. Among the reforms guaranteed were included the protection of property, liberty, and life against arbitrary kings. The barons were accorded certain privileges that tended to secure the proper enforcement of

civil rights and social freedom. Other measures embodied in the Magna Charta include the regulations of the business of traders, those in regard to the church, and those in relation to freemen generally, especially the protection guaranteed under a jury system. Several successors of King John confirmed the Great Charter and Edward I. embodied it in the statutes. The essential principles have been confirmed by many decisions of the courts and acts of Parliament.

**MAGNESIA** (mäg-nē'zhī-ä), an earthy powder. It is a tasteless white powder and possesses alkaline properties. Magnesia is used in medicine as a laxative and, administered in small doses, it acts as an antacid. Pure magnesia is obtained by exposing hydrated carbonate to a red heat. Treated in this way, it forms the pure commercial article known as calcined magnesia.

**MAGNESIUM** (mäg-nē'zhī-üm), a mineral of wide distribution, constituting a silver-white metallic element. It may be obtained by reducing magnesium chloride with metallic sodium, or by the electrolysis of fused magnesium chloride. At an ordinary temperature it is more brittle than silver, but becomes malleable when the temperature is increased, and may be formed into wire or ribbon. Its silver-white color is preserved in dry air, but when exposed to moisture it becomes tarnished. When heated in the flame of a candle, or in oxygen gas, it burns with a dazzling light. It is rich in chemical, actinic rays, a property that has led to its use in photography, but more recently the electric light has been utilized in its stead. In an atmosphere of carbonic acid gas it decomposes the gas in burning, constitutes magnesian oxide, and forms the carbon into a powder. Calcined magnesia is obtained by reducing magnesium to ashes. Magnesium deposits occur extensively in various metals, in serpentine rock, meerschaum, soapstone, asbestos, and other minerals.

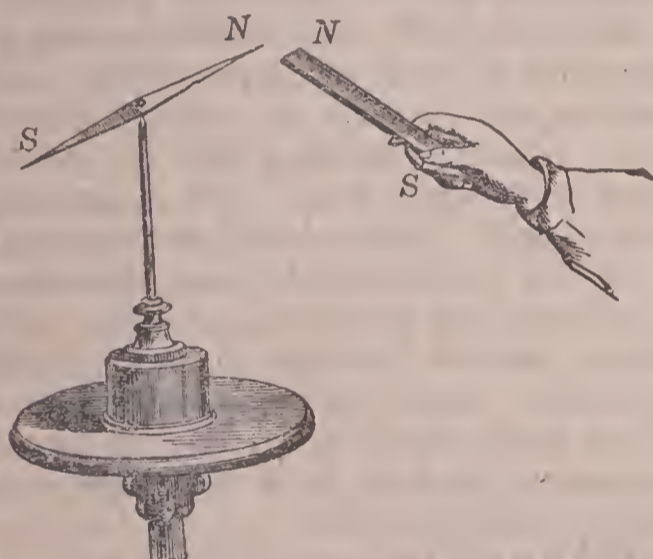
**MAGNET** (mäg'nēt). See **Magnetism**.

**MAGNETISM** (mäg'nēt-iz'm), the science that treats of the laws and conditions of magnetic force. The name was coined from Magnesia, a town in Asia Minor, near which a black mineral known as loadstone is found embedded with iron ore in volcanic rock. This mineral is widely distributed, being found in New York, New Jersey, Siberia, and Sweden, and is generally termed *magnetite*. It has the peculiar property of not remaining at rest when suspended, except when certain points are directed north and south. This quality caused the ancients to use it to direct ships at sea, for which purpose the mariner's compass displaced



it. A piece of loadstone is called a *natural magnet* and differs from an *artificial magnet*, which may be made of a bar of soft iron or steel by imparting to it the peculiar magnetic property by friction from other magnets, or by the action of an electric spark. Artificial magnets retain their magnetic properties for a short or long time, depending on the quality of the iron of which they are made. Pure soft iron remains a magnet only while the magnetizing action lasts, and one so made is called a *temporary magnet*, while hardened iron and steel retain their magnetic properties a long time, these metals being used to make *permanent magnets*. The best permanent magnets are made of hardened steel. They are called *bar magnets*, if straight, and *horseshoe magnets*, if they are U-shaped. The two ends of a horseshoe magnet are connected by a soft iron called the *armature*.

The cause of magnetic force is unknown, but is generally believed to be due to molecular action. It is thought that every magnetizable



MAGNETIC NEEDLE.

*N N*, North Poles. *S S*, South Poles.

body, whether the body is magnetized or not, constitutes a permanent magnet, but before it is magnetized the poles of the molecules point in every direction, thus neutralizing one another. When increasing magnetization is produced by friction or electric induction, the action of the molecules becomes more and more nearly parallel, and a closed electric current flowing around each molecule results. Since both natural and artificial magnets, when freely suspended on a pivot, rest with their length in a direction north and south, they are used in constructing the compass. The attraction is greatest at the extremities, which are designated respectively the *north* and *south poles*, or simply the *poles*, and decreases toward the middle. The north-seeking pole is distinguished as the positive and the south-seeking as the negative, marked  $+$  and  $-$  respectively. The similar

poles of magnets repel and the dissimilar attract each other, the intensity of repulsion and attraction varying inversely as the square of the distance. All substances are attracted or repelled, though in most cases the action is very feeble. Those attracted are called *paramagnetic* and those repelled are termed *diamagnetic* substances, though the latter class is most numerous. To illustrate, iron is attracted by both poles of a magnet, while bismuth is repelled by both. The *magnetic field* is the space surrounding a magnet in which attraction or repulsion takes place, and corresponds to the electric field surrounding an electrified body. Magnets depend for their strength upon size, material, and construction, varying greatly with the modification of each. One of the largest magnets in the world is at the Stevens Institute of Technology, in New York, which weighs 1,600 pounds, and has a lifting capacity of about forty tons, exceeding its own weight about fifty times.

The circumstance that the poles of a magnet point to the north and south is accounted for by the fact that the earth is a great magnet. Its magnetic poles do not correspond with its geographical poles, but they are known to attract the poles of a magnet. The *magnetic needle* of a compass, therefore, does not point to the true geographical north in all parts of the earth, but slightly east or west of it. This deviation from the true north is called *declination*, or *variation*, and differs in different parts of the earth. Sir J. C. Ross, in 1831, discovered the magnetic north pole in latitude  $70^{\circ} 5'$  north and longitude  $90^{\circ} 46'$  west, which is about 1,000 miles from the geographical north pole. The magnetic south pole has not yet been discovered, but the magnetic equator has been partially traced, and is known to cross the terrestrial equator at several places, though never deviating more than  $12^{\circ}$  from it. The earth appears to owe its magnetism to the electricity circulating in the atmosphere. This atmospheric electricity is probably produced by the sun's rays heating unequally different portions of the earth's surface. In many places the lines of force of the earth's magnetic field are inclined to the earth's surface. Where this is the case one of the poles of a magnetic needle is inclined to the earth, which is called the *inclination*, or *dipping*, of the needle. The north pole is inclined in the Northern Hemisphere and the south pole in the Southern. At the magnetic poles the needle dips vertically downward, and at the magnetic equator it assumes a horizontal position.

**MAGNETITE** (măg'nēt-īt), an ore of iron, so called from its magnetic properties. In some cases it exhibits polarity, when it is known as



*loadstone*, or *lodestone*. It has a semimetallic lustre, is iron-black in color, and occurs both massive and crystalline. This product is mined in many parts of the world and is important as a commercial source of iron. Large deposits of it are found in Sweden, Siberia, Canada, and many parts of the United States, especially in the Adirondacks, in the iron range of Minnesota, and in various parts of Colorado, California, and Missouri.

**MAGNETO-ELECTRIC MACHINE.** See *Electric Machine*; *Dynamo*; *Electricity*, etc.

**MAGNIFICAT** (măg-nîf'î-kăt), the song of thanksgiving uttered by the Virgin Mary, as recorded in Luke i, 46-55. It is named from the first word in the Latin version *Magnificat anima mea, Dominum*, meaning "My soul magnifies the Lord." It was incorporated into the service of vespers, and is usually sung or said after the first lesson at evening prayer.

**MAGNOLIA** (măg-nō'li-ă), a genus of ornamental shrubs and trees, native to North America, China, India, Japan, and other portions of Europe and Asia. Many of the species are



MAGNOLIA.

noted for their great beauty, handsome flowers, and evergreen or deciduous leaves. The flowers of some are ten inches in diameter, but most bear smaller flowers. They are white or purple-white in color and are noted for their fragrance. The wood is of little value on account of its being soft and spongy, but some of the trees attain a large size and yield woods utilized in manufacturing ornamental products and baskets. Some species have roots of which the bark is serviceable in preparing a useful tonic. The *Virginian magnolia*, or *Magnolia Grandiflora*, has properties that are utilized in making medicine for treating rheumatic complaints, while the *Magnolia Umbrella* yields a tonic. The largest

American species is common to the region from North Carolina to the Gulf. It attains to the height of seventy feet, has evergreen laurellike leaves, and bears a whitish flower. The *Magnolia Yulan* has been cultivated nearly 2,000 years in China, where it thrives at high elevations and serves as a favorite ornamental tree.

**MAGPIE** (măg'pî), the name of a beautiful bird classed with the crow family, but differing from the common crow in having a smaller body, short wings, a long tail, and various colors. Several species of magpies have been described, two of which are native to America, and abound from the northern portion of the continent to the Gulf of California. The common magpie is from fourteen to eighteen inches in length, has black and white plumage with markings of purple and green, and is shy, but cunning in obtaining food and avoiding enemies. It subsists principally on animal food and preys upon the eggs and young of other birds, for which purpose it robs their nests promiscuously. The nests are built substantially, some species constructing a dome of interwoven sticks for protection, and the eggs are usually from six to nine in number, bluish-green in color, and blotched with ashen hues. The magpie is generally met with in pairs, issues a chattering note, and may be domesticated, even showing capability of learning to articulate some words by imitation, and is inclined to hide articles of bright color. Most species are shy in a native state, but in populated districts they become familiar and build their nests under the eaves of habitations and churches.

**MĀHĀBĀRATA** (mā-hā-bā'rā-tā), a celebrated epic in the literature of India, comprising a history of the war waged in the ancient kingdom of Bharata. It is sixteen times as long as the *Iliad* of Homer, and is usually divided into eighteen books. The principal part of the work treats of the contest between the Kauravas and the Pandavas. It recites in an interesting manner how the ancient families of the Kauravas, owing to their conceit and wickedness, were overthrown by the Pandavas, who are treated as the heroes of the epic. The latter are lauded as faithful in their worship of the true god Krishna, the human incarnation of Vishnu. It is the opinion of most writers that the poem originated through a collection of materials produced in different periods, and the Hindus attribute it to Vyâsa, who is spoken of as the *arranger*.

**MAHANADI** (mā-hā-nūd'ê), or *Mahanud-dy*, a river in the southern part of India, rises in the Central Provinces, and flows into the Bay of Bengal by a large delta. It receives the



inflow from several tributaries and has a total length of 520 miles. During the rainy seasons it carries a large volume of water, the surplus being utilized to irrigate a large scope of country. In the dry season it becomes very low.

**MAHANNOY CITY** (mä-hä-noi'), a borough of Schuylkill County, Pennsylvania, in the anthracite coal region, ten miles north of Pottsville. It is on the Lehigh Valley and the Philadelphia and Reading railroads. Among the chief buildings are the public library, the high school, and several fine churches. It has extensive iron works and is important as a mining and shipping center for anthracite coal. The vicinity was first settled in 1859 and the place was chartered as a borough in 1863. Population, 1900, 13,504; in 1910, 15,936.

**MAHDI** (mä'dë), the name given by the Mohammedans to the messiah that was promised by Mohammed, who is expected to appear and fill the world with righteousness by effecting the universal adoption of Mohammedanism. The appellation was applied particularly to a successor of Mohammed named Abu'l-Kasim, the twelfth Imam, who disappeared mysteriously in 879 A. D. It was generally believed that he had gone to an unknown abode for the purpose of preparing a place for the righteous, and that he would reappear on the last day. Since then there have been many mahdis who claimed power and authority, the most prominent of recent times being Mohammed Ahmed. He was born in Dongola, Nubia, in 1842, and died of smallpox June 25, 1885. This mahdi took a course in Mohammedan theology at Khartoum and Berber, and retired to the island of Aba in the White Nile at the age of 25 years, where he lived in studious solitude until 1882, when he proclaimed himself the messiah. The loose government of Egypt made it possible for him to raise a considerable army. He declared a Holy War ( *Jihad* ) and seized Kordofan in 1883, which he made his capital. In November of the same year he defeated an Egyptian army of 10,000 under Hicks Pasha, and in 1885 conquered Khartoum, where General Gordon was killed.

**MAHOGANY** (mä-hög'ä-nÿ), a large tree of the order Meliaceae, common to tropical America, noted for its close-grained and hard wood. The tree reaches maturity in a period of 200 years. It attains a height of fifty to ninety feet, with a diameter of from five to twelve feet, and has lofty and spreading branches. Its flowers are fragrant and the fruit is the size of a turkey's egg. The wood is one of the most valuable, being hard, reddish-brown, compact, and capable of taking a fine polish. It is useful in the manufacture of furniture, musical instru-

ments, and for veneering. Sir Walter Raleigh brought the first specimens of mahogany wood to Europe, but it was not used extensively in the industries until about 1725. Mexico, Honduras, and the West Indies are the countries where mahogany is produced most extensively.



MAHOGANY.

*a*, flower; *b*, partly opened fruit.

The term mahogany is often applied to any one of various trees yielding wood which resembles the true mahogany, such as the *rohuna* tree of India and the *mountain mahogany* of the western part of the United States.

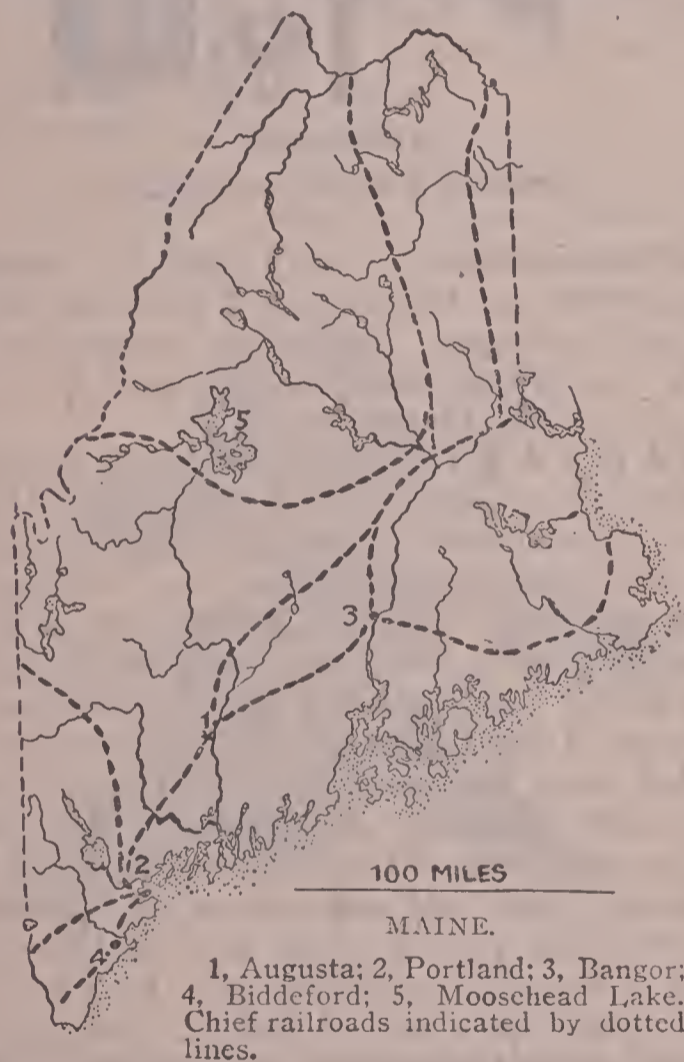
**MAHRATTAS** (mä-rät'táz), a people of British India, who are supporters of the Hindu caste and religious systems, but are thought to be of Persian descent. The first mention of them in history occurred in the 17th century, when they came in contact with the Mongols, and in 1761 fought a series of battles against incursions of the Afghans. Their possessions extended along the western side of the peninsula. They were reduced to dependence by the British in the early part of the 19th century. The last Mahratta ruler held out against the Europeans by employing French troops and discipline, but he was defeated in 1843 by the British. The three Mahratta states of Indore, Gwalior, and Baroda did not participate in the Sepoy Mutiny of 1857 and are now governed respectively by officials who bear the titles of Holkar, Sindia, and Gaekwar. These people at present do not support caste laws with much strenuousness, but are noted as Brahma worshipers of considerable earnestness.

**MAIDENHAIR**, the name of a class of small ferns, including several species that are distributed in both hemispheres. They are delicate and graceful plants and thrive best on moist rocks and in shady places. Some of the species are cultivated as house ferns. The common maidenhair has pedate leaves and sweet rootstocks.



**MAIN**, a river of south central Germany, rises in the Fichtelgebirge. It has a general course toward the west, and joins the Rhine near Mentz. The Main is 306 miles long, is navigable about 200 miles, and affords connections with the Danube by Ludwig's Canal. Its valley is highly fertile, contains several prosperous cities, and is noted for the culture of cereals and the vine. Among the chief cities on its banks are Frankfort, Würzburg, Schweinfurt, and Offenbach.

**MAINE**, the most northeasterly state of the United States, one of the New England group, popularly called the *Pine Tree State*. It is bounded on the north and east by British America, south by the Atlantic, and west by New Hampshire and Quebec. The length from north



to south is 302 miles; breadth, 185 miles; and area, 33,040 square miles. The Atlantic coast has a length of 245 miles and is indented by numerous inlets, including Casco, Penobscot, Bluehill, Frenchman, Machias, and Passamaquoddy Bays. A large number of small islands lie off the coast.

**DESCRIPTION.** Much of the surface is moderately hilly, the general slope being toward the south. Through the center and along the western boundary are groups of mountains, including chiefly ranges of the White Mountains, which extend into the State from New Hampshire. The highest elevation is Mount Katahdin,

located in the north central part, and has an elevation of 5,250 feet. Other elevations of prominence are Saddleback Mountain, 4,000 feet, and Mount Baker, 3,390 feet. The coast is fringed and has many natural harbors, but these have the disadvantage of exceedingly high tides, which range from eight to fourteen feet. The islands and headlands of the coast are rocky.

Maine has many inland lakes. Fully 600 are of considerable size and the total lake surface is about 2,350 square miles. Moosehead Lake, the largest inland body of water, has a surface of 120 square miles and is the source of the Kennebec River. Rangeley Lake, the source of the Androscoggin River, covers 90 square miles. Other lakes of large size include Chamberlin, Eagle, Milinokett, Grand, Sebec, Richardson, and Sebago lakes. Many of the streams afford excellent water power. All of the larger rivers flow southward into the Atlantic. A part of the northern boundary is formed by the Saint John and on the eastern border flows the Saint Croix, which separates the lower part of Maine from New Brunswick. The Penobscot River, which rises near the western border, drains the central part of the State and flows into Penobscot Bay. The Allegash and the Aroostook are tributaries of the Saint John. Other rivers include the Kennebec, Androscoggin, Saco, Salmon Falls, Union, and Machias. Nearly all of the rivers are rapid and have many cataracts hence are not valuable for commerce. However, the Kennebec is navigable to Augusta, 26 miles, and the Penobscot to Bangor, 25 miles.

The climate is temperate and characterized in winter by severe cold and in summer by extremely warm weather. In January the mean temperature is 20° and in July it is 68°. The extremes of summer are from 90° to 98° and in winter from 20° to 30° below zero. Sudden and violent changes in the weather are quite frequent, owing to the winds blowing alternately from the north and south. Snow falls to considerable depths in the winter, but the excellent drainage renders the State one of the most healthful, malaria being of very rare occurrence. The rainfall for the whole State is forty inches and it is quite evenly distributed throughout the year.

**MINING.** The State is rich in fine building and monument stone. The coast and the region extending many miles inland are noted for the vast deposits of granite, which occur in great veins or in eruptive masses. Limestone is quarried extensively and much of the product is utilized in the manufacture of lime. Considerable profit is obtained from the output of slate, and many localities have sand well fitted for the



manufacture of a superior quality of glass. Small quantities of iron, gold, silver, tin, copper, and manganese are obtained. Large and beautiful crystals of tourmalin are found in Oxford County, and mineral springs yield waters that are of high commercial importance.

**FISHERIES AND FORESTS.** The fisheries take high rank among those of New England and a large number of people are engaged in the fishing industry. Lobster fishing has a high place, being more important in the State than in all the remainder of New England, and clam fishing is next in importance. The salmon fisheries are the largest on the Atlantic coast. Other catches include the herring, cod, halibut, and menhaden. Much of the product is cured and canned.

The State has forests estimated at 23,700 square miles, about 78 per cent. of the total land area, and the value of its timber products is \$15,000,000 annually. Although the primeval forests have been cut over, a large output of lumber is obtained from the second growth. The most valuable timber lands are in the basin of the Saint John River, but fine forests are available in the region drained by the Penobscot and the Androscoggin. Among the chief varieties are spruce, birch, poplar, fir, hemlock, and cedar.

**AGRICULTURE.** The rugged and broken surface renders much of the State unfit for cultivation, but many of the river valleys are very fertile. In the Aroostook valley, in the northeastern part of the State, is a large region of fertile farming land. Hay is the chief crop and is grown on a larger acreage than the aggregate of all the land devoted to the cultivation of cereals and vegetables. Among the products are oats, potatoes, buckwheat, corn, and barley, but the acreage devoted to each of these is not considerable. The raising of apples is an important and growing enterprise and the quality produced is of a high class. Sheep are represented by larger numbers than any other domestic animals, being due to the fact that much of the cut-over timber land yields suitable pasturage. Cattle are grown to some extent for the market, but principally for the dairy products, in which the State ranks next to Vermont in the New England group. Other domestic animals include horses, swine, mules, and poultry.

**MANUFACTURING.** Maine is particularly favored by having an abundance of water power. This factor, combined with its timber resources and large deposits of commercial stone, gives it considerable importance as a manufacturing State. Nearly twelve per cent. of the inhabi-

tants engage in this enterprise. Shipbuilding has long been an important industry, but it has declined somewhat with the increased use of steel for the construction of vessels. Bath has extensive shipyards and has produced many of the seagoing vessels made in the United States. The manufacture of cotton goods takes high rank and may be classed in importance with the industries of lumbering and paper making. Large returns are obtained from the canning and preserving of fish, from the manufacture of woolen goods, and from the products of foundries and machine shops. Other manufactures include flour, leather, furniture, clothing, slate shingles, monuments, lime, and earthenware.

**TRANSPORTATION AND COMMERCE.** The Atlantic coast, including the indentations, has a length of nearly 2,500 miles. At present there are in operation 2,150 miles of railways and 3,500 miles of electric lines. Though railroad transportation is extensive, the lines are confined chiefly to the southern and eastern parts of the State. They include the Maine Central, the Boston and Maine, the Canadian Pacific, and the Grand Trunk, the two last mentioned being transcontinental railways of Canada. Portland, on Casco Bay, is the principal railway center. Steamers ply regularly between the largest cities of Maine and the commercial centers of the United States and Canada. The exports greatly exceed the imports. The former consists largely of lumber, cotton goods, granite, and boots and shoes, while the imports embrace principally sugar, wool, coal, and food stuffs.

**EDUCATION.** The illiteracy is 5.1 per cent. of the population ten years of age or over, but among the native white inhabitants it is only 2.4 per cent. Much attention has been given to develop the educational interests from an early period. The town is the smallest unit for the management of the schools and the compulsory attendance period is from seven to fifteen years inclusive. High schools are maintained in all the towns and cities, all of which have well-articulated courses of study and prepare the students for higher work in the academies and colleges. Formerly much of the secondary instruction was given in private academies, but free academic instruction has been maintained in the towns since 1873. Towns have been permitted, since 1889, to contract with any academy or high school for the tuition of their students, hence such schools receive the same aid as those regularly maintained by public taxation. About 15,000 students attend the 215 high schools which receive aid from the State.

State normal schools are maintained at Castine, Farmington, and Gorham. Supplementary



instruction is given to teachers under the direction of the State superintendent, who is authorized to provide for a number of summer schools. The University of Maine is at Orono, in which the educational system terminates. Among the private and denominational institutions are Colby College at Waterville, Bowdoin College at Brunswick, Bates College at Lewiston, Westbrook Seminary at Deering, and Maine Wesleyan College at Kent's Hill. Portland has the school for the deaf and the Maine General Hospital, Bangor has an orphan asylum, and Bath has a military and naval orphans' asylum. The penitentiary is at Thomaston, the industrial school for girls is at Hallowell, and the industrial school for boys is near Portland. Augusta and Bangor have hospitals for the insane. A large number of the convicts are employed in industrial work, such as making furniture, harness, and brooms.

**GOVERNMENT.** The present constitution was adopted in 1819 and the State was admitted the next year. It vests the executive authority in a Governor, who is elected for a term of two years, a plurality vote being necessary to election. Other State officers include the treasurer and secretary of State, both elected by the people, and an adjutant general and superintendent of public instruction, who are appointed by the Governor and council. The Legislature is composed of a senate and house of representatives, the former having 31 and the latter 151 members. Meetings of the Legislature convene biennially on the first Wednesday in January. Eight judges compose the supreme court, and they serve under appointment by the Governor and council for a term of seven years. A superior court is maintained in Portland. Each county has a probate judge. The officials of towns have larger powers in local government in Maine than in most of the states, and in this respect it resembles the other states of the New England group.

**INHABITANTS.** The increase in population has not kept pace with the states of the northwest. At present the average is 24 persons to the square mile. Comparatively few of the people are of foreign birth and the foreign element is made up largely of Canadians and French. Augusta, on the Kennebec River, is the capital, and Portland is the largest city. Other cities include Lewiston, Bangor, Biddeford, Auburn, Bath, Rockland, Belfast, Westbrook, Calais, Gardiner, and Waterville. In 1900 the State had a population of 694,466. This included a colored population of 2,240, of which four were Japanese, 112 Chinese, 798 Indians, and 1,319 Negroes. Population, 1910, 742,371.

**HISTORY.** The Cabots visited the coast of Maine in 1497, being the first white men to explore that region after the discovery of America by Columbus. In 1524 Verrazano cruised along the coast and landed at several places, but the early attempts made by French, English, and Dutch to found settlements were unsuccessful. The first notable English colony was established in 1607 by George Popham near the mouth of the Kennebec River, where Capt. John Smith was located for a time, but it was abandoned the next year. Sir Ferdinando Gorges obtained grants to territory between the Piscataqua and Kennebec rivers, and that part of Maine passed to Massachusetts in 1652. The Duke of York came into possession of eastern Maine in 1664, which portion likewise was annexed to Massachusetts in 1691, while the whole of Maine remained a part of Massachusetts until 1820. On April 15, 1820, Maine was admitted into the Union as the twenty-third State, and the first constitution is still in operation. A dispute regarding the northeastern boundary was settled by the Ashburton Treaty in 1842, though its boundary with Massachusetts had already been settled in 1737. The Maine law prohibiting the manufacture and sale of spirituous liquors was passed in 1851, but was further strengthened in 1858. In both the Civil and the Spanish-American wars Maine furnished its proportionate share of men to support the government. It has considerable natural resources yet undeveloped, which are attracting the attention of both capitalists and laborers.

**MAINE, University of,** a coeducational institution of higher learning at Orono, Me. It was established in 1865 as the State College of Agriculture and Mechanic Arts, but was reorganized under its present name in 1897. The departments include those of agriculture, law, engineering, pharmacy, and arts and sciences. With it is affiliated the Maine Agricultural Experiment Station. It has a library of 25,000 volumes. The value of the college property is \$325,000. The faculty consists of 65 teachers and professors and the attendance is 550 students.

**MAINZ.** See **Mentz.**

**MAIZE.** See **Corn, Indian.**

**MAJESTY** (mäj'ēs-tÿ), a title of kings, queens and emperors. It is generally used with the possessive pronoun, as, his majesty, your majesty, or, in the plural, their majesties. The King of England is spoken to directly as your majesty, and letters are addressed "To the King's Most Excellent Majesty." Various appellations were made to divers sovereigns at different times. "Most Catholic Majesty" was



the former address applied to the King of Spain; "Apostolic Majesty," to the kings of Hungary; and "Most Christian Majesty," to the kings of France. "Imperial Royal Majesty" is a title now used in addressing the emperors of Germany and Austro-Hungary.

**MAJOLICA** (mă-jöl'ĩ-kă), a species of fine pottery manufactured extensively in Italy from the early part of the 15th century. It is thought to have been produced first on Majorca, an island called Majolica in the Italian. At first it was made of coarse material and was ornamented with a plumbiferous glaze, but later a more beautiful stanniferous glazing was invented, by which the pottery was rendered more durable and of a more enameledlike appearance. Later fine paintings of ruby and golden tints were applied, which have been remarkable in preserving their appearance and mold. Within recent years it has become possible to reproduce this ware with much success, and vases, tablets, friezes, and flower pots are now made of it.

**MAJOR** (mă'jēr), in military, the lowest in rank of the field officers, being classed below a lieutenant colonel and next above a captain. In the absence of the lieutenant colonel he discharges that officer's duty, his usual duties being to attend orders of superior officers and to have charge of exercises of the battalion or regiment.

**MAJORCA** (mă-jôr'kă), the largest island of the Balearic group, in the Mediterranean Sea, forming a part of the Spanish dominion. It has a length of 57 miles; breadth, 45 miles; area, 1,332 square miles. The soil is generally fertile and the coast line is irregular. At many places the shores are precipitous and lofty. Several railway lines are operated and others have been projected. The principal products include fish, fruits, cereals, silk, hemp, cattle, and a number of minerals. Palma is the chief railroad and commercial town. Population, 1906, 251,968.

**MAJORITY** (mă-jör'ĩ-tỹ), the term applied to more than half of a given number or group, and used to designate the excess by which one group of things exceeds another group. In elections it is employed to qualify the amount more than one-half of the votes cast for all the candidates who stand for the same office, and differs from a *plurality* in that the latter designates the number by which the votes cast for one candidate exceed those cast for another, but not constituting a majority. Thus, 75 is a majority of 21 over 54. On the other hand, no one of three candidates having respectively 25, 50 and 68 votes has a majority of all the votes cast, but the one who received 68 votes has a plurality over each of the other two. The term majority

is used to designate full age; the age at which, by the laws of any country, persons of sound mind are considered legally competent to manage their own affairs. In most countries the period of minority ceases and the age of majority begins at 21 years.

**MAKAW**, the name of a small tribe of Indians in the United States, who live upon a small reservation in the vicinity of Puget Sound. They appear to have crossed over from Vancouver Island. The women do fancy basket and bead work and the men are skilled as fishers and boatmen. The men are peculiar in that many of them wear beards, although this may be due to the fact that they are an admixture with the Russians.

**MALACCA** (mă-lăk'kă), or **Malakka**, a British possession on the southwestern coast of the Malay Peninsula, constituting a part of the Straits Settlement. The area is 650 square miles. Much of the surface is low and swampy. Sago, rice, and pepper are the chief products. Malacca, the capital, has a population of 20,500. The territory has been a British possession since 1874. Population, 1906, 93,274.

**MALACCA, Strait of**, an important channel between Sumatra and the Malay Peninsula, which connects the China Sea with the Indian Ocean. It is from 32 to 140 miles wide and about 475 miles long. A number of islands are located in the narrower part of the channel, including the British settlement of Singapore.

**MÁLAGA** (măl'ă-gă), a seaport of southern Spain, capital of the Málaga province, on the Mediterranean Sea, seventy miles northeast of Gibraltar. It dates from the times of the Romans, when it developed a large commerce, and during Moorish occupation its dockyard and quay were improved materially, much of the works still existing. The manufactures include cotton and woolen goods, leather, clothing, cordage, ironware, soap, and machinery. The export and import trade is large, consisting principally in cereals, wines, salt, iron manufactures, and fruits. Sugar is one of the leading products and exports. The construction of railroads to interior points has given the trade of the city a vast impetus. Among the improvements are several public schools, the government buildings, and modern municipal facilities. The climate is remarkable for its uniformity, healthfulness, and many days of sunshine. Ferdinand and Isabella expelled the Moors from Málaga in 1487, since which time it has been a Spanish city. Population, 1906, 132,630.

**MALAR.** See **Lake Malar.**

**MALARIA** (mă-lă'rĩ-ă), a morbid poison originated in swamps, or the effluvia from the



decomposition of vegetable or animal matter. When a large quantity of such a poison is inhaled, it affects the system through the blood often as long as twelve months after one has been exposed to it, and in many cases exerts its depressive influence through life. It emanates most readily from marshy land under the influence of heat at  $60^{\circ}$  Fahr., but is not generated under thorough drainage, or when the land is flooded with much water or is frozen. An elevation of more than 1,000 feet above sea level is proof against malaria. The diseases arising from it include intermittent and congestive

sites, carry them to human beings, as well as to the water and to other animals taken as food by man. As a means of protection against malaria, plans have been devised to destroy the mosquito, which is done by fumes of tobacco, gases, odors of turpentine, garlic, and by pouring petroleum upon the surface of ponds and marshes where the insects breed and propagate their species.

**MALAY ARCHIPELAGO** (mā-lā'), the most important group of islands in the world, situated southeast of Asia. This group is frequently called the Asiatic, Indian, or Eastern Archipelago. It is surrounded by the China Sea, Pacific Ocean, Indian Ocean, Australia, and Malaya; the last named region does not belong to the group. Within the confines of the archipelago are thousands of islands, many of which are small, but all are more or less fertile and produce luxuriant vegetation. The principal islands include Java, Borneo, Sumatra, Celebes, the Philippines, the Moluccas, Bali, Madura, Banca, Timor, Flores, Billiton, Sumbawa, Lombok, and Ceram. This group includes many active volcanoes in different parts of the archipelago. Malays constitute the principal race, but there are various other races and a small per cent. of Europeans. The productions are largely tropical, embracing minerals, fish, tobacco, fine fruits, gum elastic, coffee, tea, sugar, rice, timber, and various domestic animals. Holland has the principal possessions, to which the name Dutch East Indies is applied.

**MALAY PENINSULA**, Malaya, or Malacca, a long, narrow stretch of land extending from Burmah and Siam, in Asia, in a general southeasterly direction, separated from Sumatra by the Strait of Malacca. The eastern boundary is formed by the China Sea and the Gulf of Siam, and the Isthmus of Kra forms a connection with Lower Siam. The width is from 25 to 215 miles, and the area is about 91,500 square miles. It has extensive ranges of mountains, some of which are from 5,000 to 8,500 feet above the sea. Dense forests cover the mountain districts and many of the lowlands. The drainage is by numerous rivers, but they are generally small. A large part of the surface is very productive. Tin and other minerals abound, especially iron, coal, silver, and gold. The agricultural products include sugar, cotton, rice, yams, tobacco, pepper, and many varieties of fruit. Malays, Siamese, and Negritos constitute the principal native population, and a large per cent. of Chinese have settled in the region. The southwestern portion of the peninsula consists of British territory, to which the name Malacca is applied, and of which Malacca is the capital



Malarial Fever in the Philippines, showing Proportion of Deaths for each Month in 1903.

fevers, ague, and a class of yellow fever. Rice fields and marshy regions of tropical and semi-tropical countries are most commonly affected. The west coast of Africa and the Roman Campaign of Europe are noted malarial districts.

Charles Laveran, a French physician, in 1880, discovered that the disease known as *malaria* is due, not to poisonous emanations from certain soils, but to an animal parasite found in the blood of man and many animals. These parasites belong to a class of protozoa. Additional information on this subject was furnished in 1899 by Major Ross, who was stationed at Calcutta with the British army. With the aid of several physicians he found that mosquitoes fill themselves with the infected blood of birds and other animals, and then deposit their eggs and die near them. In this way the water becomes contaminated with the germs of the disease, is fed upon by the larvae, or is drunk by man. The young mosquitoes, being infected with the para-



city. Independent chiefs still control large tracts under treaties with Siam and Great Britain. The total population is estimated at 1,750,000.

**MALAYS** (mā-lāz'), one of the principal secondary races, closely allied to the Polynesian. This race of man is found largely in the Malay Peninsula, the Malay Archipelago, the island of Madagascar, and the islands of the Indian and Pacific oceans. The Malays are of low stature, less than medium weight, and bear some resemblance to the Mongolians, although the eyes are horizontal, the face is flat, and the hair is less coarse and straight. The beard is scant, the skin varies from a clear brown to a dark olive, and the language is characterized by much phonetic and grammatical simplicity. Arabic characters were used in their writing until comparatively recent times, when the Roman system came into use. They have constituted the best traders of the Malay Archipelago since the 13th century, engage in agriculture and rude manufacture, and build simple but fixed homes. According to their tradition and history, they first occupied portions of Sumatra, where they established the state of Menangkabo, and thence spread in large numbers to other sections, but at present they are tributary principally to Holland.

**MALCOLM** (māl'kūm), the name of four kings of Scotland, who reigned between 943 and 1165. Malcolm I. reigned from 943 to 954. He secured the cession of Cumbria from the English king, Edmund I., in 946. Malcolm II. became king in 1003 and died in 1033; Malcolm III. ascended the throne in 1056 and was slain in battle on Nov. 13, 1093; and Malcolm IV. succeeded to the throne in 1153 and died Dec. 9, 1165, in his 24th year.

**MALDEN** (māl'den), a city of Middlesex County, Massachusetts, on the Malden River, five miles north of Boston. It is on the Boston and Maine Railroad and has communication by many electric lines. Among the noteworthy buildings are the public library, the post office, the Y. M. C. A. building, and the Home for Aged Persons. The manufactures are very extensive, including principally large quantities of rubber shoes, clothing, carpets, cordage, paper, leather, boots and shoes, and machinery. Malden was settled in 1641, was a part of Charlestown until 1649, and was chartered as a city in 1881. Population, 1905, 37,990; in 1910, 44,404.

**MALDIVE ISLANDS** (māl'dīv), an archipelago in the Indian ocean, situated southwest of Ceylon and extending a distance of 540 miles from north to south. It includes seventeen groups of atolls, most of which have a fer-

tile soil and rich forests of palm and other trees. They produce tropical fruits and vegetation. Fish abound off the shores and many species of birds are native here. The inhabitants are governed by a Sultan under a British protectorate. They engage chiefly in agriculture and carry on trade relations with Ceylon, India, and other regions of South Asia. The island of Male, or Mohl, contains the capital, and is three-quarters of a mile wide by one mile long. Mohammedanism is the principal religion of the inhabitants, who number about 32,125.

**MALHEUR** (māl-ōōr'), a lake and river of Oregon. The lake receives the water from Silver River and several other streams, but has no outlet to the sea. It is about ten miles wide and eighteen miles long. The Malheur River rises in the vicinity of Malheur Lake. It has a general northeasterly course of 175 miles and flows into the Snake River at the boundary between Oregon and Idaho.

**MALLEABILITY** (māl-lê-â-bil'ī-tỹ), the property of matter by means of which it may be beaten or rolled into thin sheets. It is confined almost entirely to metals, and nearly all of the metals possess this property. Gold surpasses all the other metals in malleability and gold leaf is so thin that it is transparent. The malleability of some of the metals is in the following order: gold, silver, copper, platinum, palladium, iron, aluminum, tin, zinc, lead, and nickel.

**MALLOW** (māl'lō), a family of plants, consisting mostly of herbs and shrubs, but including a number of trees. About 800 species have been described, most of which are widely distributed, but the largest representation is in the warm climates. In North America this family is represented by about 125 native species and about a dozen more have been introduced. To this family belong the *rose mallow* and the *hollyhock*, both ornamental plants, as well as the *okra*, which produces edible pods that are used in the southern part of the United States. The plants that produce cotton are classed with the mallow family and belong to the species known as *marsh mallow*. The *musk mallow* is quite frequent in America and is characterized by a musklike smell. See **Marsh Mallow**.

**MALMÖ** (mālm'ē), a seaport city of Sweden, capital of the province of Malmöhus, situated across the sound from Copenhagen. The noteworthy buildings include the Church of Saint Peter, the governor's residence, the public library, the city hall, and many schools. It has a large number of important steamboat and railway lines, a growing commercial trade, and extensive manufactures of machinery, cotton and



woolen goods, clothing, spirituous liquors, and wearing apparel. The general facilities include a public library, electric street railways and lights, and an excellent system of public education. The inhabitants are chiefly Lutherans. Malmö has belonged to Sweden since 1658. Population, 1906, 75,691.

**MALPLAQUET** (mål-plà-kâ'), a village of France, in the department of Nord, nineteen miles east of Valenciennes. It is noted as the scene of a battle on Sept. 11, 1709, in which the French under Marshal Villars were defeated by the Dutch and British under Prince Eugene and the Duke of Marlborough. Each army consisted of about 100,000 men. The loss of each was nearly 20,000, but the victory of the allies was signal and resulted in the capture of Mons and Douai.

**MALT**, the name applied to grain that has been artificially germinated by moisture and heat. It is usually prepared of barley, which is steeped in water and fermented in order to convert the starch of the grain into saccharine matter, and is dried in a kiln, after which it is used in the distillation of whisky and for the manufacture of beer, ale, or porter.

**MALTA** (mał'tà), an island belonging to Great Britain, situated in the Mediterranean Sea, 58 miles south of Sicily and 180 miles north of Africa. The colony of Malta includes Gozo, Comino, and several other small islands. Malta proper has an area of 95 square miles, Gozo about 20, and the total colony 117. Several fine harbors are on the shore of Malta, that of Valetta being the best, and the colony includes one of the most important naval stations of Great Britain. Agriculture is the principal industry, yielding cotton, potatoes, corn, oranges, figs, and many species of tropical fruits. The manufactures embrace lace, cotton goods, clothing, matches, filigree, machinery, and utensils. It has an important commercial trade, Malta being a noted center for reloading and storage. A general public school system is maintained. Other educational institutions include a university and business, professional, and industrial colleges. The language spoken chiefly is Arabic, since the natives are descendants from the Arabians, but Italian is understood and spoken by a considerable number.

The government is administered by a resident governor. Roman Catholicism and Mohammedanism are the prevailing religions. Several railways, telegraph connections, telephone lines, and steamship communication are maintained. Valetta is the capital and most important city.

The history of Malta begins about 1,000 B. C., when it was settled by Phoenician traders, but

in 700 B. C. the Greeks conquered it. In 480 B. C. it fell to the Carthaginians, became a Roman colony in 216 B. C., and later was possessed by the Vandals and Goths. The Arabs conquered it in 870 A. D., and in 1814 it was recognized as a British dependency by the Congress of Vienna. Many antiquities are found on the islands of Malta and Gozo, and points of interest are shown to tourists in connection with the visit of Saint Paul, who remained on the island of Malta a period of three months. Population, 1907, 206,690.

**MALTA, Knights of**, a religious and military order dating from about 1048, when it was founded at Jerusalem in a hospital dedicated to Saint John the Baptist. It partook more largely of a military character some years after its organization, defended the Christian faith against the Moslems and other unbelievers, but began to decline after the Reformation. The Knights of Malta adopted the Maltese Cross, an eight-pointed figure, as their badge, and on it was the motto, "Pro fide," meaning for the faith. Several modern associations trace their origin to the Knights of Malta, among them the celebrated Red Cross Society.

**MALVERN HILL** (mål'vërn), **Battle of**, the last engagement of the Peninsular campaign, on July 1, 1862, after which General McClellan changed his base of operations to the James River. Malvern Hill is a town of Virginia, about fifteen miles southeast of Richmond. After the battle of Frazer's Farm, McClellan with 85,000 troops took a strong position on the top of a plateau. The Union army was strongly intrenched behind fences, ditches, and hedges. Their batteries and infantries commanded the slopes, which the Confederates had to ascend to make an attack. It was planned to move in a uniform and concerted attack, but the Confederate army was distributed so General Lee's order could not be communicated promptly to the different lines, and consequently the attack was not simultaneous. The brunt of the battle was borne by Generals Magruder and Hill, who led charge after charge, but the heavy artillery fire made their efforts of no avail. Heavy firing continued until nightfall, when McClellan withdrew to Harrison's Landing, thus ending the Seven Days' battles. The loss on both sides was heavy, and the result was that the attempted capture of Richmond failed.

**MAMARONECK** (mámär'ô-nëk), a town of New York, in Westchester County, on Long Island Sound, twenty miles east of New York City. It is on the New York, New Haven and Hartford Railroad and is a popular residential suburb of New York City. Besides many hand-



some dwellings, it has a number of fine schools and churches, and is the seat of the Larchmont Yacht Club. Population, 1905, 5,090.

**MAMELUKES** (măm'ê-lüks), or **Mama-lukes**, a term applied by the Arabians to the white slaves of Egypt, who were introduced originally into that country from Asia Minor in the 13th century. At first they were used as a mounted bodyguard of the Sultan, but afterward became the regular cavalry of Egypt. They increased in power so rapidly that in 1254 one of their number became the Sultan of Egypt. The Mameluke dynasty ruled Egypt and Syria until 1517, when it was overthrown by Selim I. Though their government was marked more or less by violence and war, it is noted in history as the most enlightened since the time of the Pharaohs. Under their administration cities rose to much prosperity, irrigation canals were established, a postal system was organized, manufactures were encouraged, and many industrial arts were promoted by the government. Both in Cairo and Alexandria are magnificent mosques that date from their time, while their works in metal, clothing, and utensils show them to have been both ingenious and enterprising. Even after their downfall, in 1517, they continued to be the virtual ruling class in Egypt, and in 1798 they made a memorable charge upon Napoleon in the Battle of the Pyramids. Mehemet Ali, Viceroy of Egypt, treacherously massacred 470 of the most important Mameluke princes in 1810, and soon after they practically disappeared from history. Mameluke is a term now applied in Turkey to a male servant, usually a Circassian slave.

**MAMMALIA** (măm-mā'li-à), the name given by Linnaeus to the highest class of the animal kingdom, now commonly employed by zoölogists to describe all those that possess mammae, enabling them to suckle their young. The term is sometimes applied erroneously to all quadrupeds. This classification is incorrect for the reason that some amphibians, as frogs and newts, and some reptiles, as lizards and crocodiles, are four-footed, but they do not possess mammary glands. On the other hand, the whales are not four-footed, but are allied to the warm-blooded quadrupeds, and like them bring forth their young alive and suckle them. The term is therefore properly applied to all animals that have red, warm blood, of which the female produces milk by the mammary glands, such as seals, bats, warm-blooded quadrupeds, and mankind. In mammals the skin is covered more or less with hair, which ranges from spines and bristles to the finest wool and silky down. Lips conceal the mouth, which is fitted for chewing

by means of enameled teeth or equivalent bone formations.

The skeleton of mammals generally agrees with that of man in having solid bones, or, when hollowed, the bones are filled with marrow, while the bones of the face are immovably fixed to each other. Most of the species have five toes. The front limbs are present in all mammals, but in some species, as the manatees and dugongs, the hind limbs are rudimentary or wanting completely. The respiration is by lungs, the diaphragm is complete, and the heart has two auricles and two ventricles. Different classifications have been made of mammalia by Linnaeus, Cuvier, and other writers. The classification made by Cuvier contains seven orders, as follows: Bimana, Quadrumana, Carnassiers, Marsupialia, Rodentia, Edentata, Pachydermata, Ruminantia, and Cetacea.

**MAMMOTH** (măm'möth), a large extinct elephant which closely resembled the Indian ele-



MAMMOTH.

phant, of which fossil remains have been found in the northern part of North America, Europe, and Asia. The first mammoth discovered was found in 1799 on the shores of the Lena River, where it was imbedded in ice, and since then many others have been discovered. In 1806 a mammoth in good condition was found enveloped in ice, which was afterward cut out and given a careful examination. The bones were not only intact, but the muscles, skin, hair, and internal organs were in a good state of preservation. Subsequently great numbers of bones and tusks have been taken from the northern coast of Asia, and from islands in the Arctic Ocean adjacent to Siberia. The extinct mammoth elephant had an average height of about thirteen feet and a length of fifteen feet, and its tusks extended outward in a curved form to the length of eight feet. The hair was tufted and thick and about a foot in length, and a finer wool was underneath the outer growth.



Writers generally agree in expressing the view that the average size of the mammoth was fully twice as large as the elephants now living. These animals lived before the glacial period, but seem to have been common for a long time after that period. The early cave dwellers of Europe utilized their tusks in making weapons and for engraving on them articles of ornament and utility. They were so abundant in Asiatic Russia that the fossil ivory found there became an article of commerce in the early part of the 19th century, although these remains were offered in the market as early as the 10th century. The extermination and disappearance of these species is assigned to changes of climate, but the disappearance of forests and the disadvantage of their great size in battling against flesh-eating animals and the advance of settlements are other probable causes. The remains of a mammoth found in 1846 had been inclosed apparently in ice immediately after death, and its flesh was in such a good state of preservation that it was utilized as food for dogs. The Russian government preserved some of the vital organs and the skeleton, which are now at the Royal Museum in Saint Petersburg.

**MAMMOTH CAVE**, a remarkable cave near Green River, about 82 miles southwest of Louisville, Ky. It is formed in the limestone region, which stretches through Indiana, Kentucky, and Tennessee, covering about 6,000 square miles. Exploring parties have penetrated fifteen miles in the cave, but the main cave is only about three miles long. It is estimated that all the rooms and their windings would permit traveling a distance of 175 miles. The largest apartment, known as the Chief City, is 125 feet high, 287 feet wide, and 544 feet long. A connection seems to exist between the Green River and the cave, since the water found in various parts of different chambers rises and falls in unison with that river. In the main it is dry, but there are several rivers and lakes, the largest of the former being Echo River, which is about three-fourths of a mile long and in places about 200 feet wide. The cave is well ventilated and has many beautiful halls with stalagmite and stalactite formations. Some of the domes reach a height of 300 feet, notably Lucy's Dome and the Egyptian Temple. Several species of animals are found in the cave, among them rats, wingless beetles, and grasshoppers, and amblyopsis fish, all of which are destitute of sight. A hunter by the name of Hutchins discovered Mammoth Cave in 1809.

**MAN**, a term used to designate the human race, as distinguished from other forms of animal life. In zoölogy it is applied to a primate

mammal, representing a special family of the genus *Homo*. It is recorded in the Scriptures that God created man in his own image on the sixth day of creation. At that time he was a creature little lower than the angels, but was driven from the Garden of Eden because of partaking of forbidden fruit, on account of which he became liable to death. It is further detailed that the duration of human life shortly after the expulsion from the Garden was nearly 1,000 years, but it was gradually curtailed on account of the wickedness of the antediluvian world until the limits which still continue were reached. By a plan of salvation man was given a Savior, and those believing on him should overcome the evils of Adam's sin, thereby securing everlasting life of the material body after death. The Jewish race was selected as a special people by God, from whom the Savior should descend, though there is some difference in opinion as to whether the Messiah has appeared, Christians holding that Jesus is the Savior.

Darwin accounts for man's creation through a process of evolution from a species of mollusks belonging to the *Ascidia*. From these he traces the line of ascent through the lancelet fish, later through the ganoids and other fish; thence up through the amphibians, reptiles, and birds; thence the line of ascent is through the monotremata, the lowest mammals, the marsupialia, the placentia, the lemurs, the simiidae, and finally the anthropoid apes. Naturalists have long discussed the question as to whether man constitutes a single species with several varieties, or more than one species. The general view is that there is but one species, and that all varieties descended from a single parent stock. Blumenbach divided mankind into five races—the Caucasian, Mongolian, Ethiopian, American, and Malay. Cuvier reduces them to three primary races, but mentions three secondary races. The primary races, according to Cuvier, are Caucasian, Mongolian, and Ethiopian, while the secondary races embrace the Malay, American, and Australian.

Accredited writers generally agree upon the points of similarity between man and other animal forms, as well as upon their differences. The points of similarity briefly stated include the functions of animal life and instinct; appetites, sensuous emotions, and emotional language; power of sensation and of faint reproductions in imagination; sensuous memory and dim sense perceptions; power of organic interference; and organic volition. The points of difference that distinguish man from the mere animals are abstraction, intellectual perception,



reflection, self-consciousness, intellectual memory, judgment, intellectual synthesis and induction, intellectual intuition, higher emotions or sentiments, rational language, and a true power of will. Man is also distinguished by his erect position and in that he is tool using. In the manufacture and use of tools he has undergone a series of marked progressions, the earlier consisting of flakestones and cracked bones. He is the only living being that uses fire, though fire may exist without the productive energies of man in the form of volcanic action, spontaneous combustion, and lightning.

Many of the primitive tools of man have been found in caves and alluvial deposits along with the remains of tropical fauna, like the hippopotamus, elephant, and lion. Discoveries of this character have been made in continental Europe, from which it is taken that the climate of that part of the earth was at one time similar to the region of the Equator. Geologists approximate the time at 50,000 years. That this long space of time has elapsed since man first left traces of his existence is verified by the remains of Arctic animals that were deposited above tools made by man, which have been found with the remains of tropical animals both in America and Europe. From this circumstance it is evident that the glacial period visited America and Europe after man had made considerable progress in constructing and using tools. Those holding this view generally agree that the days mentioned in the Scriptures as the distinct times for creating different objects and animals correspond to vast periods of time, thus establishing a fair agreement between science and the biblical view of creation.

**MAN, Isle of**, an island in the northern part of the Irish Sea, about midway between Ireland, Scotland, and England. It has a length of 33 miles, a breadth of 12 miles, and an area of 226 square miles. A chain of mountains with a general elevation of 2,000 feet stretches along the eastern shore, Snaefell, 2,024 feet high, being the culminating peak. Fully two-thirds of the surface is under cultivation, the principal agricultural products being wheat, oats, barley, rye, and fruits. It has deposits of zinc, lead, iron, and limestone. Cod and herring fishing is an important industry. The manufactures include machinery, cotton and woolen goods, utensils, wearing apparel, and earthenware. The government is administered by local authorities under the supervision of the crown, and laws become effective only after publication. Acts of the British Parliament do not affect the island unless it is specially mentioned. A Celtic dialect known as the Manx language is still

spoken, but the English is understood by most of the people and is coming gradually into use. Douglas, the principal seaport city, is the capital and has a large railroad and steamboat commerce. Railroad lines connect Douglas with Peel, Castletown, Ramsey, and other cities. A small island south of the Isle of Man is called the Calf of Man. Welsh kings governed the Isle of Man from the 6th to the 9th century, when it came into the hands of the Scandinavians, but in 1266 it was ceded by treaty to the Scotch king, Alexander III. The government of Britain purchased the Isle of Man for \$350,000 in 1765, and all special privileges were ceded by the duke in 1829. Population, 1907, 54,827.

**MANAGUA** (mä-nä'gwä), a city of Central America, capital of Nicaragua, on a railway at the southern shore of Lake Managua. The lake is forty miles long and from six to fifteen miles wide. It communicates with Lake Nicaragua through the Tipitapa River. The city is surrounded by a fertile region and has a large trade in coffee and sugar. It was made the capital in 1855. Population, 1908, 34,908.

**MANAR** (mä-när'), **Gulf of**, an inlet of the Indian Ocean, located between Ceylon and the southern part of India. It is separated from Palk Strait by a low reef called Adam's Bridge, which is situated between the islands of Manar and Rameswaram.

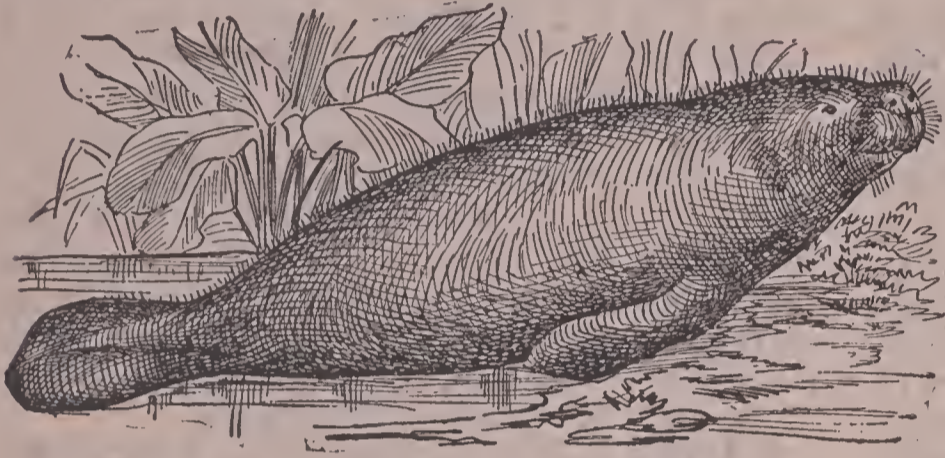
**MANASAROWAR** (mä-nä-sä-rō-wär'), a lake of Asia, in Tibet, located north of the Himalaya Mountains. It is situated between the sources of the Indus and the Brahmaputra and the overflow is carried through the Sutlej River. The lake is about twelve miles wide and eighteen miles long and is held sacred by the Tartars and the Hindus, who make pilgrimages to it.

**MANATEE** (män-ä-tē'), or **Sea Cow**, an animal found in the waters of South America, Australia, and West Africa. It is herbivorous, subsisting especially on sea moss and plants in shallow water. In many respects it shows affinity to the dugong. The body is from eight to twenty feet long, the skin is covered with grayish hair, and the tail is broad and oval formed. The fore limbs are in the form of flappers and are provided with a naillike formation, which aids the animal in moving along the shore or at the bottom of the water. It is the custom of manatees to go in herds, but they are extremely inactive and disappear in the water when danger becomes manifest. The mouths and estuaries of rivers are their favorite abode, where they are hunted for their skins, as well as for their flesh and the oil derived from it. They are not afraid of man and show considerable



affection for their young. The manatee may be tamed in captivity.

**MANCHESTER** (män'chēs-tēr), a town of Connecticut, in Hartford County, on the Hockanum River, five miles east of Hartford. It is on the New England Railroad, has an electric street railway system, and maintains systems of sewerage and public waterworks. The chief buildings include the public library, the townhall, and several schools and churches. Among the manufactures are woolen goods, paper, silk, needles, incandescent lamps, and electrical ma-



MANATEE, OR SEA COW.

chinery. Manchester was separated from East Hartford and incorporated in 1823. Population, 1900, 10,601; in 1910, 13,641.

**MANCHESTER**, a city of New Hampshire, one of the county seats of Hillsboro County, on the Merrimac River, 55 miles northwest of Boston, Mass. It is on the Boston and Maine Railroad and on a number of electric railway lines. The site extends along both sides of the Merrimac River, which is joined here by the Piscataquog River, and is well drained and improved by grading and pavements. Among the noteworthy buildings are the public library, the county courthouse, the Federal building, the Roman Catholic cathedral, the Saint Anselm's College, a State industrial school, and many churches and schools. The manufactures include cotton and woolen goods, boots and shoes, machinery, locomotives, agricultural implements, carriages, and edged tools. An abundance of water power for manufacturing is derived from the Amos'eag Falls of the Merrimac, which have a descent of 55 feet. Manchester was settled by Scotch-Irish in 1722 and was incorporated as Deerfield in 1751. It was renamed Manchester in 1810 and became a city in 1846. Population, 1900, 56,987; in 1910, 70,063.

**MANCHESTER**, a city of Virginia, in Chesterfield County, on the James River, opposite Richmond. It is on the Southern, the Sea Board Air Line, and the Atlantic Coast Line railroads. The surrounding country is agricultural and

contains productive coal deposits. Among the manufactures are ironware, cotton goods, flour, paper, machinery, furniture, oil, leather, ice, and hardware. In the vicinity of the city are large granite quarries. An abundance of water power is derived from the James River, which has a fall of 100 feet in six miles. Gas and electric lights, waterworks, pavements, and several fine schools are among the improvements. Population, 1900, 9,715.

**MANCHESTER**, a commercial and manufacturing city of England, in Lancashire, on the Irwell River, thirty miles east of Liverpool. It has extensive railroad connections, maintains modern municipal facilities, and is surrounded by a country which is noted for its productive manufacturing towns. On the opposite side of the Irwell River is Salford, with which it is connected by several railway viaducts and a large number of bridges.

It is beautifully built and contains much wealth. Among the noteworthy buildings are the Gothic assize court, the townhall, the Royal Exchange, the public library, the perpendicular Gothic cathedral erected in 1422, and the Victoria University, an institution founded by John Owens with a bequest of \$500,000, in 1846. The city contains several hundred churches, among them splendid specimens of Gothic architecture, representing the various leading Protestant sects. It has a number of German churches, two Jewish synagogues, and a Greek Catholic church. The educational institutions embrace high schools, professional and business colleges, industrial institutions, and several charitable and benevolent schools. It has many educational and scientific societies and a public library of about 200,000 volumes, these being distributed in several branches for convenient access. In 1887 the authorities erected a beautiful post office in the Renaissance style at a cost of \$500,000. Manchester has splendid parks, an electric street railway system, waterworks, pavements, gas works, electric lights, and numerous monuments, among them those erected in memory of Richard Cobden, Cromwell, Prince Albert, and other noted men of Great Britain.

Manchester is particularly noteworthy as an industrial and a wholesaling center. Among the leading manufactures are cotton, woolen and silk goods, steamships, machinery, ironware, spirituous liquors, soap, chemicals, paper, edged tools, and musical instruments. The export and import trade is extensive. Improvements in the city waterworks were made in 1894 at a vast expenditure, and the supply is now drawn from



Lake Thirlmere by means of tunnels and aqueducts. The city owns and operates the systems of waterworks, electric lighting, and gas plants and supplies a number of the neighboring towns at a large profit. It likewise owns the electric street railways, but they are operated by a private company at a profit of ten per cent.

The history of Manchester dates back to Roman occupation, when it was a base of military operations, and in the time of Edward III. became a manufacturing town. By the middle of the 18th century the factory system attained a foothold and it was the first town of England in which this system developed. The Bridgewater Canal was constructed in 1576 for the purpose of making an outlet to the sea and establishing convenient connections with the coal and salt mines situated in Cheshire and Lancashire. Railroads were put in operation in 1830, but the Civil War in America interfered greatly with its cotton manufacture, since it cut off its supply of raw cotton. A fine canal and inland harbor were completed in 1894, by which the foreign trade became vastly augmented, though this improvement cost fully \$75,000,000. Population, 1907, 643,148.

**MANCHESTER SHIP CANAL**, an artificial waterway of England, extending from Manchester to Eastham, on the estuary of the Mersey River. It is 26 feet deep, about 600 feet wide at the surface, and 35.5 miles long. The canal was completed in 1894 and on May 21 of that year was formally opened for traffic by Queen Victoria. Ocean steamers of the largest size enter Manchester, which has six miles of wharfage, and dock accommodations equal to 100 acres. The canal was constructed at an expense of \$75,000,000, of which one-third was contributed by the city of Manchester.

**MANCHURIA** (mǎn-chōō'ri-à), a territory in the northeastern part of China. The northern boundary is formed by the Amur River, which separates it from Siberia. It is bounded on the south and the southeast by the Gulf of Liao-tung, Corea, and the Gulf of Corea, and on the west by the Argun River and Mongolia. The total area is about 365,000 square miles. The territory is divided into the three provinces of Liao-tung, Kirin, and He-Lung-Kiang. Shing-yang, in the province of Liao-tung, is the capital of Manchuria. The native race is made up of Manchus, but at present the Chinese predominate. Manchuria has a temperate climate. Though severe in winter, it is healthful and favorable to various industries. The principal productions include wheat, millet, cotton, opium, tobacco, barley, lumber, and indigo.

The natives, known as Manchus, are a Tartar

people of Tungusic origin. In the 17th century they invaded and conquered China, which has since been governed by a Manchu dynasty, and the court and official language continues to be that of the Manchus. Russia obtained a lease of several harbors, including Port Arthur, in 1898, and two years later took possession of several ports and interior cities with the view of controlling Corea and the Yellow Sea by an extension of the Trans-Siberian Railway. Subsequently Russia refused to evacuate, but by the treaty of Portsmouth, in 1905, restored all of it to China, except the leased territory of Liao-tung. This treaty gave the Japanese possession of the chief towns, including Dalny, Mukden, and Port Arthur. A large majority of the inhabitants are Chinese. Population, 1908, 16,565,550.

**MANDALAY** (mǎn'dà-lā), a city of India, the former capital of Upper Burmah, on the Irrawaddy River, 350 miles north of Rangoon. In 1860 the King of Burmah transferred the seat of his government to Mandalay from Amarapura, when its present prosperity began, and in 1886 it was annexed to India by the British. The site of the city is on a fertile plain. It has railway connections, manufactures of silk and other textiles, and is an attraction for many Buddhist pilgrims. Among the interesting buildings are the Aracan Pagoda, several government structures, and numerous mosques. It has been damaged several times by floods and fires, but the city has been growing materially. Electric street railways, telephones, electric lights, and several fine schools and hospitals are among the improvements. The inhabitants include many classes of Asiatics and a small number of Europeans. Population, 1906, 185,761.

**MANDAN** (mǎn'dǎn), a city of North Dakota, county seat of Morton County, five miles west of Bismarck. It is located on the Missouri River and is on a division of the Northern Pacific Railway. The surrounding country has large interests in farming and stock raising. A good grade of lignite coal is mined in the vicinity. The chief buildings include the high school, the State Reform School, and several churches and business blocks. It was named from the Mandan Indians, who formerly populated a large part of North Dakota, but are now settled on Fort Berthold Reservation at the junction of the Little Missouri with the Missouri River. These Indians were first met by Lewis and Clark, when they were a powerful tribe, but at present they do not exceed 250. In the vicinity of the city of Mandan are numerous prehistoric remains that seem to indicate a former semicivilization. Population, 1905, 2,714.



**MANDARIN** (mǎn-dá-rěn'), a general name for a Chinese magistrate. It is applied by Europeans to any public official of China, either civil or military. Khan, the Chinese equivalent, implies a public official or character.

**MANDINGO** (mǎn-dīngō), the name of a tribe of Negroes in West Africa, who dwell in the region located between Monrovia and the Senegal and Upper Niger rivers. They are mixed more or less with Hamites, but have woolly hair and are unusually tall. Their state of society is semicivilized. In religion they belong to the Mohammedans. Many of their towns are walled, the houses are chiefly of clay and adobe brick, and the government is administered by independent states. The language is known as Mandi, but a large number have learned the use of French.

**MANDOLIN** (mǎn'dō-līn), a musical instrument which resembles the guitar, so called from its almond shape. It was first manufactured by the Italians, who now make several varieties, each with different tunings. The *Neapolitan mandolin* is considered the most perfect instrument of this class. It has four strings. The sound is made by a *plectrum* used in the right hand, while the strings are stopped on the fretted fingerboard by the fingers of the left. The compass is about three octaves.

**MANDRAKE** (mǎn'drāk), a plant native to Amercia, Europe and Asia, belonging to the order *Solanaceae*. A narcotic poison is found



MANDRAKE.

in all of its parts. The root is fleshy, often forked, and described as resembling a human being in general outline. The leaves are lanceolate, beneath which are concealed several pale violet-colored flowers, with a purple bell-shaped corolla. Its fruit is a fleshy,

orange-colored berry. Although a very different plant, the *May apple* of North America is sometimes called mandrake. In Europe and Northern Africa the mandrake is gathered for its narcotic properties, which are utilized as a purgative, but the use among professional physicians has decreased materially.

**MANDRILL** (mǎn'drīl), a large and powerful species of baboon, distinguished by having a short tail and a savage disposition. It is native to Africa, found chiefly in the northern and

western parts, where it is seen in large troops. The adult male is about five feet tall, when standing erect. These animals have a long muzzle, furrowed with purple and scarlet, and



MANDRILL.

the nose is bright red. The cheeks are enlarged by swellings. They are both strong and cunning. See **Baboon**.

**MANGANESE** (mǎn-gā-nēs'), a metallic element which is widely diffused, occurring chiefly as sulphide and carbonate and in the form of peroxide. It has a grayish-white color, but by being exposed to air readily oxidizes, and decomposes in water with an evolution of hydrogen. Extensive deposits are found in various countries, especially in Virginia, Arkansas, California, Spain, Moravia, and Germany. Manganese is serviceable under various conditions for numerous purposes, including its use in the manufacture of plate glass, bleaching powder, pottery, and enamel, and for various purposes in analytical chemistry.

**MANGE** (mānj), a skin disease of various domestic animals, due to the presence of a small mite upon the skin. It is most prevalent among cattle, dogs, swine, and horses. In sheep it is known as *scab*, or *scabes*. The early symptoms are heat and itching, after which the skin becomes bald and sore. In the early stages it may be treated by applying the tincture of belladonna or such tonics as iron or arsenic locally, but where the disease has spread over various parts of the body it is best to plunge the animals in dips or tanks containing solutions of lime and sulphur, or tobacco and sulphur. When arsenic and other poisonous materials are used, they must be diluted and applied with much care.







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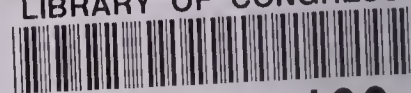


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